

An Ethnopharmacological Study of The  
Injecting Use of Performance and Image Enhancing  
Drugs (PIED)  
Volume I of II

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## **Abstract**

**Aim:** This thesis aims to explore the practices, beliefs and values of individuals who inject performance and image enhancing drugs (PIED) through describing and analysing dynamics in online asynchronous interactions

**Background:** As use of PIED attracts increasing clinical and research attention, knowledge with regard to the practices of individuals who use PIED is increasing. However, injecting as a concept within PIED culture is rarely studied.

**Methods:** A systematic review was conducted using Critical Appraisal Skills Programme (CASP) guidelines. General and substantive theory concerning body ideals, technology, health and risk were used to guide data collection according to Layder's adaptive theory. Online discussion forums (n = 8) were selected based on accessibility, relevance to the research question, highest level of traffic, activity and number of postings. The final data set of records was analysed using ethnographic content analysis and NVivo software and unique theoretical concepts developed.

**Results:** Several empirically undocumented PIED injecting practices were discovered in the data for this study, including self-phlebotomy in individuals who inject AAS, "cocktail injecting" - injecting multiple PIED in a single syringe, homebrewing of AAS and use of DIY Botox and dermal filler kits. Individuals who inject PIED were seen in this study to be motivated by identity construction and selfhood. Gendered identity displays in the data demonstrated that injecting was related to concepts of empowerment and individualism.

**Conclusion:** This doctoral research presents a study which gives an illustration of contemporary injecting PIED use as described within discussion forums. It gives an insight into the phenomenon of injecting in the context of PIED use and the functioning and dynamics of the online discussion forum space. Further research in this area is warranted, particularly as this relates to evidence informed and targeted harm reduction policies and effective public health interventions.

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## Publications

Findings arising out of this doctoral work have been published as follows:

Brennan, R., Wells, J.G. and Van Hout, M.C. (2015). An Unhealthy Glow? A review of Use and Associated Clinical Outcomes, *Performance Enhancement and Health*, 3(2),pp 78-92

Brennan, R., Wells, J.G. and Van Hout, M.C. (2016). A Systematic Review of the Injecting Use of Image and Performance Enhancing Drugs – *Health and Social Care in the Community* 25(5), pp 1459-1531

Brennan, R., Wells, J.G. and Van Hout, M.C. (2017). “Raw Juicing” – an online study on the home manufacture of anabolic-androgenic steroids (AAS) for injection in contemporary performance and image enhancing drug (PIED) culture, *Performance Enhancement and Health*, 6, pp 21-27

Brennan, R., Wells, J.G. and Van Hout, M.C. (2018). “Saving Face” - an online study of the injecting use of DIY Botox and dermal filler kits, *Plastic Surgery*, early online

Brennan, R., Wells, J.G. and Van Hout, M.C. (2018). "Blood Letting" – Self-phlebotomy in injecting anabolic-androgenic steroids within performance and image enhancing drug (PIED) culture, *International Journal of Drug Policy*, 55, pp. 47-50

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## **Chapter 1: An introduction to the study**

### **1.0 Introduction**

This doctoral work was funded by the Irish Research Council and was conducted as a postgraduate research project within Waterford Institute of Technology from 2013 to 2017, as a submission for the award of PhD by Research. The main aim of the research was to develop a greater understanding of the phenomenon of injecting performance and image enhancing drug (PIED) use as discussed and described by individuals who inject PIED in dedicated internet forums. This study is unique, as it focuses on injecting as the phenomenon of interest in PIED culture, and contributes new evidence regarding the practices, beliefs and values of individuals who inject PIED and access the online discussion forum space. This study will provide a framework for discussion and useable knowledge for healthcare providers and policy makers and for future academic research in injecting PIED use. Section 1.1 in this chapter describes the catalyst for this study. Section 1.2. provides a background to research in a sociocultural context. Section 1.3 states the research objectives. Section 1.4 outlines the contents of this thesis. Section 1.5 concludes the chapter.

### **1.1 Catalyst for the study**

My personal and academic interest in this area began in 2009, while studying for my honours degree in Addiction Counselling. Throughout my studies I accumulated theoretical knowledge on drug use behaviours, which strengthened my interest in the phenomenon of substance use. As an undergraduate I was inspired to take part in research into the emergence of novel psychoactive substances (NPS) in Ireland, known as ‘legal highs’, a topical area in the media at the time. The popularity of these drugs



was at first fuelled by the emergence of ‘headshops’ where legal highs could be purchased locally and post legislative control via websites and cyberpharmacies. This research resulted in my first peer reviewed publications as a co-author<sup>1</sup>. Investigation into the online sourcing of NPS by participants in these studies fed my curiosity and thirst for knowledge into the development of new drug trends, the role of the internet in the creation of a new drug market and the emergence of new online subcultures within these contexts. I became aware of the existence of a large online community behind drug use where detailed information-exchange occurred. This is an online environment where accounts of drug experiences, guidelines for use and anecdotal advice are available readily online for curious individuals open to initiation or seasoned ‘veterans’ seeking support and validation with likeminded others.

The use of PIED injectables came to my attention through interviewing a research participant in my earlier study. I initially interviewed her with regard to her use of mephedrone - a new ‘designer’ psychoactive stimulant. She disclosed her use of tanning injectable Melanotan II, after I complimented her on her deep tan. She commented that, in addition to sourcing psychoactives online, she also was able to order tanning injections in this manner. I was increasingly aware of the growing popularity of tanning

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<sup>1</sup> Brennan, R., & Van Hout, M.C. (2012). Miaow Miaow: A Review of the new psychoactive drug Mephedrone. *Drugs and Alcohol Today*, 12(4): 241-253.

Van Hout, M.C., & Brennan, R. (2012). Curiosity killed M-Cat: A post legislative study on mephedrone use in Ireland. *Drugs: Education, Prevention and Policy*. 19(2): 156-162.

Van Hout, M.C. & Brennan, R. (2011). Plantfood for Thought: A Qualitative Study of Mephedrone Use in Ireland. *Drugs Education Prevention and Policy*. 18(5): 371-381.

Van Hout, M.C. & Brennan, R. (2011). Heads Held High: An exploratory study of Legal Highs in pre legislation Ireland. *Journal of Ethnicity of Substance Abuse*. 10(3): 256-272.

Van Hout, M.C. & Brennan, R. (2011). Bump and Grind: An Exploratory Study of Mephedrone Users’ perceptions of sexuality and sexual risk. *Drugs and Alcohol Today*, 11(2): 93-104.

injectables along with other cosmetic enhancement substances such as Botox and anabolic-androgenic steroids through media reports. It became apparent to me that this was a growing and under studied social phenomenon, worthy of research attention.

## **1.2 Sociocultural context**

Recently, researchers have underscored the enduring nature of many Western sociocultural body ideals as an institutional force, despite raised awareness around the negative impact of objectification of bodies (Mooney et al, 2017; Ricciardelli and Williams, 2016). While muscularity has been revered since ancient times in the Western world, in imagery depicting Greek, Roman and biblical deities, the Far East has no such historical or cultural references to muscularity as a component of masculinity, and favours a slim, lean male body (Kanayama, Hudson and Pope, 2012). Interestingly, recent research described acculturated South Asian males in the U.K. who had absorbed a Western body ideal in their use of AAS (Van Hout and Kean, 2015). While a muscular and lean ideal for male bodies is extolled in Western countries (Hall, Grogan and Gough, 2016; Ricciardelli, Clow and White, 2010; Atwood, 2005), this ideal has also been adopted in other areas of the world where use of AAS to achieve it has been documented (Haerinejad et al., 2016; Sagoe et al., 2014a; Sagoe et al., 2015b).

Similarly, while connotations of wealth and class are made with pale skin in parts of Asia (Leong, 2006), and skin bleaching occurs in many non Western countries (Choma and Prusaczyk, 2018), a slender, toned and tanned body blueprint for females (O’Dea and Cinelli, 2016; Frith, 2012; Hall, Grogan and Gough, 2016) continues to be propagated by various types of Western media including magazine articles, advertising and represented in children’s toys (Ricciardelli and Williams, 2016). In this regard,

‘appearance culture’ (O’Dea and Cinelli, 2016) continues to exert pressure on individuals, creating body dissatisfaction and a desire for enhancement (Smith, Rutty and Olrich, 2016). Certain PIEDs may alter the body’s appearance in accordance with Western ideals.

PIEDs are pharmacologic agents sourced to strengthen and build muscle; lose fat (e.g. anabolic- androgenic steroids (AAS), human growth hormone (GH)); combat signs of aging (e.g. Botox and dermal fillers) and enhance and tan the skin (e.g. Melanotan I and II) (Evans-Brown et al., 2012). Use of the most popular PIED, anabolic-androgenic steroids (AAS) is approximately sixty years old (Smith, Rutty and Olrich, 2016). However, while the use of AAS has been scientifically documented since the 1980s (Pope et al., 1988), the past three decades has seen use by recreational gym attendees or ‘body aesthetes’ (Underwood, 2017), who now outnumber the early adopter groups of competitive bodybuilders and athletes (McVeigh and Begley, 2017; Sagoe, Andreassen and Pallesen, 2014). In this regard, use of PIED to enhance the body in the general population is increasingly a focus of clinical and research surveillance (Hall, Grogan and Gough, 2016).

The research reported in this doctoral study is concerned with the injecting use of PIED and the emergence of what appears to be a heterogeneous and distinct group of injectors. Although a broad category with dynamic drivers for use, individuals who inject PIED have been seen in the literature to disassociate from those who inject opioids and stimulants (Bates et al., 2015; Kimergard and McVeigh, 2014; Kimergard, 2014; Monaghan, 2001) despite facing many of the same injecting risks, and to exhibit reduced engagement with healthcare services (Bates and McVeigh, 2016).

The phenomenon of injecting in illicit drug use has long been the subject of qualitative research and dates back to opium injection in the 1800's (Rhodes, Greenwood and Robertson, 2001). Despite its relative low prevalence as a drug use behaviour in opioid and stimulant use as a route of administration, injecting has been described as the most deleterious to health through association with overdose fatalities and transmission of bloodborne viruses HIV-1 and Hepatitis B and C (Rhodes, Greenwood and Robertson, 2001). Despite this, studies have found that many individuals who inject psychoactive drugs consider injecting the superior way to consume their drug of choice, due to efficiency, increased bioavailability and albeit rarely, a complex social and relational attachment to the needle itself and the process of injecting (Pates, McBride and Arnold, 2005). The perspectives of individuals who inject PIED in relation to injecting have rarely been documented, despite evidence that the phenomenon of body enhancement through PIED use may be increasing (Hall, Grogan and Gough, 2016).

There is now a robust evidence base with regard to serious health consequences associated with the use of PIEDs. This includes AAS associated organ failure; cardiac arrest; fertility problems; gynecomastia in men and virilisation in females (Hanley Santos and Coomber, 2017). Use of GH has been linked to hypoglycaemia; Hodgins's lymphoma; diabetes and joint and tissue damage (Brennan, Wells and Van Hout, 2016), with melanoma, systemic toxidrome and clonic seizure noted in people who inject Melanotan (Brennan, Wells and Van Hout, 2015). Use of self-administered Botox and dermal filler kits sourced online has rarely been studied scientifically; however incidences of botulism in people who were injected with counterfeit Botox has been recorded in the clinical case literature (Chertow et al., 2006). Specific to injecting risk,

there has been recent identification of the human immunodeficiency virus (HIV) amongst people who inject PIEDs, in addition to Hepatitis B (HBV), Hepatitis C (HCV) and skin and soft tissue infections (SSTI) (Rowe et al., 2017; Hope et al., 2016; Hope et al., 2013).

Another key aspect to PIED related risk is the online market from which many products are sourced by the general population. The internet has been described as supporting self-medication with PIED through facilitating access to drugs that were previously difficult to procure for the average individual (Mooney et al, 2017; Graham, Baker and Davies, 2016). The availability of PIED products through an exponentially expanding online market has been well documented in the literature (McBride, Cullet and Coward, 2016; Brennan, Kanayama and Pope, 2013, Clement et al.,2012; Cordaro, Lombardo and Consentino, 2011), which may create a false presumption of safety (Mooney et al, 2017). Many websites exist dedicated to the sale and use of these drugs where unregulated and untested substances are sold freely without prescription, facilitated by the absence of and difficulty in establishing internationally coordinated legislative controls over online pharmacies and global transport and postal networks (Mooney et al, 2017; Evans-Brown et al., 2012). As a consequence, studies which analysed PIED products sourced from internet sellers have found them to be typically counterfeit, mislabelled and contaminated (Stensballe et al., 2015; Breindahl et al., 2015; Kimergard et al., 2014).

As PIED use in the general population attracts increasing clinical and research attention, knowledge with regard to the practices of individuals who use PIED is building. However, some areas remain understudied, particularly in relation to injecting. It has

been underscored recently by a review of the PIED literature (Brennan, Wells and Van Hout, 2016) that the online space is likely to contain information about empirically undocumented practices within contemporary PIED culture. In this regard, this study explores beliefs and values as discussed in PIEDs related online forums through describing and analysing the dynamics in online asynchronous interactions between individuals who inject.

### **1.3 The research objectives**

This study focuses upon the injecting use of PIEDs with regard to AAS; GH; tanning peptides Melanotan I and II and bremelanotide; cosmetic injectables Botox and dermal fillers and oil injectable Synthol. Some information was also gathered throughout the data collection process regarding other PIED injectables such as insulin, growth hormone releasers, (e.g. CJC-1295, GHRP-2 and GHRP-6) and SARMS – nonsteroidal selective androgen modulators. This study investigates the contemporary profile of individuals who inject PIED; sourcing routes; product endorsement; risk perceptions and health outcomes of injected PIED. In doing so, this study aims to add to the current knowledge base of policy makers, health and social care professionals as this relates to recommendations for prevention, harm reduction and clinical intervention for injecting use of PIED. It also contributes to the scientific literature new knowledge on the injecting practices, beliefs and values of individuals who inject PIED and through critical analysis of these, provides a theoretical framework for future research in this field.

#### ***1.3.1 Research Objectives***

To identify and analyse the cohort profile of individuals who inject PIED in mainstream society to include motives for use, risk perceptions and risk navigation strategies;

To analyse attitudes and perceptions amongst individuals who inject PIED towards their injecting;

To describe and analyse patterns of injecting in PIED use to include preferred site of administration, dosages and polypharming regimens;

To review and build a profile of short and long term effects, side effects, risk of misuse and dependence for each product;

To identify product endorsement and popularity of specific PIED injectables;

To explore sourcing routes and analyse the relative diffusion of PIED injectables in non-registered online pharmacies and other online shops;

To provide a theoretical framework for future research and investigation in the field of injecting PIED use.

#### **1.4 Thesis chapters**

Chapter Two presents a critical analysis of the extant literature on PIED injection; using Critical Appraisal Skills Programme (CASP) methodology to assess the quality of the literature and to summarise what is currently known, as well as identifying challenges to health services and highlighting gaps in the literature where further research is needed.

Chapter Three presents a detailed discussion of the prior theoretical framework which underpins the research. Within this prior theory, consideration is given to both societal and institutional forces, such as appearance culture and gender roles and subjective individual elements including agency and embodiment of identity through body enhancement.

Chapter Four provides a detailed description of the methodological theory underpinning the study, i.e. Layder's Adaptive Theory (1998). This theory was found to be an appropriate approach with which to conduct this research as it investigates a phenomenon which requires theoretical framing and exploration of the causal and cognitive mechanisms interlocking PIED use behaviours with the wider social realm.

Chapter Five details the process of investigation of PIED injection in the online discussion forum space and gives the rationale for a passive, observational and ethnographic content analysis approach in an internet research setting. Ethical considerations are explored in relation to whether the internet constitutes a public or a private space and data collection and analysis are described.

Chapters Six and Seven present the results of the research. Chapter Six describes online discussion in relation to motivators for PIED use, sourcing routes and risk, health outcomes and product endorsement as stated in the research objectives for this study. Chapter Seven has a particular focus on results in relation to injecting and describes beliefs and values referenced to injecting within PIED related online forums, novel and innovative harm reduction strategies and other previously undocumented injecting practices such as bloodletting in individuals who inject AAS, cocktail injecting and use of DIY Botox and dermal filler kits. Both chapters discuss the findings of the research in relation to the prior theoretical framework introduced in Chapter Three and to the extant literature.

Chapter Eight discusses the findings of the study and presents three new theoretical concepts which emerged from the data; namely selfhood in injecting PIED use;



communal folk pharmacology in online forums and the relationship with the syringe in PIED injecting. It concludes the thesis by summarising the research journey which took place throughout the duration of this study, identifying this study's contribution to research in the field of injecting PIED use and its implications for practice and policy and finally, stating the study's limitations.

## **Chapter 2: A systematic review of the literature on injecting use of performance and image enhancing drugs (PIED)**

### **2.0 Introduction**

Injecting use of performance and image enhancing drugs (PIED) in the general population is an increasing phenomenon. This chapter will systematically review the extant literature on PIED injection. Section 2.1 presents the background to this study and states the aims of the review. Section 2.2 describes the methodology for the literature review. Section 2.3 discusses the literature on extent of PIED use. Section 2.4 presents findings on profiling of individuals who inject PIED, including gender, age of onset and motivators for use. Section 2.5 discusses sourcing and PIED injectable product endorsement. Section 2.6 examines identified patterns of injecting PIED use. Section 2.7 describes the known health consequences associated with PIED use. Section 2.8 looks at perceptions of health risk amongst groups of individuals who inject PIED. Section 2.9 discusses the findings of the review with regard to gaps in the literature and 2.10 concludes by stating the rationale for the research.

### **2.1 Background and key review questions**

The transitioning of PIED use from peripheral groups of bodybuilders, powerlifters and sex workers to the mainstream population is an emergent trend (Underwood, 2017; Maycock and Howat, 2007; Baker, Graham and Davies, 2006). Of particular significance is the injecting use of PIED, from which a distinct group of individuals who inject, with dynamic motivators, have emerged. Individuals who inject PIED typically disassociate from an injecting drug user identity, as PIED use is perceived as being motivated through body enhancement (Brennan, Van Hout and Wells, 2013). In

this regard, injecting may be conceptualised as self-improvement within PIED injecting groups.

Surveys (Chandler and McVeigh, 2014), needle exchange data (Jennings et al., 2014, Hope et al., 2013) and reports (Evans Brown et al., 2012) indicate that some of the more popularly used PIED are anabolic androgenic steroids (AAS); human growth hormone (GH) and tanning peptides Melanotan I and II. Synthol and unregulated Botox/dermal filler injectables are the most undocumented scientifically despite anecdotal reporting and online media consumerism of use (Coleman and Zilinskas, 2013, Schafer et al., 2012, Pickett, 2011, Pickett and Mewies, 2008).

The purpose of this review is to assess the quality of the extant literature on PIED injecting, to summarise what is currently known on the increasing trend of injecting PIED use, to identify challenges to health services and to highlight gaps in the literature where further research is needed. In this regard, key review questions were chosen as follows:

What is the extent of injecting use of PIED?

What is the typical profile of the individual who injects PIED?

What are the identified motivators for use?

Where do individuals source their PIED?

What are the identified patterns of PIED use?

What are the identified health risks and consequences?

What are the perceptions of risk amongst individuals who inject PIED?

## 2.2 Methodology

The Critical Appraisal Skills Programme (CASP) was chosen to guide this review. The CASP is widely used and provides for the assessment of the quality of the literature reviewed. CASP is comprised of seven checklists developed from guides produced by the Evidence Based Medicine Working Group published in the *Journal of the American Medical Association* (Public Health Resource Unit, 2006). These tools were developed to assess the quality of the literature from different types of studies (e.g. reviews, randomized control trials, qualitative research).

### 2.2.1 Search Strategy

Search terms used included generic, brand and street names for injectable PIED (see Table 1) used in combination with ‘illicit use’ and ‘non-medical use’.

**Table 1 Search terms**

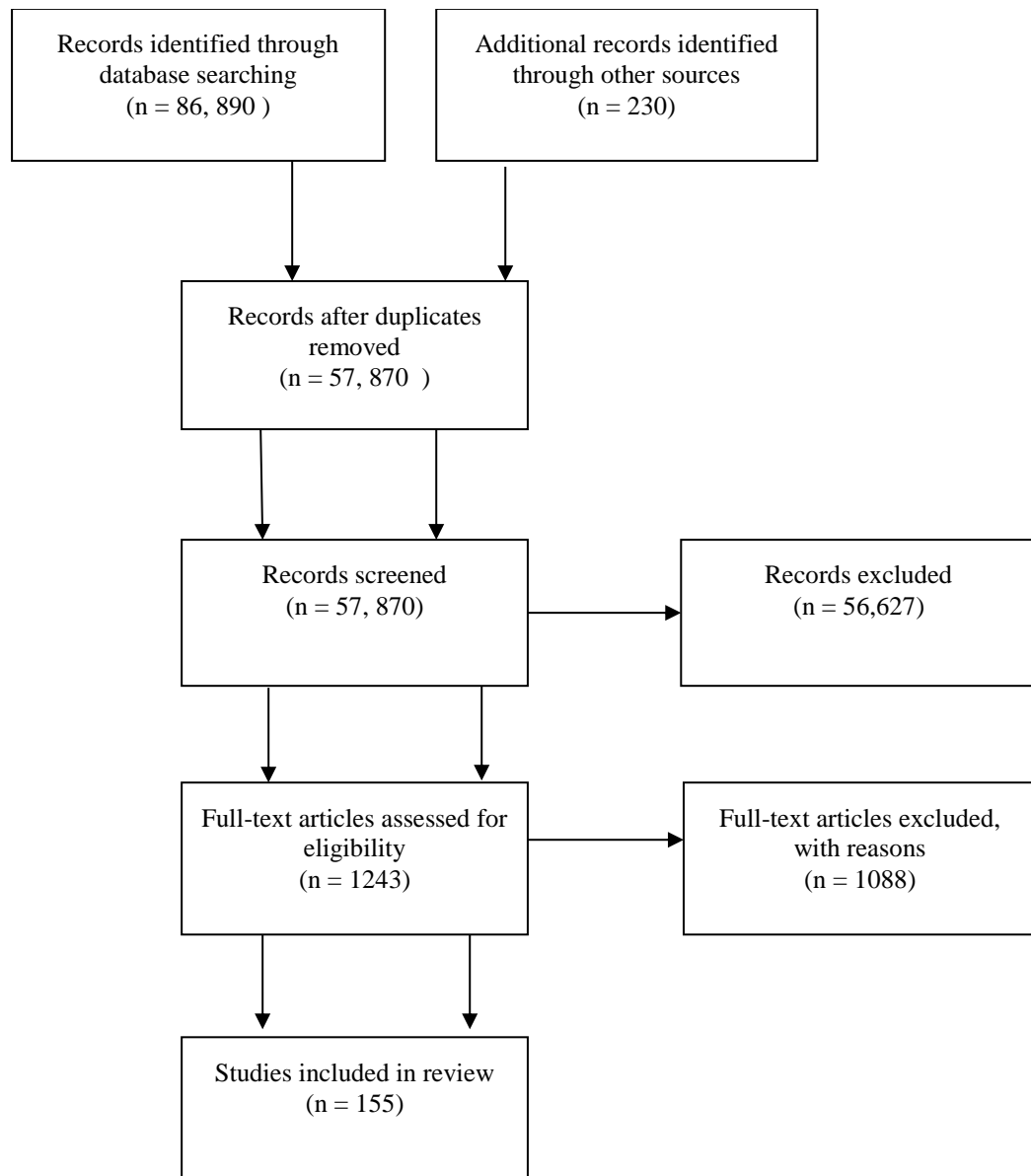
| AAS                               | Generic Names                                                                                                                                                                                       | Brand Names                                                                                                                                           | Other                                                                                                                                |
|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|
| Anabolic-Androgenic Steroids      | “boldenone undecylenate”<br>“Dromostanolone Dipropionate”<br>Testosterone esters”<br>“Testosterone undecylenate”<br>“Trenbolone Acetate”<br>“Nandrolone Phenylpropionate”<br>“Methenolone Enantate” | “Equipoise”, “Ganabol”,<br>“Equigan”, “Ultragan”,<br>“Masteron”,<br>“Winstrol Depot”<br>“Nandrolone” “Deca-Durabolin” “Averbol”<br>“Primobolan Depot” | “Anabolic Androgenic Steroids”<br>“AAS”<br>“anabolic steroids”<br>“NPP”<br>“EQ”<br>“Primo”<br>“Deca”<br>“Winnie”<br>“Test”<br>“Tren” |
| Human Growth Hormone              | “human growth hormone”, “somatotropin”,<br>“somatropin”                                                                                                                                             | “Saizen”, “Omnitrope”,<br>“Zorbitive”, “Genotropin”,<br>“Norditropin”                                                                                 | “HGH”,<br>“GH”,<br>“peptide hormone”,                                                                                                |
| Melanotan I, II and bremelanotide | “Melanotan I”; “Melanotan II”, “bremelanotide”,<br>“afemelanotide”                                                                                                                                  |                                                                                                                                                       | “tanning peptides”;<br>“tantastic”<br>“MSH analogues”;<br>“tanning injections”,<br>“Barbie drug”,<br>“tanning jab”,                  |
| Synthol                           | n/a                                                                                                                                                                                                 | “Synthol”, “Syntherol”,                                                                                                                               | “posing oil”,                                                                                                                        |

|                          |                                                 |                                                                  |                                     |
|--------------------------|-------------------------------------------------|------------------------------------------------------------------|-------------------------------------|
|                          |                                                 | “ADE”                                                            | “oil injection”<br>“pump oil”       |
| Dermal fillers and Botox | “botox”, “botulinum toxin A”<br>“dermal filler” | “dysport”, “Xeomin”,<br>“MyoBloc”, “Novotox<br>Ultra”, “Canitox” | “DIY Botox”,<br>“DIY dermal filler” |

There were no date restrictions placed on searches for Melanotan, human growth hormone (GH), site enhancement oils or cosmetic injectables studies, due to the limited literature base on unregulated use of these particular PIEDs. In the case of anabolic androgenic steroids (AAS), dates were restricted from 2004 to the present day, as the literature prior to this interval is already well summarized in prior reviews (Evans, 2004, Brower et al., 2002; Yesalis et al., 1993; Perry, Wright and Littlepage, 1992).

Electronic databases relative to health science were used. These were: Academic Search Complete; British Nursing Index; Cinahl, Cochrane; Eric, PsyARTICLES; Psycinfo; Pubmed; Science Direct; Sports Discus; Web of Science and Wiley Online. Additional ‘grey’ references suitable for inclusion in the review were found in the reference lists of published works (n=230). A total of 87,120 records were identified and 57, 860 records remained after duplicates were removed (see Fig 1).

**Figure 1 Inclusion and exclusion of records**



Remaining articles were then screened to exclude results which were not relevant to the aims of the review (n=56,627). Twelve hundred and forty three articles remained. One thousand and sixty nine articles were removed including articles which were non-specific to the topic (injecting use of PIED) and written in a language other than English. This left one hundred and fifty five articles for quality analysis according to CASP guidelines (see Appendices A-F). Although quality assessment can be used to

exclude certain studies on the basis of methodological flaws, this is uncommon practice (Centre for Reviews and Dissemination, 2009). For this review, papers were not excluded through quality assessment, although limitations were identified (Appendices A-F). Papers found to be most methodologically strong and relevant to the aims of the review were more influential in the synthesis (Gough, 2007).

Textual narrative synthesis was selected as an approach to summarise and explain findings and was chosen due to the importance of quality appraisal associated with this method of synthesis (Lucas et al., 2007) and due to the heterogeneous nature of the studies reviewed (Popay et al., 2006). Textual narrative synthesis uses an inductive method to identify common themes within multiple study results according to the review questions and ‘tell the story’ of findings (ibid).

Findings from studies reviewed were therefore analysed under headings derived from the review questions: *Extent of use; Profiling the individual who injects PIED; Sourcing and product endorsement; Patterns of use; Health risks and consequences and Perceptions of health risk in individuals who inject PIED.*

### **2.3 Extent of use**

The majority of empirical research available concerns anabolic androgenic steroids (AAS), as the most commonly used PIED (Pope et al., 2014a). While previous indications were that use of AAS was largely a Western trend (Kanayama, Hudson and Pope, 2012), with prevalence estimates typically high in the U.S (Pope et al., 2014b); Australia (Dunn and White, 2011); across Europe (Hakansson et al., 2012; Mattilla et al., 2010) - particularly in the Nordic countries (Sagoe et al., 2015a) - and in the U.K

(Chandler and McVeigh, 2014) recent studies have indicated high prevalence in the Middle East (Haerinejad et al., 2016); South America (Sagoe et al.,2014a) and Africa – specifically Ghana (Sagoe et al.,2015b) - suggesting that AAS use is a global and cross cultural/ ethnicities phenomenon (Van Hout and Kean, 2015).

Due to the extensive polypharming with AAS documented in previous studies (Bates and McVeigh, 2016; Jennings et al.,2014; Chandler and McVeigh, 2014; Baker, Graham and Davies, 2006; Perry et al.,2005) use of AAS is a predictor for use of other PIEDs. The findings of these studies indicate that many individuals utilise multiple PIEDs in a polypharming regimen and may initiate their PIED pathway with use of AAS, introducing additional agents on a PIED use continuum, with the exception of use of DIY Botox and dermal filler kits.

In line with this view, studies investigating prevalence of human growth hormone (GH), Synthol (oil injection) and tanning peptide Melanotan have been conducted in subsets of AAS users (Nogueria et al.,2014; Hope et al.,2013; Chandler and McVeigh, 2014; Brennan et al.,2010; Azevedo, Ferreria and Ferreira, 2009; Evans et al.,1997) with varying results. Studies yielding the highest prevalence rates for AAS, GH and Synthol injection have used gym and fitness centre settings (Pipet et al.,2014; Lindqvist et al.,2012; Brennan et al.,2010; Azevedo, Ferreira and Ferreira, 2009; Striegel et al.,2006; Evans et al.,1997) indicating that recreational weightlifters are the primary group of individuals who inject PIED.

Data from needle exchanges indicates a rise in presentations of individuals sourcing needles for PIED injection over the past decade (Jaacka et al., 2017; Van Beek and



Chronister, 2015; Iversen et al.,2012; Evans Brown et al.,2009; Larance et al.,2008; McVeigh, Benyon and Bellis, 2003). Documentation of GH and testosterone use as anti-aging or wellbeing drugs is restricted to editorials (Olshanksy and Perls, 2008; Drazen 2003). Similarly with unregulated online sourcing of Botox and dermal filler injectables, widespread availability has been indicated by reports (Coleman and Zilinskas, 2013; Pickett 2011; Pickett and Mewies, 2008) with a dearth of field studies estimating prevalence of use.

Of the studies reviewed, varying methodological flaws were noted, most commonly the use of self-report measures. Findings from self-report measures are reliant on the participant's disclosure of their use and reticence to disclose use has been found amongst individuals who inject PIED (Zanhow et al., 2017; Bates and McVeigh, 2016; Chandler and McVeigh, 2014; Pope et al.,2004). Data from needle exchange is also restricted to those who present to services, with some individuals reporting sourcing needles online for PIED injection (Bates and McVeigh, 2016; Van Hout and Brennan, 2013). Due to the methodological flaws in the studies reviewed, it seems likely that prevalence of PIED use has been underestimated by researchers, particularly in the case of lesser studied PIED: GH, Melanotan peptides and oil and cosmetic injectables.

## **2.4 Profiling the individual who injects PIED**

### ***2.4.1 Gender***

Use of AAS is largely found to be in males (Pope et al.,2014a; Thorlindsson and Halldorsson, 2010; Kanayama et al.,2009a) which has meant that use of AAS and GH in women has been understudied, particularly in females who recreationally weight train.

Anecdotal evidence of rising PIED use amongst women can be seen in Jespersen's

recent observational study of a Danish bodybuilding website, where women posted in a discussion forum seeking advice on a wide range of PIED (Jespersen, 2012). Empirical evidence of female use of AAS can also be seen in surveys (Chandler and McVeigh, 2014; Ip et al.,2010). It is likely that use of muscle enhancing PIED amongst women has risen in recent years considering the current cultural climate which favours female weighttraining. This is indicated by an increasing presence of females in the weight rooms of gyms, as elements of the once subversive trend of bodybuilding is increasingly adopted by the mainstream (Andreasson and Johanssen, 2014).

With regard to Melanotan use, clinical case report literature describes both male and female use. Use of Melanotan by males is likely to be common in bodybuilding or weight-training cohorts, as reported in three case reports (Schulze et al.,2014; Cardones and Grichnik, 2009; Shelly, Husain and Lawrence, 2009). This is further evidenced by use of Melanotan in males who inject AAS accessing needle exchange services (Bates and McVeigh, 2016; Chandler and McVeigh, 2014; Hope et al.,2013). There is lack of research on the aetiology and trajectory of use of Melanotan in bodybuilding or weight lifting subsets in the literature, yet plentiful anecdotal evidence exists online pertaining to its use in this regard (Mahiques-Santos, 2012).

Use of unregulated Botox and dermal fillers sourced online is evident through a simple Google search; however it has rarely been described in the scientific literature and no data exists on the demographics of individuals who use these DIY kits. Similarly, while there is discussion and images available through a Google search online regarding female use of Synthol, to date no published scientific studies on this topic were identified through this review

### ***2.4.2 Age of Onset***

Previous U.S studies have found age of onset for AAS use to be over twenty (Kanayama et al., 2009a) which was supported by a recent meta-analysis of nine U.S studies (Pope et al.,2014a). Another meta analytical study, one using one hundred and eighty seven studies worldwide, has recently found highest prevalence of AAS use to be amongst teenagers (Sagoe et al., 2014). However, this may be a cohort effect, as studies using secondary/high school samples have typically found low prevalence (Johnston et al., 2013; Thorlindsson and Halldorsson, 2010). A recent report in the U.K found that use of AAS in young people (between sixteen and twenty four years old) increased in the previous year (Home Office, 2017).

Findings indicate that older and younger groups of individuals who inject AAS may be characterized by different types of use. Older individuals tend to practice moderated use, adhering to recommended cycle duration and dosages; thereby experiencing mainly positive outcomes and relatively few adverse effects (Chandler and McVeigh, 2014; Cohen et al.,2007), whereas more reckless drug use practices such as excessively long cycles and supraphysiological dosages have been reported in relation to younger subsets of individuals who use AAS (Chandler and McVeigh, 2014; Christiansen and Bojsen – Mollers, 2012). Data from needle exchange services in the UK indicates that users of GH were typically older (> thirty five years) than individuals who use other PIED (Hope et al.,2013). This is likely to be due to the elevated financial cost of this PIED compared to others.

There is a lack of data available on age of onset for use of Melanotan, Synthol, Botox and dermal filler. The largest field study on Melanotan use to date, which analysed

forum posts online (Van Hout, 2014a) was unable to collect demographic data on users such as age and gender due to the passive and observational nature of the study. Similar to individuals who use AAS, clinical presentations of Synthol injection report most patients aged in their twenties (Schafer et al.,2012; Henriksen, Lovenwald and Matzen, 2010; Iversen et al.,2009).

### ***2.4.3 Motivators for use in the general population***

The reviewed literature suggests that PIED use is heterogeneous in nature, with many different motivators, including enhanced appearance (Van Hout, 2014a); sporting achievement (Sagoe, Andreassen and Pallesen, 2014); increased musculature (Petrocelli, Oberweis and Petrocelli, 2008); increased strength (Smith and Stewart, 2012); occupational functioning (Van Hout and Brennan, 2013); enhanced self-confidence (Vassello and Olrich, 2010); body image disturbance (Sagoe, Andreassen and Pallesen, 2014); a healthy appearance (Van Hout and Kean, 2015; Van Hout, 2014a) and sexual attraction (Petrocelli, Oberweis and Petrocelli, 2008). Of the above listed motivators, athletic performance, appearance enhancement and body image disturbance were most prominent in the reviewed literature.

#### *Athletic performance and fitness goals*

A history of participation in sports was identified in Sagoe, Andreassen and Pallesen's (2014) systematic review as an indicator for AAS use, albeit less prominent than bodybuilding and weightlifting. Previous studies have shown that AAS is less likely to be motivated by sports performance than by other factors, such as non-athlete weightlifting, though strength performance in the gym can motivate use (Cohen et al., 2007). The importance of strength as a motivator for use is illustrated in qualitative studies where weightlifters describe their enjoyment of almost supernatural feats of

strength in the gym powered by AAS (Smith and Stewart, 2012) and also in individuals who use heroin also using AAS, where participants describe the social currency of a strong physique in risky drug dealing environments (Comford, Kean and Nash, 2014). Clinical studies which have investigated the efficacy of GH in enhancing the user's athletic performance found limited evidence to support this (Birzniece, Nelson and Ho, 2011; Meinhardt et al.,2010; Liu et al., 2008). However, these studies may not have utilised the suprapharmacologic dosages typical of an individual who uses illicit GH due to ethical restrictions.

#### *Appearance enhancement*

Motivators disclosed by participants in field studies have been shown its use to be grounded in building an aesthetically pleasing physique (Jennings et al.,2014; Ip et al.,2011; Parkinson and Evans, 2006; Perry et al.,2005). Participants in qualitative studies describe how AAS is sourced to increase sexual attractiveness to prospective partners (Petrocelli, Oberweis and Petrocelli, 2008) and to boost feelings of self-confidence (Vassallo and Olrich, 2010).

Studies on individuals who inject Melanotan also describe motivation for use as grounded in appearance. An internet study of forum posts found descriptions of desired side effects listing benefits such as being slimmer, enhanced eye colour and clearing skin with acne (Van Hout, 2014a). The surveyed site was found to contain messages such as "*tanning injections will make you tan, slim and hot*" (Van Hout, 2014a pg 10). However, this study was limited to a Melanotan specific forum and isolated multiple bodybuilding forums where use of Melanotan may be discussed with differing motivators (Mahiques-Santos, 2012). A single case study of Melanotan use in an exotic dancer also described 'a Melanotan tan' as being perceived as more attractive than

topical tanners available over the counter (Van Hout and Brennan, 2013) as it did not streak or run. Appearance enhancement was also described as increased occupational functioning in this case study, as the case described Melanotan as more effective when working as a dancer with ice or under hot lights. This has also been seen in the use of AAS to increase size by doormen and security officers as well as sexworkers (Sagoe, Andreassen and Pallesen, 2014; Maycock and Howat, 2007) and drug dealers (Cornford, Kean and Nash, 2014).

Individuals also source PIED to combat the appearance of aging, as can be seen with the use of DIY Botox and dermal filler injectables to improve the appearance of wrinkles and lines and the use of GH and testosterone to combat the physiological and psychological effects of aging on the body (Conrad, 2007; Olshanky and Perls, 2004; Drazen, 2003). Empirical research with individuals who use AAS, GH and Melanotan has found slowing down the aging process or the provision of a youthful appearance, to be a motivator for use (Ip et al.,2014; Van Hout 2014). Use of GH as an anti-aging supplement is understudied, with little documentation in the scientific literature apart from some editorials (Olshanky and Perls, 2004; Drazen, 2003). Similarly, no empirical studies could be identified on use of unregulated Botox and dermal filler kits available online, despite editorials and reports indicating high prevalence (Coleman and Zilinskas, 2013; Pickett, 2011; Pickett and Mewies, 2008).

### *Appearance of Health*

The pursuit of health has also been reported as a motivator for PIED use (Van Hout and Kean, 2015; Van Hout, 2014a, Cohen et al.,2007). Studies have described how in order to achieve their body ideal and strength goals, recreational weightlifters commonly

adhere to a strict dietary and training regime, into which PIED use is woven (Christiansen and Bojsen-Mollers, 2012; Cohen et al., 2007).

Adaptation of practices which are clearly detrimental to health as part of a health conscious lifestyle is a contradiction of PIED use. This is evidenced in the clinical case report literature where individuals who inject Melanotan and claim to pursue what is colloquially described as a 'healthy glow' (Van Hout, 2014a) are seen to have concurrent use of carcinogenic sunbeds. Another example from the literature is where a single case study account reported the subject desiring a healthy appearance through Melanotan use, despite extensive illicit drug use (Van Hout and Brennan, 2013).

Associations with AAS use and behaviours with a high risk of health harms have been found in the literature. These include illicit drug use (Pipet et al.,2014) including heroin abuse (Petersson et al.,2010). However, there is little explanation as to why a correlation between illicit drug use and use of AAS exists. Use of AAS in individuals who currently or formerly injected heroin was found in one study in masking the physical signs of heroin addiction (Comford, Kean and Nash, 2014). Unsafe sexual behaviours have also been found in people who inject PIEDs (Hope et al.,2013). Use of AAS in prison residents (Cornford, Kean and Nash, 2014) and arrestees (Lood et al.,2012) has also been described in the literature.

Individual reporting on health as a motivator for PIED use is in contrast to the occurrence of behaviours which jeopardise health. However there is little research to investigation perceptions of good health which may be grounded in appearances, with the visual representation of health more important than actual health.

### *Body image disturbance*

Appearance anxiety, ‘muscle dysmorphia’ (where the individual feels insufficiently muscular despite increasing size) and psychological traits such as depression were found in some PIED field studies (Mooney et al, 2017; Piacentino et al., 2017; Sagoe, Andreassen and Pallesen, 2014, Ip et al.,2010), suggesting body image disturbance as a motivator for use. One large study which investigated body image disturbance in one thousand individuals who use PIED found the majority of participants had minimal symptomology (Hildebrandt et al.,2010), indicating that body image disturbance may only be present in a minority of individuals who use PIED. With newly emergent tanning peptide Melanotan, the issue of body dysmorphia as a motivator was raised in a letter to the British Journal of Dermatology by Affleck (2010), who commented on the likelihood of bodybuilders, who may also suffer from muscle dysmorphia, sourcing Melanotan to alter their appearance. However, there is a lack of published research on body dysmorphia in individuals who inject Melanotan.

### **2.5 Sourcing and product endorsement**

Rather than depicting a centralised global criminal PIED market, studies which have investigated PIED sale and supply have found it’s nature to be socially embedded in close networks of friends and acquaintances in an offline context (Van de Vena and Mulrooney, 2016; Coomber et al., 2015). In an online context sales are also decentralised, with suppliers operating independently of one another, although perhaps importing merchandise from the same manufacturers (Antonopoulos and Hall, 2016). Through analysis of internet material, previous studies have found extensive online availability of AAS (McBride, Cullet and Coward, 2016; Brennan, Kanayama and Pope, 2013; Clement et al.,2012; Cordaro, Lombardo and Consentino, 2011) and other muscle



building PIED such as GH (Vida et al., 2017), with thousands of sites dedicated to promoting their use. AAS products for sale on such websites are well described in the literature and are sourced for different functions (see Table 2)

**Table 2 AAS product examples**

| <b>Injectable AAS Product</b>                                                          | <b>Key Features</b>                                                                                                  |
|----------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|
| Boldenone Undecylenate e.g. Equipoise, Ganabol, Equigan and Ultragan, Boldebal         | Stimulates red blood cell production, diverted from veterinary use                                                   |
| Dromostanolone Dipropionate e.g. Masteron                                              | Anti-estrogen effects. Recommend for use in the weeks before bodybuilding competitions. Synthetic derivative of DHT. |
| Formebolone, e.g. Esiclene                                                             | Causes temporary inflammation of the muscles, creating an increase in size.                                          |
| Methenolone Enantate e.g. Primobolan Depot                                             | Recommended for beginners cycles, less side effects                                                                  |
| Nandrolone Decanoate e.g. Deca-Durabolin, Extraboline                                  | Popular, less side effects                                                                                           |
| Nandrolone Laurate e.g. Laurabolin                                                     | Intended for veterinary use, promotes lean mass                                                                      |
| Nandrolone Undecanoate e.g. Dynabolon                                                  | Fast acting                                                                                                          |
| Stanozolol e.g. Winstrol Depot                                                         | Strongest agent available                                                                                            |
| Testosterone Esters, Suspension and Blends e.g. Teste C, Testoviron, Sustanol, Andriol | Useful in “bulking phase”                                                                                            |
| Testosterone hexahydrobencylcarbonate, e.g. Parabolan                                  | No estrogenic activity, useful in cutting phase                                                                      |
| Trenbolone Acetate e.g. Trenbolone, Finaplix                                           | Much more effective than testosterone esters, less risk of side effects                                              |

No studies to identify vendor websites have been conducted for Melanotan, Synthol or DIY Botox/dermal fillers although the existence of such websites and the presentation of products sold, has been discussed in previous studies (Briendahl et al.,2014; Kimergard et al.,2014; Van Hout, 2014a; Schafer et al.,2012; Pickett, 2011; Pickett and Mewies, 2008) to include Melanotan product endorsement (Van Hout, 2014a) (see Table 3).

**Table 3 Tanning peptides**

| <b>Injectable Tanning Peptide Product</b> | <b>Key Features</b>                                                    |
|-------------------------------------------|------------------------------------------------------------------------|
| Melanotan I                               | More expensive, produces a more natural result which some users prefer |
| Melanotan II                              | Less expensive, produces a deep tan , anorectic                        |
| Bremelanotide                             | Lesser used, libido boosting effects                                   |

In the case of cosmetic injectables, Pickett's 2011 letter to the editor of the Journal of the American Academy of Dermatology describes a dermal filler product which he had purchased online. The product was mislabelled with untranslatable messages and appeared to be counterfeit, the contents of the enclosed syringe having evaporated in transit. However, this is the only report this review could identify which appeared to investigate unregulated dermal filler injectables sourced online. It is difficult to ascertain whether the presentation of the injectable in this anecdotal report is representative of other dermal filler injectables available in the online market. Also, as the contents of the syringe had evaporated, it was not possible to determine the composition of the product and whether it contained impurities or contaminants.

Pickett and Mewies's 2008 study identified several sources of counterfeit Botox online and purchased vials from these sites which had a range of presenting issues including understrength and over strength Botox, mislabelling and the presence of toxins including sucrose and gelatine. However, vendor sites were not identified by name or url. Coleman and Zilanskas (2010) also published a report on counterfeit Botox, identifying by name several online businesses which claimed to be legitimate manufacturers and suppliers of Botox, but were suspected of selling counterfeit products.

Three studies could be identified describing the sourcing of oil or Synthol injection for the purposes of muscle enhancement (Hall, Grogan and Gough, 2016; Brennan, Kanayama and Pope, 2013; Schafer et al.,2012). One study mentions the practice of 'homebrewing', where users follow instructions posted online to mix together their own oils for self-injection (Schafer et al.,2012). However, practices such as these are not

well described in the literature, with a lack of data on what products are used in *homebrews*.

Newer drugs such as growth hormone releasers, CJC-1295 (Van Hout and Hearne, 2016) GHRP-2 and GHRP-6 (Stensballe et al.,2015) and SARMS – nonsteroidal selective androgen modulators (Evans Brown et al.,2012) are sold online for muscle gain despite not being approved for clinical use.

## **2.6 Patterns of use**

In order to examine and describe patterns of injecting PIED use in mainstream population groups, findings from the literature are categorised under themes which were present in multiple studies reviewed. Reoccurrence in multiple studies may strengthen the validity of a theme (Marshall, Wolfe and McKeivitt, 2012). These themes as found in the PIED literature are as follows: *Moderate and heavy use*; *Polypharmacy* and *Injecting practice*.

### **2.6.1 Moderate and heavy use**

It can be seen from descriptions of PIED use in surveys and internet studies that many individuals who use PIED seek to practice moderated use, utilising recommended cycling and ‘safe’ dosages (Rowe et al., 2016; Van Hout and Kean, 2015; Van Hout, 2014a; Chandler and McVeigh, 2014; Cohen et al.,2007). However, studies also describe great variability in the cycles and doses of AAS (Chandler and McVeigh, 2014; Cohen et al.,2007; Perry et al.,2005). Indications are that the average cycle has increased in duration since early recommendations of ten to twelve weeks made in Llewellyn’s ‘Anabolics’, a publication which was known in bodybuilding subculture as the user handbook in the 1980s (Chandler and McVeigh, 2014).

Christiansen, Vinther and Liokaftos (2016) theorised a typology of males who use AAS, the most popularly documented PIED. They categorised them as the *expert type* (well versed in pharmacology, scientific and lay expertise relational to AAS use), the *wellbeing type* (uses AAS to improve health or quality of life), the *YOLO* ('you only live once') *type* (reckless, 'gung ho' in approach) and the *athlete type* (competition bodybuilders or sportsmen). With regard to non-professional athletes or bodybuilders, the *expert* and *wellbeing* types may tend to practice careful and moderated use. This typology may apply to many who access discussion forums where a wealth of information is available. However, cycles are dynamic, with recent studies describing a practice known as 'blast and cruise', a technique of alternating low and high dosages resulting in continuous use of AAS (Underwood, 2017; Sagoe et al.,2015c; Chandler and McVeigh, 2014). Purposeful disassociation from the more reckless *YOLO* type is evidenced in studies where participants have condemned subsets of PIED user engaging in excessive dosing and lengthy cycling (Chandler and McVeigh, 2014).

Information on dosages and cycles of Melanotan use are limited to one study and describe loading and maintenance phases of dosages of 1mg daily of tanning peptide (Van Hout, 2014a). Information on dosages of Synthol administered can be extrapolated from the clinical case report literature which details injections of large amounts of oil up to one litre per arm (Henriksen, Lovenwald and Matzen, 2010; Iversen et al.,2009; Georgieva et al.,2003) with dosage calculation grounded in self-experimentation and anecdotal advice (Schafer et al.,2012). There is a dearth of evidence on the regimens employed by individuals who use GH or testosterone sourced as an 'anti-aging therapy' or 'well-being' supplement.

There is online evidence to suggest that many PIED regimens are not documented in the scientific literature and are detailed in discussion forums in conversation between forum discussants. Researchers are increasingly utilising the online space to access such information (Underwood, 2017; Tighe et al., 2017).

### ***2.6.2 Polypharmacy***

Drug use patterns observed in published field studies suggest extensive polypharming (use of multiple substances or agents in a complex drug regimen) amongst individuals who use PIED (Sagoe et al, 2015c; Jennings et al.,2014; Chandler and McVeigh, 2014; Baker, Graham and Davies, 2006; Perry et al.,2005). In AAS use, this polypharming typically presents as a range of ‘ancillary’ substances designed to complement the effects of and combat the unwanted side effects of AAS. The types of agents employed in such regimens, to include hormones and ‘fatburners’ have been detailed in previous studies (Cordaro, Lombardo and Consentino, 2010; Cohen et al., 2007) but there is a lack of clinical evidence as to the efficacy of such regimens (Chandler and McVeigh, 2014).

A recent meta-analysis of the qualitative literature on polysubstance use amongst individuals who use AAS found associations with use of alcohol; opioids; analgesics; illicit stimulants; prescription depressants; diuretics; fatburners; sexual enhancement drugs and others (Sagoe et al.,2015c). The consumption of illicit psychoactive drugs amongst individuals who use AAS, which has also been described in field studies (Pipet et al.,2014; Lood et al.,2012) and autopsy reports (Darke et al.,2014) is associated primarily with heavy use of AAS, i.e. excessively long cycling and higher dosing.

Management of side effects through the use of other substances can be seen in studies of individuals who use Melanotan also. A single case study of an exotic dancer using Melanotan found that the case used benzodiazepines to induce sleep once she had taken Melanotan, in order to avoid experiencing the nauseous feeling that followed injection (Van Hout and Brennan, 2013). In Van Hout's internet study (2014) Melanotan users also disclosed smoking marijuana to combat feelings of nausea. It is of note that this internet study was limited to one Melanotan specific forum with bodybuilding forums excluded from the study. This isolates a body of individuals who polypharm with other PIEDs. There is a lack of research on the use of Melanotan by individuals who use other PIEDs such as AAS, despite extensive evidence in online discussion forums of this type of use.

### ***2.6.3 Injecting practice***

AAS injection techniques are well described in the literature, with individuals typically injecting intramuscularly (Pope et al.,2014b; Larance et al.,2008; Cohen et al.,2007). Melanotan injection technique is described in Van Hout's (2014) study of internet forum Melanotanforum.org, with details of high level harm reduction awareness in the forum to include sterile needle use and correct storage of product. However, this study sampled one website and isolated bodybuilding forums which may hold evidence on Melanotan use amongst weight-training cohorts who are also using AAS, GH and other injectables and may engage in varying techniques.

Use of Synthol oil is described online and in the clinical case report literature as being administered to 'lagging' muscle groups, which are less muscular in comparison to rest of the individual's physique. Oil is injected directly into the muscle, sometimes in large amounts (Brennan, Kanayama and Pope, 2013; Schafer et al.,2012). There is a lack of

data in the scientific literature on the injecting practices of individuals who use DIY Botox/dermal filler kits sourced online (Pickett, 2011).

## **2.7 Health risks and consequences**

Due to the ethical concerns associated with conducting randomized control trials with these types of drugs, the majority of the evidence for PIED health consequences is taken from clinical case reports (Shahrabi-Farahani et al., 2014; Schulze et al., 2014; Iversen et al., 2009) and case control studies, subject to selection bias (D'Andrea et al., 2007) and retrospective self-report surveys, which are subject to information bias (Lindqvist et al., 2013; Pagonis et al., 2006).

Prevalence of adverse effects amongst individuals who inject PIED and the likelihood of suffering any of the negative health consequences described in the literature is unknown. This is partially due to the poor quality of the available literature and also due to the extensive polypharmacy amongst individuals who inject PIED which hinders determination of causality.

Fear of disclosure of use may also lead to underestimates of adverse effect prevalence in users, as patients have been described as denying their PIED use in the clinical outcome literature (Ge, Liu and Singh, 2016; Weinreb, Goldblum and Rubin, 2010). Previous studies have indicated a mistrust of physicians (Zanhow et al., 2017; Pope et al., 2004) which may lead to internet forums being the sole source of information regarding PIED use. Longterm health consequences of PIED use remain understudied. This is in part due to the relatively recent emergence of PIED use in the eighties and nineties and the

lack of longitudinal and observational studies to track health outcomes in individuals who use.

From the literature reviewed, many studies link AAS use with serious adverse effects to include cardiotoxic events and disturbances (Ge, Liu and Singh, 2016; Akçakoyun et al., 2014; Luijkx et al., 2013; Montisci et al., 2012; Joynes, 2010; Ahlgrim and Gulgin, 2009; Thiblin, Mobini-Far and Frisk, 2009) stroke (Shimada et al., 2012) hepatic rupture (Patil et al., 2007), kidney damage (Ostovar et al., 2017) and psychiatric symptoms, such as aggression, recklessness and depression (Lindqvist et al., 2013; Pagonis et al., 2006). Less critical side effects have also been evidenced to include rhabdomyolysis (Farkash, Shabshin and Pritsch, 2009) lipogranulomatous reaction (Weinreb, Goldblum and Rubin, 2010), compartment syndrome and wound dehiscence (Joynes, 2010) and abscess (Marquis and Maffulli, 2006).

Use of GH has been associated with hypoglycaemia (Sein Anand, Chodorowski and Wisniewski, 2005), Hodgkin's lymphoma (Magnavita, Teofili and Leone, 1996) and diabetes (Young and Anwar, 2007). Liu et al. (2008) summarised the randomized control trial literature and reported soft tissue oedema; joint pain; carpal tunnel syndrome and fatigue in participants. However, the studies chosen for this review did not use the supraphysiological dosages which are typical in GH regimens and are likely to have less serious outcomes than in reality, where some individuals are consuming large doses for lengthy periods of time as part of an AAS cycle (Chandler and McVeigh, 2014).



Projections have also been made in the literature about GH side effects from studying patients with acromegaly, a form of GH excess (Holt and Sonksen, 2008). Acromegaly symptoms include cardiovascular, metabolic and respiratory effects, as well as increased carcinogenic risk. These estimations may be more applicable than the findings of studies using much smaller dosages of GH than is realistic. Of additional concern is the availability online of cadaveric GH from Eastern Europe, which carries the risk of potentially fatal Creutzfeldt-Jacob disease (Rennie, 2003; Jenkins, 2001).

Serious health outcomes found in individuals who use Melanotan include four cases of melanoma (Habbama et al., 2017; Brennan, Wells and Van Hout, 2015; Hjuler and Lorentzen, 2014; Ong and Bowling, 2012; Ellis, Kirkham and Seukeran, 2009). Causality in this regard is particularly difficult to determine as tanning beds are often used concurrently with Melanotan injections (Hjuler and Lorentzen, 2014; Ong and Bowling, 2012) and it must be noted that clinical trials have not found Melanotan to have carcinogenic potential (Langan et al., 2010).

Other serious events described in case reports include clonic seizure (Kaski et al., 2013) systemic toxicity (Nelson, Bryant and Aks, 2012). Less serious side effects associate with the use of Melanotan include eruptive naevi or darkening/enlargement of existing naevi (Habbema et al., 2017; Schulze et al., 2014; Sivyler, 2012; Reid, 2013; Heuso-Gabriel et al, 2012; Thestrup-Pedersen and Søndergaard, 2010; Cardones, Rand and Grichnik, 2009; Cousen, Colver and Helbing, 2009; Langan et al., 2009) and refractory priapism (Devlin and Pomerleau, 2012). Additional side effects include patchy skin (Habbama et al., 2017; Brennan, Wells and Van Hout, 2015; Von Bartenwerffer, Siebenhaar and Hunzelmann, 2011); haematoma; hyperventilation and palpitations

(Kjaergaard and Dalhoff, 2010); pigmented marks on fingernails (Paurobally et al., 2013); nausea and fatigue (Von Bartenwerffer, Siebenhaar and Hunzelmann, 2011); yawning and stretching (Habbama et al., 2017; Brennan, Wells and Van Hout, 2015; Devlin and Pomerleau, 2012).

Much of the clinical case reporting on licensed dermal filler injection describes inflammatory reactions e.g. oedema; granulomas; swelling; foreign body reaction (Shahrabi-Farahani et al., 2014; Sampson et al., 2014) or rarely, systemic reactions (Alijotas-Reig, Ferná' ndez-Figueras and Puig, 2013). In some case reports, an inflammatory reaction is documented many years after the dermal filler has been administered (Curi et al., 2014; De Almeida et al., 2014; Sanchis-Bielsa et al., 2009). This may hinder proper diagnosis of the adverse event and impact on prevalence estimates of negative outcome. Synthol injection has been reported in cases of ulcerated wounds (Iverson et al., 2009), lesions, myalgia, purpura, vasculitis (Koopman et al., 2005) and distortions of the muscle (Georgieva et al., 2003; Darsow et al., 2000).

### ***2.7.1 Injecting risks***

Poor injecting practice amongst individuals who inject PIED, although relatively less common than in opioid or stimulant injecting groups, has been indicated by data from needle exchange surveys (Rowe et al., 2017; Ip et al., 2016; Larance et al., 2008) and in clinical case reports where bacterial infection occurred (Advisory Council for Misuse of Drugs (ACMD) 2010). Presence of HIV antibodies has been found in individuals who inject PIED (Rowe et al., 2017; Hope et al., 2016; McVeigh et al., 2016; Hope et al., 2013) although it has been suggested that this is likely to have occurred through engagement in unsafe sex, particularly in men who have sex with men, rather than through injecting (McVeigh et al., 2016; Ip et al., 2016; Van Beek and Chronister,

2015). A recent study found that people who inject PIED are less likely to know their BBV status than other injectors (Rowe et al., 2017).

Analysis of the clinical case report literature on licensed Botox injection indicates that the majority of adverse outcomes are due to inept injection technique (Avery and Clifford, 2010; Cote et al., 2005). Individuals who use DIY dermal filler kits purchased online (Pickett, 2011) and individuals who inject Synthol are therefore at increased risk of injury and infection.

### ***2.7.2 Counterfeit products online***

Previous studies have evidenced incidences of mislabelling, understrength vial contents and presence of contaminants in PIED products purchased from websites (Briendahl et al., 2014; Kimergard et al., 2014; Cordaro et al., 2010). The counterfeit market for AAS in particular has been described as a major issue for individuals who inject (Antonopoulos and Hall, 2016).

In a letter to the editor of the Journal of the American Academy of Dermatology, Pickett and Mewies (2008) described their study, which identified several sources for buying counterfeit lookalike Botox online. Products purchased and examined from these sites had a range of presenting issues including toxins within the product, mislabelling and over and understrength contents (ibid). In the case of Botox, over strength unregulated products can be fatal, as can be seen in one case in Florida in 2004 where an unlicensed physician caused serious harm to four people, including himself (Coleman and Zilinskas, 2010). Similarly, Pickett's (2011) letter to the editor reports on the presentation of a dermal filler product sourced online for analysis, which was found likely to be counterfeit.

### ***2.7.3 Dosages***

One identified concern is the online availability of a “peptide calculator” for Melanotan (Van Hout, 2014a) where individuals can calculate their own doses. The potential for overdose has been indicated in a single clinical case report of systemic toxicity where the individual self-administered six times the recommended dose (Nelson, Bryant and Aks, 2012). Where individuals who inject PIED purchase substances which require reconstitution, this is also high risk, as the individual is responsible for essentially determining dosage, as well as the possibility of unsterile conditions.

### ***2.7.4 Dependence***

Dependence is discussed in the PIED literature largely in relation to AAS (Hildebrandt et al., 2011; Kanayama et al., 2009b) The majority of studies have used modified DSM –IV criteria to assess participants for AAS dependence (Ip et al., 2014; Perry et al., 2005). However, recently researchers have called into question the suitability of the DSM-IV as diagnostic tool for AAS dependence due to lack of traditional substance dependence symptomology e.g. intoxication syndrome and physiological withdrawal (Hildebrandt et al., 2011; Kanayama et al., 2009b). This uncertainty means that existing prevalence estimates of AAS dependence may be flawed.

Participant disclosures which indicate possible dependence have been reported in individuals who use Melanotan (Van Hout 2014; Brennan and Van Hout, 2013). However, prevalence and presentation of Melanotan dependence is under researched and difficult to quantify. Dependence symptomology and high risk tanning behaviours have been noted in the literature pertaining to suntanning and solarium use (O’Leary et al., 2014; Ashrafioun and Bonar, 2014; Hillhouse et al., 2012; Harrington et al., 2011).

## **2.8 Perceptions of health risk in individuals who inject PIED**

Evidence of risk perceptions amongst individuals can be seen in recent studies utilising online PIED discussion forums to collect data (Van Hout, 2014a; Smith and Stewart, 2012; Jespersen, 2012). These online communities act as support systems, information points, advisors and sourcing routes and the majority take a pro-PIED use position (Brennan, Kanayama and Pope, 2013).

The above studies have found that many individuals perceive their use as safe with manageable side effects. This management of side effects is grounded in further polypharming, often on the recommendations of other forum members (Smith and Stewart, 2012; Van Hout, 2014a). Discussion forums can present as tight knit groups, with long term forum members acting as ‘gurus’, dispatching trusted advice to include directions for injecting use of PIED.

The information that is exchanged is a mixture of scientific research and lay epidemiology and describes very detailed instructions for use. The weight of online forums in PIED culture is illustrated in many studies (Underwood, 2017; Tighe et al., 2017; Van Hout and Hearne, 2016; Seear et al., 2015; Hall, Grogan and Gough, 2015). Attitudes toward risk associated with purchasing from the online market have seldom been studied, although attitudes towards locally sourced PIED, also potentially counterfeit, has been documented, where individuals employed visual checks to ascertain authenticity of PIED products (Coomber et al., 2015).

In one single case study, the case reported no concerns about potential contamination despite having some knowledge of the dangers (Van Hout and Brennan, 2013). Forum

posts analysed by Van Hout (2014) indicated that individuals who inject Melanotan largely trusted their sources. This trust is built through recommendation swapping in discussion forums. This ‘source checking’ as a risk navigation technique is also practiced in bodybuilding forums, where forum members warn each other of sellers who tout fakes and recommend trustworthy sites for purchase of AAS and other PIED (Brennan, Kanayama and Pope, 2013).

## **2.9 Discussion**

This chapter systematically reviewed the extant literature on injecting PIED use in the general population and detailed up to date analysis of findings on profiling; motivators for PIED use in a unique group of individuals who inject; patterns of use and associated risk.

Findings of global high prevalence of AAS use indicate that it is no longer confined to groups of elite competitive bodybuilders and athletes. The extent of PIED use may be larger than documented given the low quality of available studies. Online dialogue points to prevalence of PIED use being even higher than estimated by researchers, particularly when existing studies are subject to varying methodological flaws.

There is limited scientific data available on the intricacies of injecting PIED pathways and trajectories. It can be seen that where individuals perceive their own use to be moderated, ‘acceptable’ and necessary in the pursuit of body ideals, they may disassociate from potential injecting harms. This may result in ignorance of safe injecting practice and isolation from harm reduction advice disseminated by needle exchange and drug services. Targeted harm reduction interventions designed to

safeguard the health of individuals who inject PIED are warranted, in addition to exploration of the pathway or displacement between oral or other routes of use and injecting.

Mistrust of medical professionals amongst individuals who use AAS has been found in previous studies (Zanhow et al., 2017; Chandler and McVeigh, 2014; Pope et al., 2004. As many forums have been found to take a pro-drug use position (Tighe et al., 2017; Brennan, Kanayama and Pope, 2013) exposure to advice given on discussion forums may escalate or complicate existing drug use patterns. A reliance on internet forums for medical advice concerning injecting practices, poly drug regimens and dosages also means there is a lack of engagement with healthcare professionals and limited practitioner knowledge regarding these patterns of use. Though the literature is expanding on PIED prevalence, cohort profiling and patterns of use, some areas of PIED use remain significantly understudied.

There is notable contrast between what is documented on PIED use in the scientific literature and what information is available online in discussion forums and internet sites dedicated to PIED use. Examples include ‘homebrewing’ by individuals who use Synthol (Schafer et al., 2012), female use of Synthol and use of Melanotan by weight training subsets (Affleck, 2010). Information on dosages and cycles of Melanotan use are limited to one study (Van Hout, 2014a). Widespread availability of counterfeit Botox and dermal filler DIY kits online has been reported (Pickett, 2011; Pickett and Mewies, 2008); however cosmetic injectables sourced online are underresearched, with little knowledge on the contents of the syringes in these kits. Future netnographic work

is needed to examine prevalence of site enhancement oil injection and use of cosmetic injectables sourced from the internet.

Historically, use of AAS in females has been found to be low (Kanayama et al., 2007). However, it is likely use of muscle enhancing PIED amongst women has risen in recent years considering the current cultural climate which favours female weight training (Andreasson and Johanssen, 2014). Some evidence of this trend of PIED use in weight training females can be seen from analysis of online forum posts (Van Hout and Hearne, 2016; Jespersen, 2012). Further research is needed into the use of AAS and other PIED by this cohort. Body dysmorphics are also indicated as at risk for pathological use. There is a lack of research on body image disorder amongst individuals who inject Melanotan, Synthol and cosmetic injectables. No studies to identify vendor websites have been conducted for Melanotan, Synthol or dermal fillers. However, the existence of such websites and the presentation of products sold, has been remarked upon in previous studies (Van Hout, 2014a; Schafer et al., 2012; Pickett, 2011).

Engagement in practices which contradict a health conscious lifestyle championed by many individuals who use PIED e.g. strict diet and training schedules in AAS use and individuals who inject Melanotan who seek that 'healthy glow'. This is a conflict which needs further investigation. Future work is needed to examine individual perceptions of good health, body ideals and what informs the taxonomy of beliefs fuelling PIED use. There is little known about the combined health consequences of consuming a drug regimen typical of individuals who use PIED. Granted that randomized trials are unethical, observational studies to track health outcomes are needed.



There are no epidemiological studies investigating use of GH as a wellbeing or anti-aging drug and research is needed into the drug regimens, motivators for use and adverse effects suffered by individuals who inject GH in this context. New products known as SARMS – nonsteroidal selective androgen modulators - are being sold online, yet there is little data on products endorsed, patterns of use or outcomes. Future research is needed to investigate the use of SARMS and track health consequences amongst individuals who use them.

## **2.10 Concluding comments**

The PIED literature is characterised by varying methodological limitations, such as the use of self report measures and access to research participants being restricted to needle exchange services, which may not be representative of the broader population of individuals who inject PIED (Rhodes, Greenwood and Robertson, 2001). Some information on cohort profiling and patterns of use which are anecdotally described online are not as yet scientifically documented. This chapter has underscored the need for future research to include internet settings to investigate prevalence, profiling and patterns of injecting PIED use amongst the general population and longitudinal studies to track health outcomes in individuals who use PIED. Chapter Three will explore societal acquiescence and social group reinforcement in relation to this distinct group of individuals who inject PIED and present a prior theoretical framework for this study in investigating injecting PIED use as described in online forums.

## **Chapter 3: Understanding a distinct group of individuals who inject – a prior theoretical framework for the investigation of injecting PIED use**

### **3.0 Introduction**

This chapter outlines the nature and form of injecting PIED use in the general population, particularly in relation to societal acquiescence and PIED social group reinforcement of pharmacological enhancement of the body in pursuit of body ideals embedded in amateur sport, fitness, health and beauty culture. In this regard introduce potential elements of a theoretical framework for this study. Section 3.1 introduces the sociological challenge associated with this heterogeneous group of individuals who inject. The individual who injects PIED is seen in the literature to disassociate from individuals who inject opioids and stimulants, despite facing much of the same injecting risk. The impact of this on potential health consequences is discussed. Section 3.2 examines theoretical concepts and their interface with PIED use. Section 3.3 describes how PIED use is reinforced by cultural ideals and examines the potential for harm in the mainstreaming of PIED injection. This chapter also operationalizes the terms ‘hegemonic masculinity’; ‘health aestheticism’; ‘the porn body’; ‘the supernormal body’ and ‘PIED risk navigation’ as these are used within this study to inform the conceptual framework developed to facilitate the investigation of the injecting use of PIED. In Section 3.4 the role of ‘cultural doping’ in informing PIED bodywork is considered using theories of disciplined bodies and gender, health, fitness and sexual attractiveness norms. Societal perception of extreme PIED use is considered using bioconservative theory. In Section 3.5 individual agency of the individual who injects PIED in negotiating sense of self is discussed using theories of embodiment through bodywork and moderated drug use. Normalisation theory is also applied here to

examine the transition of PIED use from subcultural groups to the mainstream population. Section 3.6 examines risk perception and navigation in injecting PIED use. Section 3.7 discusses identity in PIED use and Section 3.8 presents an integrated explanatory and analytical model incorporating the above theories.

### **3.1 The sociological challenge**

As described in Chapter Two, there are indications that PIED use may be expanding in society. The sociological challenge with regard this expansion of use lies in understanding the potential semi-norming of PIED injecting amongst the mainstream population, motivated by body ideals and self improvement. Injecting PIED use brings a unique set of public health issues, namely polypharmacy with combinations of substances, with largely unknown long term health outcomes; product sourcing from the unregulated online market; and injecting risk. Particularly salient with regard to public health is the increasing prevalence of HIV in individuals who inject PIED (Rowe et al., 2017; Hope et al., 2016).

### **3.2 Current theoretical constructions and their interface with ‘normalising’ PIED injection**

The transitioning of subcultural drug trends to the general population has been discussed previously in the sociological literature as normalisation theory (Parker, Aldridge and Measham, 1998). When considering the passage of PIED use from peripheral user groups to mainstream society, indicators of normalisation as described by Parker, Aldridge and Measham in relation to young people’s use of psychoactives may resonate with PIED injection. Of particular significance are indicators such as cultural accommodation, where current social behaviour reinforces drug use practices.

Contemporary emphasis on bodywork and self –improvement creates a climate of physical enhancement which encourages PIED use (Mataix, 2012; Evans Brown et al., 2012). PIED is then no longer associated solely with societally peripheral groups (e.g. bodybuilders), but is a central part of transformative bodywork culture, conceptualised by individuals as consumeristic self care and self improvement; often as part of a fitness regime or amateur sport participation. Increased access and availability as an indicator is also relevant to PIED use, which has an extensive and growing online market (McBride, Cullet and Coward, 2016; Brennan, Kanayama and Pope, 2013; Clement et al., 2012; Cordaro, Lombardo and Consentino, 2011).

Etorre (2004) theorised that drug use ‘scars’ the body, marking it with an obvious anomaly, a subversion from social norms. She conceptualises the individual who uses drugs as societally deviant, perceived as physiologically and psychologically diseased (Etorre, 2010). This construction of the drug using body as abnormal and sick in the eyes of society is grounded in social ideals of health and wellness, self-control and discipline. The individual who injects drugs both challenges and contradicts this construction (ibid). While motivators and outcomes are highly dynamic in PIED injection, where the individual embodies social health, fitness, youth and beauty ideals, e.g. a youthful, unlined face through Botox injection, through the act of injecting drug use, this is in marked contrast to Etorre’s theory.

The social and group aspect of PIED use demonstrated in the online discussion forum space is well documented (Underwood, 2017; Tighe et al., 2017; Van Hout and Hearne, 2016; Hall, Grogan and Gough, 2015). Rhodes’s theory of the risk environment (1997) may be useful in conceptualising a framework here. In his work with individuals who

inject opioids, Rhodes describes how injecting risk behaviours are shaped by context and by the social environment. In the case of individuals who inject PIED, mistrust of physicians (Zanhow et al., 2017; Pope et al., 2004) may have led to a reliance on advice disseminated within subcultural networks (Brennan, Van Hout and Wells, 2013; Chandler and McVeigh, 2014; Evans Brown et al., 2012), particularly in the online setting.

Risk perception in this social environment includes concepts of relativity of risk (Rhodes, 1997) where the individual places greater importance on immediately salient threats than on perceived distant harm. One study found that people who inject PIED have expressed greater concern over short term side effects, such as acne, than longterm potential harm such as psychiatric symptoms (Christiansen and Bojsen-Moller, 2012). Another aspect to risk theory according to Rhodes is risk neutralization, where the individual adopts varying techniques/ strategies to accommodate risk. One such strategy Rhodes terms as ‘scapegoating’ where a subgroup of individuals who inject are labelled as less skilled, less informed or more chaotic in their drug use and thus more susceptible to harm. Intergroup scapegoating is evident in the PIED literature where older individuals who use AAS criticise those younger for use of supraphysiological dosages and excessively long cycles (Chandler and McVeigh, 2014; Monaghan, 2001).

Another theorist who discusses risk in drug using social networks is Miller (2005). He examines the construct of lay epidemiology in injecting drug use and elements of his theory, particularly the subjectivity of risk perception, where the individual utilises concepts of luck and fate to determine risk, may be useful in examining PIED use.

However, Miller's work assumes that individuals who inject are likely to be socially marginalised and situated in environments of disadvantage. This may not be the case here, as individuals who use PIED have been profiled in the literature typically as gainfully employed and educated with sufficient means and access to fund PIED regimens (Corazza et al, 2014; Cohen et al., 2007; Monaghan et al., 2001) .

### **3.3 PIED use potential for harm through mainstreaming**

The popularity of PIED injectables can be in part attributed to the current 'appearance culture' (O'Dea and Cinelli, 2016) of self-beautification. Appearance culture places high social value on achievement of body ideals such as the muscular male mesomorph and tanned, fit female (O'Dea and Cinelli, 2016; Frith, 2012). In addition to enduring pressure on females to maintain a slim, tanned physique conducive to male fantasy and pop culture (Van Hout and Brennan, 2013), sexualisation of the male body and identity has become a focal point for media in the last twenty years (Riccardelli, Clow and White, 2010; Atwood, 2009). In this discourse, the ideal male body is portrayed as lean with large, defined muscles. These sexualised body ideals, coupled with a societal fixation on health and fitness (De Luca et al, 2017; Glassner, 1990) may have partially informed the development and growth of PIED markets (Brennan, Van Hout and Wells, 2013).

The potential power of societal ideals may be described using Foucault's theory of docile bodies (Foucault, 1977). Cultural norms which attribute higher social value and reward (Featherstone, 1991) to the idealised appearance or performance, may act as Foucauldian power structures, a rule set referenced to bodies which encapsulates ideals of hegemonic masculinity and emphasized femininity (Connell and Messerschmidt,

2005; Connell, 1987) regulating such bodies through visual representations in media of the perfect man and woman. This 'rule set' against which individuals who inject PIED may self measure may include the fit, high performing body, accompanied by the sexualisation of the body ideal (Lynch, 2012) with the outward appearance of health and fitness (Glassner, 1990). In this regard, the concept of injecting drug use as deviant (Etorre, 2004) is directly challenged, since injecting drug use is deemed as necessary to achieve and be compliant with these idealised body reference points. The perception of normal, necessary and acceptable injecting is evidenced in previous PIED studies (Van Hout, 2014a; Smith and Stewart; Cohen et al., 2007; Monaghan, 2001).

Despite a disconnect of perceptual identity on the part of those who inject PIED with those who inject opioids and stimulants (Bates et al., 2015; Kimergard and McVeigh, 2014; Kimergard, 2014; Monaghan, 2001) significant potential harms associated with PIED injection have been identified in the literature. These include presence of HIV antibodies (Rowe et al., 2017; Hope et al., 2016; McVeigh et al., 2016; Hope et al., 2013) and infections (Advisory Council for Misuse of Drugs (ACMD) 2010). Poor injecting practice is evidenced in data from needle exchange concerning individuals who inject PIED (Rowe et al., 2017; Ip et al., 2016; Larance et al., 2008). Where PIED use is characterized by self-experimentation and reliance on advice grounded in the subjective experience of peers, risk of adverse health outcomes is compounded.

Injecting use of PIED has become a means of group formation where belonging and support may reinforce normalisation of injecting. The social space where PIED use occurs may equate visual representations of health, in flux according to popular culture, with actual health and wellbeing (Van Hout, 2014a; Cohen et al., 2007; Monaghan,

2001). Perceptions of risk may be shaped by the outweighing of potential negative outcomes by more immediately salient desired outcomes grounded in societal ideals of health, beauty and youth. The concept of PIED injection as a lifestyle enhancement minimizes the threat of adverse effects or transfers the risk to those perceived to engage in riskier, pathological use (Chandler and McVeigh, 2014; Monaghan, 2001). In this regard the social culture decides what an acceptable dosage is for PIED and what an appropriate cycle is. This creates a risk environment (Rhodes, 1997) where ‘safe’ PIED use is defined and normed within groups and risks taken are assigned subjective acceptability (Rhodes, 1997). Consideration of each individual’s PIED use experience and pathway is necessary to understand the PIED risk culture.

### **3.4 Cultural doping**

#### ***3.4.1 Docile bodies***

Foucault (1977) theorises the relationship between the body and forces of power that seek to train/ contain it. He conceptualises the body as conformist to sets of invisible rules. Through willing compliance with the unspoken rule set, ‘docile bodies’ support the existence of such power structures. Bodies are ordered into ranks in a hierarchal fashion according to how ‘normal’ they are.

*‘The judges of normality are present everywhere. We are in the society of the teacher-judge, the doctor-judge, the educator-judge, the social worker-judge; it is on them that the universal reign of the normative is based; and each individual, wherever he may find himself, subjects to it his body, his gestures, his behavior, his aptitudes, his achievements.’*

*Foucault, 1997 pg 304*

Cultural gender, health, youth and sexualisation norms may be conceptualised as Foucauldian power structures informing socially constructed body ideals underpinning



PIED bodywork. In line with Foucault's theory of hierarchal ordering of normal bodies, the more a body conforms to these ideals the higher its social value (Featherstone, 1991 pg177). Etorre (2004) discusses how the drug user embodies deviance from cultural norms. It may be argued that in this regard that PIED use is in contrast to this theory, where the individual who injects PIED may embody cultural ideals *through* drug use. Drug use which is likely to have been perceived as deviant and associated with "*low social status and lack of moral agency*" (Etorre, 2004 pg 4) had it not been in pursuit of the cultural norm for bodies. In this regard, it may be argued there are key sociocultural body ideals evident in contemporary culture, which may inform some individuals in their use of PIED.

### **3.4.2. Gender**

One method of regulating bodies is through gender. In this regard, Connell's theory of hegemonic masculinity (1987) is a useful lens through which to explore this. Hegemonic masculinity refers to a dominant and socially constructed form of masculinity which subordinates other expressions of masculinity. Contemporary Western values propagated through media include musculature (Ricciardelli, Clow and White, 2010; Atwood, 2009) sexual virility (Loe, 2004), power and physical fitness (Wood, 2000). Davis (1995) discusses manipulation of physical appearance as a key part of compliance with gender norms (pg 53). We see hegemonic masculinity theory reflected in males who inject PIED and who supplement their diet and training regimes with AAS or GH to gain lean muscle to create a hyperbolic, chiselled physique. While consumption of drugs may be seen as a disregard for health, which is against hegemonic masculinity, consumption of PIEDs has been described in the literature as largely taking place in a responsible and careful manner, thereby allowing the male who injects PIEDs to rationalise their use and retain his masculinity (Monaghan, 2001).

Intrinsic to Connell's theory of hegemonic masculinity is her theory of emphasized femininity, the subordination of women to men. One indicator of emphasized femininity at play according to Connell is the maintenance of a sexually attractive body to attract or entertain the male gaze. Lynch (2012) talks about how in contemporary Western culture, women seek to engage 'the white heterosexual male gaze' and in doing so, self-objectify according to western Caucasian beauty ideals (pg 10). One example of such female bodily enhancement from the PIED literature is the use of Melanotan, a tanning injectable with anorectic and libido enhancing effects. Female compliance with western beauty standards can be seen as normalising or disciplining the body and maintaining an oppressive Foucauldian system through willing conformity (Foucault, 1977).

Emphasized femininity can also include strategies of resistance or noncompliance, an example of which may be the use of AAS amongst female bodybuilders (McGrath and Chananie-Hill, 2009). Lynch (2012) talks about how mainstream gender norms can take inspiration from subversive trends. Female musculature is an example of a subcultural phenomenon, subversive to mainstream gender ideals, which has been transferred from bodybuilding and diluted into the less extreme, sexualised fitness model body ideal (Andreasson and Johanson, 2013).

Using Measham's theory of gendered drug use (2002)<sup>2</sup>, gendering of the social space is evident in PIED literature, where the social space may be conceptualised as the online discussion forum for the purposes of this study. Examples of hegemonic masculinity

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<sup>2</sup> Measham (2002) posited that the facets and nuances of culture in which drug use is located may be harnessed to create and perform a gendered identity

can be seen in studies which have described displays of male strength and musculature in the gym (Monaghan, 2001; Bridges, 2009) and online settings (Smith and Stewart, 2012). Hierarchical systems of subordinated masculinities have been described in previous gym based studies (Maycock and Howatt, 2007) and studies mapping online forums have evidenced a similar system of hierarchy (Smith and Stewart, 2012). Pursuit of a toned healthy fit body ideal (Davis, 1995) by women is illustrative of emphasized femininity and evidence of subordination to a masculinised hegemony can be seen in misogynistic male commentary towards female forum posters seeking PIED use advice in Jespersen's (2012) internet study of PIED use. The interplay of gender and PIED use is of interest (Hall, Grogan and Gough, 2016) and has yet to be studied specifically in relation to PIED injection in relation to these modern gendered constructs (Ricciardelli and Williams, 2016).

### ***3.4.3 Health***

Foucault's theory of docile bodies can also be applied to internalisation of cultural ideals of a healthy body. Several theorists have discussed current societal fixation on health. As Gomes (2010) theorised, health is no longer embedded in nature but in consumerism of healthcare products. This can include the medicalization of cosmetic imperfections (Turner, 2004) and image consumerism grounded in creating the appearance of health, or health aestheticism, rather than physical wellbeing (De Luca et al, 2017).

Applying Foucault's theory here, the docile body is subject to transformation and improvement (Foucault, 1977). Through constant surveillance, people self measure against this societal construct of health. Compliance includes consumerism of health aestheticism through bodywork, such as PIED use.

*“He who is subjected to a field of visibility and who knows it, assumes responsibility for the constraints of power; he makes them play spontaneously upon himself; he inscribes in himself the power relation in which he simultaneously plays both roles; he becomes the principle of his own subjection.”*

*Foucault, 1977 Pg 202*

Cultural emphasis on health acts as surveillance over the docile body. Compliance includes consumerism of health and constant self improvement, where optimizing wellbeing and ‘being healthy’ is a moral responsibility (Outram, 2016). Glassner (1990) provides a useful framework in which to locate health driven PIED use. He posits that cultural health obsession is largely appearance based, fuelled by idealized bodies in media as visual representations of health. Fitness as a movement, according to Glassner, acts as escapism from modern living, embodiment of self, therapeutic intervention and an act of vanity. He talks about “*the image of healthiness*” (pg 227) as the goal; an image which is in flux according to fashion trends. Pursuit of health in any case is possible through the consumerism of health care and enhancing products, supplements and in this case, PIED injectables.

To apply this theory to current ‘fit body’ trends, fashionable health aestheticism is grounded in muscularity for males and tanned toned female physiques (Brennan et al., 2013). Contemporary trends for female weightlifting (Andreasson and Johansson, 2013) have been fuelled by media depictions of what Glassner refers to as “*simulacra*” (1990 pg 228). Rather than images of actual people, female fitness models are styled using airbrushing and lighting, makeup and outfits, borrowing from contexts outside of

actual fitness (Glassner, 1990). One such context which may be soft pornography in the creation of a sexualised fitness ideal (Andreasson and Johansson, 2013).

PIED use may be grounded in attempts to emulate visual representations of the contemporaneous 'fit body'. As Glassner notes, it is an unrealistic task to achieve media representations of fitness through diet and exercise alone (pg 228). In line with Foucault's theory of surveillance, he talks about how people judge themselves against idealized bodies when assessing their own health. Glassner also discusses the association of the outer self with the inner self – how an "*outer glow*" (pg 253) is said to represent inner health. Thus the use of tanning peptides may be motivated by pursuit of health aestheticism in individuals who use PIED. The use of AAS to pursue the appearance of health has been evidenced in PIED literature, in individuals who inject opioids seeking to conceal a wasted frame (Comford, Kean and Nash, 2014) and in gay men who wish to disassociate from a weak frame that may indicate ill health or HIV positive identity (Olivardio, 2002; Shernoff, 2001; Bolding et al., 1999).

#### ***3.4.4 Sexual Attractiveness***

Foucault's theory of docile bodies has been applied to the internalisation of cultural ideals of sexual attractiveness by Lynch (2012). She posits that the norms of the porn industry have been adopted by mainstream culture, through saturation with pseudo pornographic imagery, the iconification of misogynistic behaviour and through dissemination of pornographic material itself. Lynch talks about how breast implants and genital shaving, synonymous with porn, have now become body norms for ordinary people. Sexualised body and gender ideals, to include musculature in males, have infiltrated mainstream beauty culture in what Lynch terms "*the porn body*" (pg 99).

To extend this theory to PIED practise, use of muscle enhancing drugs such as AAS and GH in males may be grounded in pursuit of the porn body as a perceived ideal. Mukherjee (2014) states that the erotic gaze which has historically been reserved for women has now turned to men. The sexual objectification of men has been found in previous studies to be typically linked to a “*drive for muscularity*” (Daniel and Bridges, 2010) and cultural saturation with mesomorphic male body ideals (Ricciardelli, Clow and White, 2010; Atwood, 2009).

Fixation on the mesomorphic ideal in gay subculture has been discussed in the literature (Janokowski, Diedrichs and Halliwell, 2014; Benzie, 2000). This element of gay culture has filtered through to bodybuilding and clubbing in the mainstream, with researchers describing bodybuilding subculture as an initially gay phenomenon which became of universal interest as time progressed (Klien, 1993). Motivation for bodybuilding in gay communities was grounded largely in creating an attractive aesthetic for sex rather than strength or fitness gains. This aesthetic driven bodywork is evident in individuals who use PIED who cite attractiveness as their motivation for use (Cohen et al., 2007).

In females who inject PIED there is evidence in the literature of efforts to comply with sexualised body ideals. In Van Hout’s (2014) study of online Melanotan networks, Melanotan specific sites were found to contain messages such as “*Melanotan will make you tan, slim and hot*” (Van Hout, 2014a pg 8). Use of Melanotan by an exotic dancer is also described in a single case study (Van Hout and Brennan, 2013). In this study the case pursued a slim, sexy body ideal with a healthy glow, in contrast to her self-disclosed current and past illicit drug history.

Frederick and Roberts's objectification theory (1997) states that internalization of ideals such as 'the porn body' can result in body shame, which in turn may be expressed through consumerism of bodywork products and procedures. The porn body may be a commodity, with beauty and image markets saturated with products to help us achieve a sexually appealing look (Cash, 2002; Davis, 1995). This now includes the availability of PIEDs, the appeal of which lies not just in the results obtained through their use but in the "quick fix" (Conrad, 2007). Baumann (1999) talks about how instant gratification is a key component of consumer culture. He states that consumed goods should satisfy immediately, requiring very little work or effort on behalf of the consumer. In this regard PIEDs are the prototypical commodity: they fast deliver body ideals encapsulating youth, health and sex.

#### **3.4.5 Youth**

The aging process is commonly defined as a process of 'losing' elements of life that we revere such as health, attractiveness and power (Baker and Gringart, 2009). In this regard, to age is to be noncompliant with cultural ideals. Using Foucault's theory here, the aging body is the criminal, the deviant,

*"he appears as a villain, a monster, a madman, perhaps, a sick and, before long, 'abnormal' individual."*

*Foucault, 1977 pg 109*

Rejection of aging as a normal part of the human life cycle is evident in the anti-aging culture of today to include use of PIEDs. The emergence of medical clinics specialising in GH and testosterone therapy for enhanced longevity is an example of this (Conrad, 2007). Cosmetic injectables such as botox and dermal filler injection deemphasise facial wrinkling and plump the skin and lips, mimicking a younger appearance (Evans

Brown and McVeigh, 2012). Empirical research with individuals who inject AAS, GH and Melanotan has found slowing down the aging process or the provision of a youthful appearance, to be a motivator for use (Ip et al., 2014; Van Hout, 2014a).

#### ***3.4.6 Extreme PIED use and social stigmatisation***

When considering cultural accommodation of enhancement drugs, evidence of stigmatisation must also be examined. Social criticism of PIED use can be aroused through extreme forms of PIED bodywork, e.g. hypermusculature and Synthol use. The perception of individuals who inject PIEDs as “*freaks*” that are revolting to observe is described in Monaghan’s (2001) description of the general public’s reaction to some competitive bodybuilders who expose their physiques on the beach.

Individuals who use Synthol heavily inject copious amounts of oil into muscle groups to create hugely inflated biceps, at times resulting in a swollen and cartoonish appearance, earning them the moniker “Synthol freaks” (Brennan, Kanayama and Pope, 2013; Schafer et al., 2012). Freak outcomes have also been noted in individuals who inject Melanotan, where the skin tone darkens to the extent that race is indeterminable (Van Hout, 2014a).

The concept of radical human enhancement is supported by transhumanist theorists, who seek constant improvement on and transcendence of natural human limitation (More, 2013; Hughes, 2002). While much of transhumanist literature is futuristic and grounded in technological and bioethical advancement, Bostram (2005) draws our attention to transhumanist predictions that are already active in current culture, through the use of PIEDs and anti-aging therapies. For some individuals, a new enhanced version of ‘normal’ evolves through PIED use and submergence in bodywork culture,



the ‘supernormal body’ (Brey, 2008). Lynch (2012) theorises that acts of ‘upping the ante’ extremism in relation to cultural products is grounded in ‘more is more’ mentality which occurs through processes of desensitisation and intense competition.

Opposition to greatly transforming the human body is best framed by bioconservatist theory, in conflict with theories of transhumanism. The work of bioconservative Leon Kass (1997) has relevance in considering the disadvantages associated with bodily enhancement. He posits that people should trust their natural instinct of repugnance towards what he perceives as a ‘Frankenstein’s monster’ approach to humanity. Such repugnance is evident in social stigmatisation of visible PIED use.

### **3.5 Individual agency**

#### ***3.5.1. Individual who injects PIED as embodied subject***

Contrary to the theory of docile bodies (Foucault, 1997) PIED bodywork may not be the result of ‘cultural doping’ but self-directed cathartic intervention. Davis (1995) discusses cosmetic surgery as embodiment of power and agency, where the individual renegotiates their relationship with their body rather than passively self-objectifying (pg 114). Use of PIEDs builds on this concept, by virtue of entering the mainstream for anyone wishing to alter their appearance to conform to perceived aesthetic ideals.

Intrinsic to the conceptualisation of acceptable and moderated drug use is the rational consumerist decision making process undertaken by the individual who injects. Measham (2002) theorises that moderated drug use is often characterised by desirable outcomes perceived to enhance the user’s lifestyle. This type of drug use disassociates from problematic or dependant use. Drawing upon the PIED literature, studies have

found that the majority of participants attempt to use responsibly and experience few complications with mainly positive outcomes reported (Chandler and McVeigh, 2014; Van Hout, 2014a; Cohen et al., 2007).

Measham also describes how just as cosmetic augmentation of the body with piercing and tattoos is an embodiment of agency and identity, embodiment of self-image also occurs through drug use itself (Measham, 2002). PIED use is a combination of both these elements, embodiment of a negotiated sense of self through transformative bodywork as described by Davis (1995 pg 59) and embodiment of self through the act of drug use.

### ***3.5.2 Moderated drug use***

Compartmentalisation of perceived reckless or chronic drug use as a separate entity to moderate, acceptable use is described by Parker, Aldridge and Measham (1998) where young people who use drugs distance themselves from individuals with problematic use. This type of disassociation in PIED use is evidenced in studies where participants have criticised subsets engaging in lengthy cycling or extremely high dosages (Chandler and McVeigh, 2014; Monaghan, 2001). Parker, Williams and Aldridge (2002) note that young people who recreationally use drugs seek to actively disconnect from the stigmatising ‘druggie’ identity, perceived to be characterised by an outward appearance and behaviours associated with chronic long term drug use. This rejection of a problematic drug using identity is also discussed in the PIED literature, where study participants discuss PIED use as being more health conscious than many social behaviours such as consumption of junk foods and a wish not to mix with other individuals who inject when accessing needle exchange; referring to them as “*junkies*” (Monaghan, 2001 pg3).

Measham (2002) writes about the use of AAS amongst male clubbers/ravers wishing to display an attractive torso in a setting where clothing is typically minimal. She also theorises that drug use can be a tool for females to identify with a “*club babe*” (pg 355) identity. By extension, use of PIEDs to increase aesthetic appeal in the “*nocturnal genderscape*” (Henderson, 1997 pg 96) may be a tool for enhancing the clubbing experience in some individuals who inject PIED. Longstanding subcultural emphasis on a sculpted physique in gay clubbing communities has led to use of AAS within this cohort (Shernoff, 2001) and aesthetics driven muscle building has transferred from a gay male subculture to the mainstream (Benzie, 2000).

### **3.5.3 Normalisation**

In understanding the transition of PIED use from subcultural user groups such as bodybuilders, powerlifter’s and sex workers (Maycock and Howatt, 2007) to the general population of gym attendees (Underwood, 2017) and people seeking simply to become more attractive (Vest Christiansen, Vinther and Liokaftos, 2016) normalization theory as posited by Parker Aldridge and Measham (2002) may hold relevance,

*“Normalization is about stigmatized or deviant individuals or groups (and to some degree their social behaviour) becoming included in as many features of conventional everyday ‘normal’ life as possible”*  
(Parker, Williams and Aldridge, 2002 pg 942).

Parker, Aldridge and Measham argue that when certain key factors are present “*counting drug abuse as an activity of the abnormal... no longer holds*” (Parker, Aldridge and Measham, 1998 pg 19). Diffusion of drug use trends from marginal user groups to the mainstream means loss of deviance as normalisation occurs. The transitioning of PIED use from competitive bodybuilding communities to mainstream

gym attendees has been described in previous studies (Underwood, 2017; Evans Brown et al., 2012; Cohen et al., 2007; Baker et al., 2006). Features of normalisation as theorised by Parker, Aldridge and Measham are compared with evidence from the PIED literature in Table 4 below.

**Table 4 Normalisation of PIED injection**

| <b>Key Features</b>                                                                     | <b>Examples from PIED literature</b>                                                                                                                                                                                                                                                                                                                                                        |
|-----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| “Access and Availability”                                                               | Previous studies have highlighted the vast, highly accessible and affordable online PIEDs market (Cordaro, Lombardo and Cosentino, 2011; Clement et al., 2012; Brennan, Kanayama and Pope, 2013)                                                                                                                                                                                            |
| “Drug Trying”<br><i>dynamic user profiles e.g. across all socioeconomic backgrounds</i> | In addition to bodybuilding subsets (Ip et al., 2014; Perry et al., 2003), studies have profiled the individual who uses PIED as a recreational gym or health club attendee (Christiansen and Bjosens - Moller, 2010; Baker et al., 2006) gainfully employed and educated (Corazza et al, 2014) and motivated by physical appearances rather than sporting achievement (Cohen et al., 2007) |
| “Drug Use”<br><i>prevalence rates</i>                                                   | Though exact prevalence rates for PIED use are unknown, use of AAS is estimated to be up to four million in the U.S (Pope et al., 2014) with 3.3% prevalence worldwide (Sagoe et al., 2014) and use of other PIEDs such as GH, Melanotan and cosmetic injectables is thought to be increasing (Evans Brown et al., 2012)                                                                    |
| “Being Drug Wise”<br><i>Knowledge of drug practices</i>                                 | Internet studies have highlighted the extensive ethnopharmacological knowledge disseminated through PIED specific online discussion forums (Underwood, 2017; Van Hout, 2014a) This highly accessible information has been described as a blend of scientific research and lay epidemiology.                                                                                                 |
| “Future Intentions”<br><i>Attitudes/openmindedness towards drug use</i>                 | While condemnation of perceived high risk or dependent PIED use exists amongst the general population (Chandler and McVeigh, 2014; Monaghan, 2001) cosmetic procedures are accepted as people express themselves through bodywork (Davis, 1995 pg 17)                                                                                                                                       |
| “Cultural Accommodation”                                                                | Previous studies have underscored the role of contemporary emphasis on physical appearances, to include appearance of health and sexual attractiveness, with use of PIEDs to create a socially valued body (Van Hout, 2014a; Brennan, Van Hout and Wells, 2013; Mataix, 2012; Mahiques-Santos, 2012, Evans Brown et al., 2012)                                                              |

It can be seen that key features of normalisation theory are described in the extant PIED literature.

### 3.6 Risk perceptions and navigation

The normalisation of risk behaviour as conceptualised by Rhodes (1997) has relevance here. Rhodes analyses the social unit rather than the individual when exploring injecting drug users. In this regard, high risk injecting behaviours are assigned subjective meanings and are shaped by social environments and context. In his work with individuals who inject opioids, Rhodes explored concepts such as relativity of risk, which refers to the risks given priority over others by the individual in terms of urgency. Rhodes found that it was typically the immediate salient threats which received greater attention, such as sudden overdose and not perceived distant threats, such as HIV.

Applying this perspective to individuals who inject PIED, Rhodes' theory of relativity of risk (1997) is seen in an empirical study of individuals who use AAS and their prioritisation of minor side effects with obvious physical symptoms e.g. *"..is there one of them .. where you don't get sore nipples... and pimples?"* and dismiss other major potential outcomes *"I don't care if I get sick in the head"* (Christiansen and Bojsen-Moller, 2012). Here AAS associated psychological harm is seen as an *"acceptable risk"* (Rhodes, 1997 pg 11) whereas more immediately salient physical outcomes such as sore nipples are defined as urgent and more influential to the purchase decision making process.

Refinement of Rhodes's theory to incorporate consideration of the extensive online ethnopharmacological knowledge that is typically disseminated in a researched and informed manner (Christiansen, Vinther and Liokaftos, 2016) is required to study

individuals who inject PIED. Here risk perception is complex since scientific knowledge and lay epidemiology is combined in messages of risk navigation.

Peretti-Watel (2003) also theorises that risk neutralization involves the adaptation of individual belief systems to accommodate the risk when confronted with information which challenges the risk behaviour. One such risk neutralization technique is scapegoating. This occurs when the individual adopts an 'us versus them' approach; for example, labelling groups who have encountered negative health outcomes as careless or unskilled. Forms of reckless use are in opposition to the perceived acceptable forms of use or moderated use as conceptualised by Parker, Aldridge and Measham (1998). This is also evidenced in Monaghan (2001) where all individuals who used AAS interviewed defined themselves as 'users' but defined others who suffered adverse effects and became dependant as 'abusers', those who lacked restraint and were incapable of managing their AAS use.

Another negotiation of risk technique described by Peretti-Watel (2003) is risk comparison - where the individual who uses drugs will compare the risks involved in their drug use with a popular risk undertaken in society. This can be seen in action in Van Hout and Brennans' single case study of an exotic dancer using tanning peptide Melanotan, who when asked if the risk potential for inadvertently using contaminated product sourced online was a worry responded "*You don't know what's in anything anymore*" (Van Hout and Brennan, 2013). The final technique of risk neutralization as theorised by Peretti-Watel is that of self-confidence, where the individual who uses drugs attributes worth to their own risk navigation abilities.

In the case of individuals who use PIED, mistrust of physicians has been documented in previous studies (Zanhow et al., 2017; Pope and Kanayama, 2005; Pope et al., 2004). This has led to a reliance on lay epidemiology, which is disseminated online within subcultural networks (Brennan, Van Hout and Wells, 2013; Chandler and McVeigh, 2014; Evans Brown et al., 2012). Online discussion forums provide a channel for accessing peer group experience and disseminating pragmatic directions for PIED use. Interpersonal trust embedded in subcultural social capital results in the establishment of risk taking norms, perceived as established and acceptable.

### **3.7 Technology and PIED use**

Technology may also be considered a power structure and a lens through which to examine the dynamics of the PIED online discussion forum space. His theories of information technology. Floridi (2010, 2001, 1999) discusses the emergence of the information age and information society, which he states is expanding and growing 'relentlessly'. In his work he describes the growth of the online "information environment". Computer science, like all other sciences, impacts how we see the world and ourselves. The reflexive relationship between the offline and online world is such that they blend into one 'infosphere'. Floridi introduces the 'moral agent' who both consumes and produces information, and through this changes the information environment. To apply this to the PIED online discussion forum, the forum discussant may be conceptualised as a 'moral agent' as they absorb and contribute information in the online discussion forum space, a micro "information environment". Floridi (2010) also describes how in a society where individualism is being eroded in favour of conformity and people feel replaceable, the online identity is a construction of personal taste and originality. People who inject PIED may also be seeking to construct their

identity, and engagement in online discussion may be a tool in this regard. Identities may also be collective in the discussion forum peer group. Floridi writes that online identities formed in discussion groups may have salience for self esteem, lifestyle and values. Floridi (2001) also examined the ethics of information, including information technology. He compares us to children playing, and states that ethical wisdom may not automatically occur alongside technological advancement. This may be applied to the emergence and development of unregulated online PIED markets where contaminated and understrength PIED products are often sold. Another ethical issue Floridi (2001) discusses is 'disinformation', when information is given incorrectly, for example, through propaganda or censorship. Both may occur within the online discussion forum space, where a pro drug use ethos has been found in previous studies (Brennan, Kanayama & Pope, 2013). Harms relational to PIED injection may be minimized, and their benefits exaggerated. It may also be the case that online lay epidemiology contains truths that scientific community has yet to disseminate.

### **3.8 Identity in PIED use**

The consumption of PIED is embedded in bodily enhancement and often undertaken by people with vested interest in health, fitness and wellbeing (Van Hout, 2014a; Monaghan, 2001; Christiansen and Bjosen-Moller, 2012). This causes a disconnect between individuals who inject PIED and those who inject opioids and stimulants. Where drug use is positively conceptualised as bodywork or self improvement, injecting risks may be underestimated and minimized. Using Peretti Watel and Moatti's (2006) theory of innovative deviance, where voluntary risk taking represents an autonomous gesture of self mastery, risk taking in bodily enhancement can be seen as a



transhumanistic action and a rejection of the passive role of acceptance of fate. Lupton and Tulloch (2002) states that to surpass the ordinary to the extraordinary and to engage in practices which may be seen as risky may be a positive experience. The exhilaration of “*edgework*” (Lupton and Tulloch, 2002 pg117) may be compounded for the individual who uses PIED, who embodies this transcendence from the everyday to the remarkable in reshaping their bodies.

### **3.9. Concluding comments**

Cultural gender, health and sexual attractiveness norms may form a Foucauldian power structure (1977) with which compliance is rewarded with heightened social value. In this context, Connell’s hegemonic masculinity and emphasized femininity theory (1987) may have some relevance in PIED culture, as traits of each are evident in body ideals. This interfaces with the pursuit of fitness and high performance in recreational sport as illuminated by Glassner’s theory of the fit body and the image of healthiness (1990) and hold importance in consideration of fitness and health driven PIED use. The contradiction in PIED use with the pursuit of health is informed by the concept of health aestheticism where ‘looking healthy’ supercedes ‘being healthy’. Pornographication of culture refers to mainstream societal absorption of porn industry norms, to include sexualised body ideals: the tanned, curvaceous female and muscular mesomorphic male. Internalization of these ideals may have led to pursuit of ‘the porn body’ (Lynch, 2012) which is commoditized in consumerist culture. The concept of the porn body may be extended to PIED use as individuals seek out musculature and toned tanned body ideals.

Although drawing upon cultural resources to inform consumptive decision making processes, the individual who injects PIED is not a ‘cultural dope’ – someone who acts

out blindly the cultural directive (Davis, 1995). Extending the theories of Measham (2002) and Davis (1995) to PIED use, embodiment of identity may be negotiated through bodywork and drug use practices. Within the discussion forum social environment, Rhodes theory of risk (1997) may have relevance in examining online subcultural networks and dissemination of ethnopharmacological knowledge.

This conceptual framework for investigation of PIED injecting in mainstream society as seen in the online discussion forum space (see Figure 2) highlights that this study is concerned with:

The complex relationship between broader societal body ideals as they inform PIED use and concurrent stigmatisation of individuals who inject PIED;

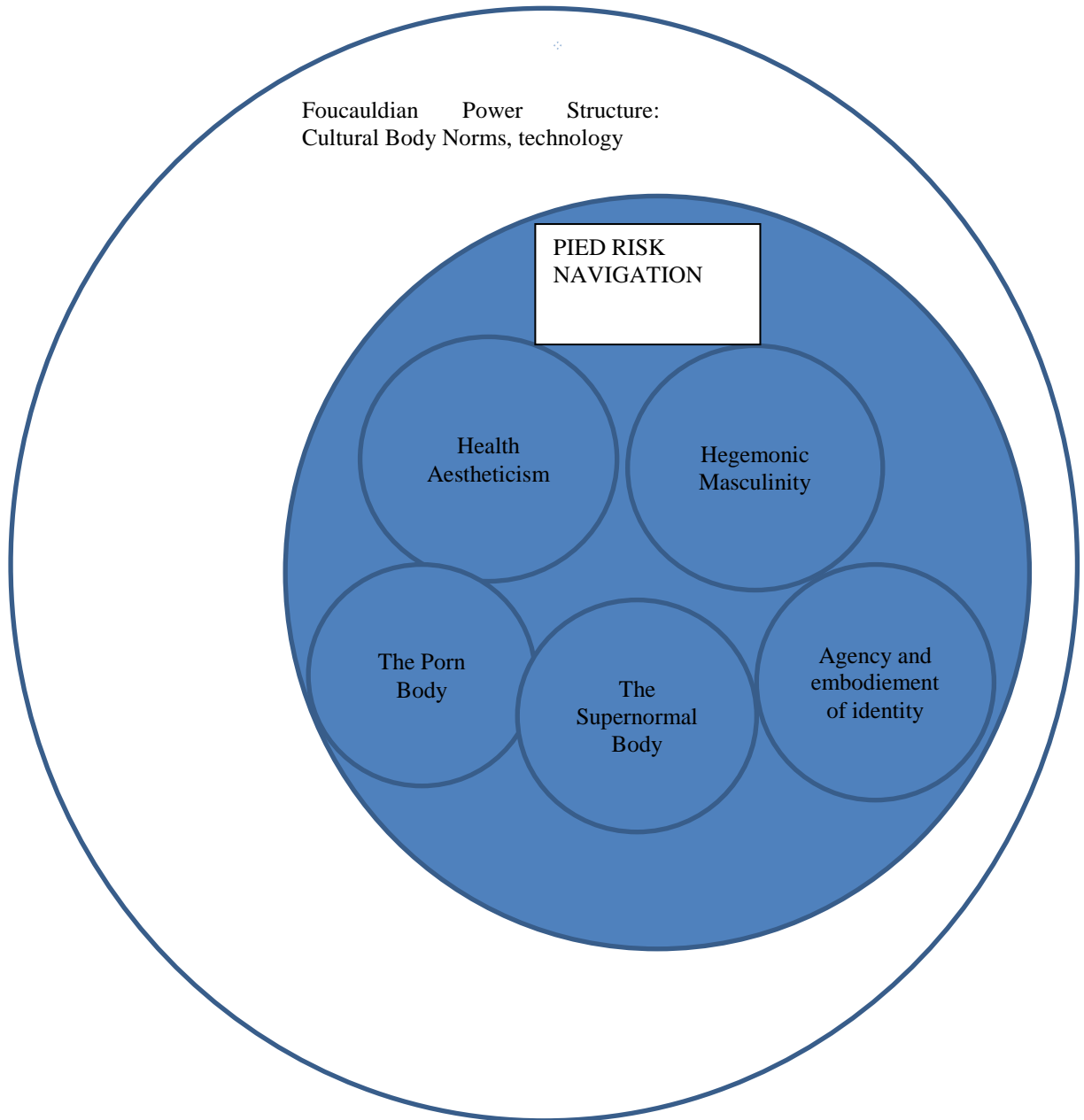
The individual agency of PIED users in negotiating sense of self through embodied PIED practices;

Injecting risk navigation through perceived moderated and normalised drug use in a densely ethnopharmacological online culture;

Perceptions and beliefs around injecting in online forums as a social space for PIED use.

This integrated framework is important in giving direction and context to data collection and analysis in the study of injecting PIED use. The concepts identified in this chapter form “*orienting concepts*” that structure and clarify findings as they become apparent in this study (Layder, 1998 pg 19). This is in accordance with Adaptive Theory, the chosen methodological approach for this research (ibid). Chapter Four will discuss Adaptive Theory and why it was found to be an appropriate approach for this study.

**Figure 2 Conceptual framework for the investigation of injecting PIED use**



## **Chapter 4: The Research Journey: Choosing a Methodological Approach**

### **4.0 Introduction**

This chapter presents Layder's (1998) Adaptive Theory as a methodological approach for the study of the injecting use of PIED. Section 4.1 briefly discusses the philosophical underpinnings of research paradigms, with particular emphasis on Adaptive Theory's ontological and epistemological underpinnings. Section 4.2 describes how and why Adaptive Theory was selected for this online study of injecting use of PIED. Section 4.3 explores why Adaptive Theory is appropriate for this research project, with consideration of its strengths and limitations compared to other research approaches. Section 4.4 concludes by stating the rationale for using Adaptive Theory as a research approach for the study of injecting PIED use in the general population, as described.

### **4.1. Philosophical underpinnings of research paradigms**

#### ***4.1.1. Definition of Ontology***

Ontology refers to the nature of reality. Within qualitative research, the researcher seeks to report on multiple perspectives of reality. In this regard, ontology is concerned with whether social reality is context dependant or whether a social reality exists independently of human interpretation (Snape and Spencer, 2003 pg 11).

The three main ontological positions are realism, idealism and materialism (Snape and Spencer, 2003). Realism takes the position that a concrete reality exists outside of human interpretation. Idealism maintains that it is human understanding that defines reality and that reality only exists through how the human mind understands it.

Materialism takes the position that only the physical and materialistic represents reality (ibid).

In the study of injecting PIED use, the impact of “*already formed*” social circumstances (Layder, 1998 pg 88) which confront individuals in their daily lives is of importance when considering the causal mechanisms for PIED use. As exploration of systemic concepts which play a role in the initiation and continuation of PIED use will be necessary to put research findings into context and to add depth to analysis, this research project takes a realist ontological position.

#### ***4.1.2 Definition of Epistemology***

Epistemology concerns the nature of knowledge and, in particular, how one goes about the discovery of knowledge and the limits of that which is discovered. Two distinct perspectives of epistemology are positivism and interpretivism (Sibeon, 2004). Positivism is the epistemological position that only the observed can be factual knowledge, i.e. through measurement or other means of scientific testing (Collins, 2011). Interpretivism is the epistemological position that values the social and human construction of reality.

In the study of injecting PIED use in the general population, acknowledgement of non-behavioural systemic concepts which contain some similarities to the natural world in their absoluteness (Layder, 1998 pg 88), in addition to interpretation of the subjective elements of user perceptions and experience, is needed. Motivators and trajectories of use cannot be fully understood in isolation from cultural and societal influences (Layder, 1998 pg 156). Thus this study draws upon elements of both positivist and interpretivist epistemological positions.

#### ***4.1.3. Adaptive Theory***

The purpose here is to describe the ontological and epistemological positions which Adaptive Theory holds in relation to realism. Adaptive Theory is consistent with Social Domains Theory, which takes a largely realist ontological position (Layder, 1997). Adaptive Theory acknowledges that there is a world order separate to an individual's interpretations or knowledge of it (Layder, 1998 pg 151). However, rather than view this world order as completely detached from human influence, as with true positivism, Layder takes the view that people also impose order on the world as they attempt to make sense of it (ibid). Thus Adaptive Theory supports the subjectivist nature of an interpretivist position and the exploration of motives, reasons and meanings which occur in social settings (Layder, 1998, pg 141). Therefore, the epistemological position taken by Adaptive Theory is neither positivist nor interpretivist (Layder, 1998 pg 139).

The incorporation of a realist stance allows for the consideration of systemic phenomena such as culture, ideology, power structures and role expectations (Layder, 1998 pg 143). It therefore helps to identify the causal mechanisms for a particular phenomenon and the adaptation of elements of subjectivism to facilitate the study of people and their behaviours (Layder, 1998 pg 141). In this regard, Adaptive Theory differs from interpretive analysis e.g. phenomenology. Interpretive analysis is solely concerned with social activity and the experiences, perceptions and meanings of actors (Layder, 1998 pg 91). In this regard, systemic concepts are not recognized as they are not grounded locally in individual's day to day activity (ibid). Adaptive Theory differs also from institutional analysis which focuses on systemic and structural features of society alone (Layder, 1997 pg6). The intersection of both these aspects of the social world is at the heart of Adaptive Theory.

## **4.2 Factors affecting the choice of research approach**

The purpose here is to consider why a qualitative, ethnographic content analysis approach using Layder's Adaptive Theory was chosen for this study. The focus of this study was an in-depth exploration of injecting PIED use in mainstream society through an examination of the views and experiences of individuals who inject PIED as posted in online discussion forums. Research questions for this study include:

What are the motivating factors for PIED use?

How do individuals navigate risk in online sourcing of PIED?

What health outcomes do individuals who inject PIED experience?

How do individuals perceive injecting drug use in PIED bodywork?

Firstly, in order to answer these "how" and "what" research questions and to explore the topic of injecting PIED use in detail (Cresswell, 1998 pg 17), a qualitative approach was selected to "*tell the story*" of injecting PIED use. Qualitative research has a longstanding history in the field of drug use (Rhodes, Greenwood and Robertson., 2001). This approach allows for interpretation of behaviours that may occur within hidden population groups, such as individuals who inject. Qualitative research also aims to explore the social context and meaning of behaviours which are both individual and socially situated (ibid).

The study aims are referenced to the nature of injecting PIED use as a socially organised activity with a range of cultural allusions to health, beauty, fitness and youth. An approach which gives access to the understanding of these concepts within PIED communities and can explore the impact of this understanding on PIED use decision making processes necessarily therefore is qualitative.

A secondary aim of this study is to inform health care services' policy and practices. Investigators of health and health behaviour are increasingly using qualitative methods of research (Green and Thorogood, 2009). Therefore, another rationale for the selection of a qualitative approach is the receptiveness of the healthcare audience to research conducted in this manner (Cresswell, 1998 pg 14).

In order to choose the specific method of qualitative enquiry, consideration of the online PIED communities (Van Hout, 2014a; Brennan, Kanayama and Pope, 2013) provided the rationale for using an internet setting, where a study of individuals who inject PIED in a "*natural setting*" (Cresswell, 1998 pg 14) incorporating uncensored discourse can take place. PIED injecting is a topic which needs to be explored, detailed and a theory developed to explain PIED use behaviours (Cresswell, 1998 pg 17). As it supports theory generation through empirical investigation, I decided to explore Layder's Adaptive Theory and its suitability as a research approach for this study.

Layder recognises that grounded theorists have proven a solely qualitative approach can be geared towards theory construction (Layder, 1998 pg 45). One potential drawback to this approach, as posited by Layder, is an overload of concepts arising from the descriptive nature of qualitative research (ibid). However, Layder also discusses how use of prior general theory to inform "*orienting concepts*" (Layder, 1998 pg 101) and consideration of the systemic and structural aspects of social reality will 'rein in' the introduction of too many concepts (Layder, 1998 pg 154).

Hall, Grogan and Gough (2016) describe how the study of body image and body enhancement requires consideration of individual experiences and cultural settings. The



exploration of injecting PIED use in the general population involves consideration of how cultural power structures inform societal norms (Foucault, 1977) and may shape the behaviour of actors. In this regard, extant general theory including theories of power and control over bodies (Foucault, 1977) are relevant to this project. In addition to general theory which concerns itself with systemic structures, Adaptive Theory also advocates consideration of the subjective realm and social agency. Thus substantive theories of embodiment (Etorre, 2004; 2010) and sense of self (Davis, 1995) will help guide an exploration of individuals' experience of injecting PIED, their motivations and perceptions. Due to the utilisation of prior theory to inform background or 'orienting' concepts, in order to give direction and context to an in depth process of data collection and analysis, a qualitative approach was seen to be compatible with Adaptive Theory as a research approach for this study.

### **4.3 Adaptive Theory**

#### ***4.3.1. Theory data relationship***

Adaptive Theory advocates a strengthening of the theory data relationship. It does so by utilising extant general theory (concerning social life in general e.g. Foucault, 1997) and substantive theory (relating to particular areas of interest e.g. Glassner, 1990) and new theory which emerges from the data. In this regard, it draws on elements of middle range theory which formulates a theory prior to research (Merton, 1967) and grounded theory which promotes theory construction through analysis of lived experiences (Glaser and Strauss, 1967). However, Adaptive Theory rejects the neglect of subjective experience which occurs in middle range theory (Layder, 1998 pg19) and the dismissal of general and *a priori* theory in grounded theory (ibid.). Adaptive Theory provides an alternate approach with the inclusion of both prior and inductive theory.

In this study of injecting PIED use, general theory is of relevance in explaining how cultural norms around beauty, gender, fitness and health impact on social life. Understanding the systemic phenomena which inform PIED use is essential in putting the behaviours and interpretations of individuals who inject PIED into context.

In addition to the incorporation of extant theory in data analysis, theory construction is also an aim of this research. It is the combination of data collection and analysis with consideration of extant theory which generates a new theoretical model for the study of a social reality (Layder, 1998 pg 151). The phenomenon of injecting PIED in mainstream population groups is a trend which requires framing theoretically (Cresswell, 1998 pg17). In this regard, Adaptive Theory, with its use of extant theory and theory construction, is an appropriate approach to inform such theory development.

#### ***4.3.2 Social Agency and Social Structures***

Another aspect of Adaptive Theory which has relevance here is the analysis of the socio structural or systemic aspects of society in addition to analysis of behavioural phenomena (Layder, 1998 pg19). Adaptive Theory is most suitable for research that attends to the interconnection of social systems with the subjective realm of social life (Layder, 1998 pg 144). It is the relationship between social systems, e.g. culture, power and ideology and “*lifeworld*” elements, e.g. human activity, behaviours and motives, which will explain how and why a particular set of activities occur (Layder, 1998 pg 172). This study aims to understand the online social world as it relates to PIED use as a system (Layder, 1997 pg100). It is understood that people do not act solely on the influence of power structures nor do they act completely in isolation from them (Layder, 1997 pg 236). It is the interplay between these two elements that will explain the

cognition (motivators, perceptions, lay epidemiology) linking PIED use behaviours with wider society (ibid).

In this case the set of activities is the injecting practise and use of PIED and the investigation of the interconnections between social organisation and human behaviours is likely to involve examination of the cultural blueprints for beauty, health, sport and fitness and gender. It may also include exploration of the social settings and context of PIED use; in this case the online discussion forum as it relates to environing forms of power (Layder, 1998 pg 148). Socially organised hierarchal systems have been noted in previous studies of PIED communities (Smith and Stewart, 2012; Maycock and Howat, 2007).

Power can also be conceptualised as personal power or agency (Layder, 1997 pg 152). It can be seen from the PIED literature that many individuals experience their use as positive, life enhancing and with few adverse outcomes (Van Hout, 2014a; Chandler and McVeigh, 2014). Investigation of the “*life world*” of individuals who inject PIED – their experience, meanings and motives- in addition to exploration of the cultural and social impact on their use, is thus warranted to illustrate the everyday activity and interpersonal exchanges in PIED communities.

#### ***4.3.3 Theory Development***

Adaptive Theory utilises both an inductive and deductive method for theory construction, the exact combination of which will vary from study to study (Layder, 1998 pg 15). This essentially means that research begins with a prior theory formulated from general theory, which is typically abstract and concerns social reality in a general sense (Layder, 1998 pg 39). This extant theory shapes data collection and is considered

at every phase of research, but it is not an 'end product' and will adapt and expand as incoming evidence emerges from the data (Layder, 1998 pg 38).

For the study of the injecting use of PIED the work of Foucault was consulted to construct an *a priori* analytical model. Layder gives a description of Foucault's framework of ideas in relation to social domains theory in his book *Modern Social Theory* (Layder, 1997 pg 152). In this he states that social activity is made possible only through the influence of systemic elements such as cultural norms, language and ideology (Layder, 1997 pg 198). This is relevant to PIED use in that individuals may draw upon cultural scripts for beauty and health ideals to inform PIED use. Layder rejects some of Foucault's theory that power is defined by discourse in social life, as Adaptive Theory considers power more complex than that and represented through social agency and activity, systemic and subjective phenomena (1998 pg 148). However, the importance of discourse can be seen in PIED use where discourses around gender and body ideals shape perceptions of the ideal man or woman (Layder, 1997 pg 46).

Systemic phenomena as conceptualised by Layder is framed by Foucault's theory of *docile bodies*. Foucault's theorizing of power structures and how they cause bodies to self-regulate and transform in order to be 'normal' (Foucault, 1977) was used to frame multiple substantive theories relating to societal ideals of health and fitness (Glassner, 1990), gender (Connell, 1987) and sexual attractiveness (Lynch, 2012). Noncompliance with these 'normalizing' ideals is punished through reduced social value (Layder, 1997. pg 149). The use of *a priori* theory throughout data collection and analysis helps put the

‘life world’, which data illustrates, into a social context and adds depth to findings (Layder, 1998 pg 48).

One limitation of Foucault’s general theories of power and control is a failure to recognise personal power and agency (Layder, pg 152) which is an important characteristic of PIED use. Social domains theory describes the importance of personal agency or “*psychobiography*” in impacting social activity (Layder, 1997 pg 237). In this regard, substantive theories of embodiment of self (Etorre, 2004; Davis, 1995) are utilised in this study to construct background theories that guide investigation of PIED use as self-directed intervention and examine discourses of identity and sense of self.

#### ***4.3.4 The extent and limits of Adaptive Theory***

Adaptive Theory takes elements of a range of research approaches such as critical theory, grounded theory, middle range theory and general theory but differs from all of them. Due to its emphasis on sociostructural variables such as ideology, power and role expectations (Layder, 1998 pg 143) Adaptive Theory is best suited to the study of the ‘interweaving’ of systemic phenomena such as these and the interpersonal and subjective elements of social life. Adaptive Theory rejects the total subjectivism of phenomenology (Layder, 1998 pg 91) and therefore is not be suitable for researchers who take the stance that all concepts must be grounded in social activity.

Adaptive Theory also advocates the concurrent use of prior theory with emergent theory and, in this sense, it rejects the basis of grounded theory (which states that researchers should begin data collection with a ‘clean slate’ theoretically and allow a unique theory to emerge from the findings (Layder, 1998 pg 19). However, while Adaptive Theory rejects elements of these theories, it also draws from them as it concerns itself with the

lived experiences of actors in a phenomenon. The motives and meanings of social life are part of the Adaptive Theory approach and a focus on empirical evidence as it elaborates on prior theory is taken. Such an approach contextualises the behaviour of individuals within the social reality that shapes decision making.

In this regard, Adaptive Theory was found to be appropriate for the study of injecting use of PIED in the general population. In order to understand the influence of the wider social environment and “*already formed social circumstance*” (Layder, 1998 pg 88) on the activity of individuals who inject PIED, systemic concepts must be considered. Additionally, general theory, such as that of Foucault, is relevant in constructing *a priori* theory with which to shape data collection to produce “*an enhanced or more accurate reading of the nature of social reality under scrutiny (e.g. a particular group) than what has gone before*” (Layder, 1998 pg142). The use of extant general theory to frame the role of cultural norms on PIED use in addition to the use of substantive theories by Etorre (2004; 2010) and Davis (1995) to explain the element of personal power and agency in PIED use creates a conceptual framework for the study of injecting use of PIED in the general population. Such an *a priori* framework can be seen to add depth to the exploration of the issues and give the empirical evidence direction and context.

#### **4.4 Concluding comments**

Adaptive Theory is concerned with the interplay between the subjective realm or ‘lifeworld’ as it relates to human behaviour, decision making, motives, experiences and systemic structures of power, ideology and role expectations. In relation to the study of injecting PIED use in the general population, Adaptive Theory allows injecting PIED

use to be investigated at a subjective level concerned with the activity and experiences of individuals who inject PIED and at the objective level of the sociocultural setting and context of PIED use. The links which connect individuals who use PIED with social values of health and beauty and complex social settings which put PIED use into context can all be explored using Adaptive Theory. Adaptive Theory rejects the extremist elements of positivism and interpretivism and blends together aspects of both to create an approach which accommodates theoretical and empirical work. This research is concerned with investigating a phenomenon which requires theoretical framing and exploration of the causal and cognitive mechanisms interlocking PIED use behaviours with the wider social realm. In this regard, Adaptive Theory is an appropriate approach with which to conduct this research. Data collection and analysis from an Adaptive Theory perspective are now described in Chapter Five.

## **Chapter 5: Process of Investigation: Research Setting and Data Collection**

### **5.0 Introduction**

This chapter explains how Layder's (1998) Adaptive Theory was applied throughout the data collection process and in informing the thematic framework for analysis for this study - an ethnographic content analysis of online discussion posts. Section 5.1 describes the justification for the research methodology. In Section 5.2 the focus of this study is described in terms of the study's aim, objectives and chosen methodology. Section 5.3 describes the methodological approach. Section 5.4 describes data collection. Section 5.5 focuses on data analysis, in which Krippendorff's (2004) phases of content analysis was applied whilst maintaining an Adaptive Theory (Layder, 1998) stance. Issues of trustworthiness and validity are also explored. Section 5.6 discusses ethical considerations in the online setting to include safeguarding forum discussants in relation to informed consent, confidentiality and anonymity. Section 5.7 concludes the chapter.

### **5.1. Justification for the research methodology**

The majority of studies to date investigating injecting use of PIED have been conducted with individuals in contact with harm reduction services such as needle exchange (Jaacka et al., 2017; Van Beek and Chronister, 2015; Iversen et al., 2012), however, this cohort may not be representative of the wider population of individuals who inject PIED (Rhodes, Greenwood and Robertson, 2001). It was decided to examine online discussion forum threads and posts specific to PIED use in order to research the issues of interest in this study. The research consisted of content analysis of discussion forum posts, previously referred to as 'passive netnography' (Kozinets, 2002) and evident in



the literature on emerging drug trends (Van Hout and Hearne, 2016; Soussan and Kjellgren, 2015; Kjellgren, Henningson and Soussan, 2013; Kjellgren and Jonsson, 2013; Davey et al., 2012; Kjellgren and Soussan, 2011). This methodology has also been previously used in some extant studies to investigate use of PIEDs (Hall, Grogan and Gough, 2015; Van Hout and Hearne, 2016; Van Hout, 2014a).

Benefits associated with this approach include the non-intrusive observation of uncensored and rich communication amongst forum discussants over a lengthy period of time (Smith and Stewart, 2012) without “*disturbing the synergy of the community*” (Ulusoy, 2012). Kozinets describes the use of an online setting for research as allowing unprecedented access to “*previously unobservable behaviours of interacting consumers*” (Kozinets, 2002). Phenomena which have not yet attracted clinical or scientific attention can be found through analysis of online discussion (Paul et al., 2016; Davey et al, 2012).

An observational approach is beneficial when researching controversial or sensitive issues, where the results of research are likely to improve the welfare of individuals and of society (Ulusoy, 2012). Vitellone (2017 pg 68) observes that the physical presence of the researcher in ethnography tends to constrain real world study of subjects – namely individuals who inject drugs - since the ethnographer when researching such vulnerable individuals is obliged to issue harm reduction information regarding clean needle usage. This may result in the research participants feeling obligated to conform to ethical practice in their narrative (Campbell and Shaw as cited in Vitellone, 2017 pg 68). In this regard, their responses are often influenced by social and moral expectations of injecting harm reduction; for example, declaring that they never share needles in

instances where needle sharing occurs. The participant has absorbed the ‘*social suffering*’ of the syringe and is incited to distance themselves from it (Vitellone, 2017 pg 23). The ethnographical space therefore can present an opportunity to construct a self-image of public health citizen and ethical harm reduction subject (Vitellone, 2017 pg 68). Thus the novel and innovative harm reduction strategies which naturally emerge from the participant’s everyday reality may be lost. The research participant seeks to distance from the syringe in their narrative to the researcher.

Use of the online setting in a passive research method circumvents this phenomenon. Reticence to disclose injecting use of PIED has been found in the literature (Zanhow et al., 2017; Chandler and McVeigh, 2014; Pope et al., 2004) alongside mistrust of healthcare professionals (Cohen et al., 2007) and a cliquish nature of groups of individuals who inject PIED (Jespersen, 2012; Smith and Stewart, 2012). Ethnographic content analysis focuses on the situations, context and meanings of narratives as experienced by the human actors and speakers involved (Krippendorf, 2004 pg 16), which was deemed appropriate for the analysis of textual discourse within discussion forum threads. In this regard, an online approach which is passive and observational in nature was chosen for this study in order to capture the authentic *voice* of those who inject PIED.

### ***5.1.1 Selecting the Research Design***

#### ***5.1.1.1 Ethnographic content analysis***

Qualitative research is typically restricted to a small number of geographical, organizational or community locations relevant to the subject under investigation

(Ritchie, 2003). In this regard, factors influencing the selected research setting were as follows:

An extensive online community of individuals who inject PIED is described in the literature (Underwood, 2017; Van Hout, 2014a; Brennan et al., 2013; Smith and Stewart, 2012; Jespersen, 2012). In this regard, online discussion forums may act as “*distinct cultural spaces*” (Kozinets, 2002) for individuals who inject PIED, as they act as a point of convergence for a demographically diverse group, comprised of people from dynamic socioeconomic backgrounds and with differing motivators for use of PIED. Thus the online space may be regarded as a community location (Ritchie, 2003) for PIED.

Previous PIED studies have highlighted the online space as an underutilised research setting for investigation of injecting PIED use (Underwood, 2017; Brennan, Wells and Van Hout, 2016; Chandler and McVeigh, 2014). Within this distinct cultural space, engagement in online forums is grounded in retrieval of information, individual informed decision making processes and the initiation of early adopters. Here dynamics in trends, individual interest in products, social marketing aspects and sourcing of products can be studied. This makes the cyber community very useful in garnering information.

Whilst there is increased knowledge with regard to the injecting practices of people who use PIED, some areas remain understudied. Gaps in the public health policy and clinical practice knowledge base with regard to PIED, as indicated by previous studies (Brennan, Wells and Van Hout, 2016; Pope et al., 2014b Brennan, Wells and Van

Hout, 2013), are centred on details of injecting behaviours, polypharming regimens and health outcomes. Many of these details may not be revealed by individuals who inject PIED to healthcare professionals, as reticence towards disclosure is indicated in the literature (Zanhow et al., 2017; Chandler and McVeigh, 2014; Pope et al., 2004). In this regard, an online content analysis design, which describes and analyses the dynamics in online asynchronous interactions between individuals who inject was chosen for this study.

## 5.2 Focus of study – aims, objectives and methodological approach

### 5.2.1 Aim of the study

To explore and describe individuals’, who inject PIED, decision making processes, injecting drug use practices and side effect phenomena through studying their subjective individual experiences, articulated thoughts and interpretation of cultural and societal messages around body ideals and injecting drug use as described in online discussions.

#### 5.2.1.1 Objectives and research questions

The objectives and related research questions for this study are outlined in Table 5 below.

**Table 1 Research aims and objectives**

|   | Objective                                                                                                                                                                               | Research Questions                                                                                                                                                                                                                                                                                                                                                                                                                   |
|---|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | To build a detailed profile for cohorts of individuals who inject PIED and who engage in online discussions to include motives for use, risk perceptions and risk navigation strategies | How are forum discussants motivated to initiate and continue injecting PIED?<br>How do cultural and societal body ideals influence the PIED decision making process?<br>How do forum discussants perceive risk in injecting PIED, to include the risk involved in sourcing from the online market, injecting risk and health risk?<br>How do forum discussants navigate this risk e.g. through indigenous harm reduction strategies? |
| 2 | To investigate attitudes and perceptions towards injecting PIED                                                                                                                         | How do forum discussants describe their PIED use?<br>How do forum discussants experience injection as a route of                                                                                                                                                                                                                                                                                                                     |

|   |                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|---|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|   | use amongst people who inject PIED                                                                                                                                | administrating PIED?<br>How do societal perceptions of injecting PIED use or other types of injecting drug use influence forum discussant's decision making process?                                                                                                                                                                                                                                                                               |
| 3 | To describe patterns of PIED injectable use (incl. preferred site of administration; dose; and combination with other products/substances)                        | What injecting PIED use patterns can be identified within the online discussion forum space?<br>How do these patterns emerge and become embedded in injecting trajectories?                                                                                                                                                                                                                                                                        |
| 4 | To assess the long and short term physiological and psychological health effects of injecting PIED use to include risks of misuse and dependence for each product | What are the long and short term physical effects of injecting PIED use for each type of product as described in online forums?<br>What are the long and short term psychological effects of injecting PIED use for each type of product as described in discussion forums?<br>What types of acute events, if any, are described in discussion forums?<br>Do forum discussants describe any dependence symptomology in relation to PIED injecting? |
| 5 | To track individual endorsement of products, estimate relative popularity of PIED injectables                                                                     | What are the most popular PIED injectables being used?<br>How do forum discussants explain the popularity of particular PIED products?                                                                                                                                                                                                                                                                                                             |
| 6 | To identify sourcing routes and explore the relative diffusion of PIED injectables in non-registered online pharmacies and other online shops                     | What are the sources for injectable PIED products online as described by forum discussants?<br>What impact does the online risk environment have on forum discussants and how do they navigate this risk?                                                                                                                                                                                                                                          |

### 5.3 Methodology and approach

As described in Chapter Five, a qualitative methodology using Layder's (1998) Adaptive Theory was used for this study. This approach focuses on the relationship between the macro (i.e. social structures) and the micro (i.e. individual) facets of the social world. This chosen approach allows for the consideration of systemic phenomenon such as culture, ideology, power structures and role expectations (Layder, 1998 pg 143). It therefore helps to identify the causal mechanisms for a particular phenomenon and adapts elements of subjectivism to facilitate the study of people and their behaviours (Layder, 1998 pg 141). This study concerns itself with the social and

cultural context of injecting PIED use and how this impacts upon forum discussants as well as their subjective experiences.

#### **5.4 Data collection strategy**

Using Layder's Adaptive Theory, theory generation occurred throughout the online data collection phase as findings emerged, in addition to *a priori* theory developed in Chapter Three which guided data collection through use of keyword searches. Previous studies which have utilised an online methodology to investigate drug use have used particular guidelines to identify the most useful websites for analysis and, within these, the most relevant and data rich posts relevant to research questions. Kozinet's (2010; 2002) guidelines for online research have been previously used by researchers investigating PIED (Smith and Stewart, 2012) and new psychoactive substance trends (Van Hout and Hearne, 2015; Van Hout and Hearne, 2014). Due to the comprehensive and specific nature of Kozinet's instructions for online research, these guidelines were chosen to guide data collection for this study, underpinned by an Adaptive Theory approach. Key steps described in Kozinet's recommendations (2002) as they apply to this study will now be discussed and illustrated using practical examples from previous online studies.

##### ***5.4.1 Identify discussion forums which are appropriate to the research questions***

Kozinets directs that a broad and thorough search which covers the topic under investigation at varying levels of abstraction is needed (Kozinet, 2002). Previous studies have described identification of keywords, relevant to the topic, which act as search terms (Van Hout and Hearne, 2015; Van Hout and Hearne, 2014; Kjellgren and Johnson, 2013) sometimes used in combination with the word 'forum' (Van Hout and Hearne, 2015; Van Hout and Hearne, 2014). In order to ensure a comprehensive search,

generic, brand and street names for types of injectable PIED product were identified through google search and used as search terms for this study, in combination with the word ‘forum’ to identify the appropriate websites (see Table 6).

**Table 6 PIED injectable search terms**

| <b>AAS</b>                           | <b>Generic Name</b>                                                                                                                                                                                      | <b>Brand Name</b>                                                                                                                                         | <b>Other</b>                                                                                                                     |
|--------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|
| Anabolic-<br>Androgenic Steroids     | “boldenone undecylenate”<br>“Dromostanolone<br>Dipropionate” Testosterone<br>esters”<br>“Testosterone undecanoate”<br>“Trenbolone Acetate”<br>“Nandrolone<br>Phenylpropionate”<br>“Methenolone Enantate” | “Equipoise”, “Ganabol”,<br>“Equigan”, “Ultragan”,<br>“Masteron”,<br>“Winstrol Depot”<br>“Nandrolone” “Deca-<br>Durabolin” “Averbol”<br>“Primobolan Depot” | “Anabolic<br>Androgenic<br>Steroids” “AAS”<br>“anabolic steroids”<br>“NPP”<br>“EQ”<br>“Primo” “Deca”<br>“Winny” “Test”<br>“Tren” |
| Human Growth<br>Hormone              | “human growth<br>hormone”, “somatotropin”,<br>“somatropin”                                                                                                                                               | "Saizen", "Omnitrope",<br>"Zorbitive", "Genotropin",<br>"Norditropin"                                                                                     | "HGH", "GH",<br>"peptide<br>hormone",                                                                                            |
| Melanotan I, II and<br>bremelanotide | “Melanotan I”; “Melanotan<br>II”, “bremelanotide”,<br>“afemelanotide”                                                                                                                                    |                                                                                                                                                           | “tanning peptides”;<br>“tantastic”<br>“MSH<br>analogues”;<br>“tanning<br>injections”,<br>“Barbie drug”,<br>“tanning jab”,        |
| Synthol                              | n/a                                                                                                                                                                                                      | “Synthol”, “Syntherol”,<br>“ADE”                                                                                                                          | “posing oil”, “oil<br>injection” “pump<br>oil”                                                                                   |
| Dermal fillers and<br>Botox          | “botox”, “botulinum toxin A”<br>“dermal filler”                                                                                                                                                          | "dysport", "Xeomin",<br>"MyoBloc", "Novotox<br>Ultra", "Canitox"                                                                                          | “DIY Botox”,<br>“DIY dermal<br>filler”                                                                                           |

#### **5.4.2 Identify the fora for analysis**

The next step, according to Kozinet (2010; 2002), is to identify from the search results the discussion forums from which to collect data. Forums were selected based on relevance to the research question; highest level of traffic; activity and number of postings. Typically, traffic figures, number of members and numbers of posts/threads were published on the homepage of websites. In a minority of sites the total number of threads was not provided. In these cases, threads were manually counted by the researcher, who added together totals displayed per sub forum within the site. Due to

the large number of search results typically yielded, previous researchers have limited the number investigated to the first thirty hits per search term (Kjellgren and Johnson, 2013; Kjellgren and Soussan, 2011); the first twenty five hits per search term (Van Hout and Hearne, 2014) and the first ten pages of search results (Kjellgren, Henningsson and Soussan, 2013). Two PIED studies restricted their sample to one forum, specific to their respective topic (Van Hout, 2014a; Smith and Stewart, 2012).

To ensure a comprehensive search for each PIED injectable under investigation in this study and taking into account the cross-use of PIED products amongst people who polypharm with PIED described in the literature (Bates and McVeigh, 2016; Pope et al., 2014b, Cohen et al., 2007), the first thirty hits per search term were scanned for discussion forums. Initial searches yielded a total of 660, 610, 611 results (see Table 7 below).

**Table 7 Search results**

| <b>PIED Injectable</b> | <b>Number of search results</b> | <b>Total number of websites identified in the first thirty hits per search term</b> |
|------------------------|---------------------------------|-------------------------------------------------------------------------------------|
| AAS                    | 544, 048, 094                   | 406                                                                                 |
| GH                     | 27,152,570                      | 152                                                                                 |
| Tanning Peptides       | 5,329,420                       | 125                                                                                 |
| Botox/Dermal Fillers   | 2,081,527                       | 79                                                                                  |
| Synthol                | 81,999,000                      | 41                                                                                  |
| <b>TOTAL</b>           | <b>660,610,611</b>              | <b>803</b>                                                                          |

After the removal of duplicates (n- 642), discussion forums were then scrutinised and subjected to specific inclusion and exclusion criteria (see Table 8).

**Table 8 Inclusion and exclusion criteria**

| <b>Inclusion Criteria</b>          | <b>Exclusion Criteria</b>                   | <b>No.of Websites Excluded</b> |
|------------------------------------|---------------------------------------------|--------------------------------|
| Website is in the English language | Website is in a language other than English | 5                              |
| Website contains discussion forum  | Website did not contain discussion forum    | 8                              |



|                                                                                                                                |                                                                                                                                                                                                                                      |    |
|--------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| Forum is active                                                                                                                | Forum is no longer available, or not yet available                                                                                                                                                                                   | 3  |
| Researcher can access forum through google search OR registration                                                              | No means of access to forum (private forum)                                                                                                                                                                                          | 2  |
| Website has a significant focus on the use of PIED in the general population (minimum one sub forum dedicated to their use)    | Website did not have a significant focus on the use of PIED in the general population                                                                                                                                                | 52 |
| Website is concerned with or contains discussion forum postings which are concerned with the non-medical (illicit) use of PIED | Website is concerned with or contains discussion forum postings which are concerned with the legitimate use of certain PIED licensed for medical purposes (e.g. testosterone for treatment of testicular cancer, Botox for migraine) | 13 |
| Total number of posts is displayed or can be calculated                                                                        | Level of PIED related activity on forum, or number of posts cannot be calculated                                                                                                                                                     | 5  |

Once exclusions had been made (n = 730) seventy three forums remained. From these, hten forums were selected based upon the fact that these were a cross section of the three largest forums with the most traffic per type of PIED injectable searched. This was to ensure a broad and comprehensive sample which did not restrict the data solely to bodybuilding forums. Eight forums remained for analysis after permission to access data was denied by two forum moderators when requested (www.anabolicminds.com and ww.skindeepchat.forumotion.net)

[www.elitefitness.com](http://www.elitefitness.com)

[www.steroid.com](http://www.steroid.com)

[www.ukmuscle.co.uk](http://www.ukmuscle.co.uk)

[www.muscletalk.co.uk](http://www.muscletalk.co.uk)

[www.musculardevelopment.com](http://www.musculardevelopment.com)

[www.thinksteroids.com](http://www.thinksteroids.com)

[www.makemeheal.com](http://www.makemeheal.com)

[www.smartskinicare.com](http://www.smartskinicare.com)

### 5.4.3 Data Collection

According to Kozinet (2010, 2002) the researcher must then make a decision on which data to analyse, based on the research question and on available resources e.g. time. Varying methods are described in the literature to internally search or scan the available data in the selected forums. One such method is to search the forum internally using keywords (Van Hout and Hearne, 2014). In line with Layder’s Adaptive Theory, key words here were derived from orienting concepts concerning the intersection between macro and micro features of social life in relation to the injecting use of PIED (see Table 9). These concepts were developed from the study of general and substantive theoretical literature in related fields. Each forum was searched using these individual keywords, and threads containing these keywords downloaded.

**Table 9 Orienting concepts / keyword searches**

| <b>Macro orienting concept</b> | <b>Keywords</b>                                          | <b>Micro orienting concept</b> | <b>Keywords</b>                            |
|--------------------------------|----------------------------------------------------------|--------------------------------|--------------------------------------------|
| <b>Gender Ideals</b>           | Masculinity,<br>manliness<br>Femininity                  | <b>Normalisation</b>           | Normal,<br>Injecting,<br>Needle,<br>Stigma |
| <b>Health Aestheticism</b>     | Health, fitness,                                         | <b>Agency</b>                  | Identity,<br>Choice,<br>Control            |
| <b>The porn body</b>           | Attractive,<br>Sexy, hot, beauty                         | <b>Risk Navigation</b>         | Danger<br>Safe<br>Risk<br>reckless         |
| <b>Eternal Youth</b>           | Aging, anti-<br>aging, young,<br>longevity               |                                |                                            |
| <b>The Supernormal Body</b>    | Performance,<br>strength, freak,<br>extreme,<br>abnormal |                                |                                            |

Another technique for data collection seen in the literature is to download a number of pages (e.g. ten) from each available thread (Van Hout, 2014a). One particular study downloaded the twenty most recent threads from each subforum (i.e. categorized fora within a main discussion forum) of which the twenty ‘most discussed’ posts were used

for analysis (Soussan and Kjellgren, 2014). Another study sampled data only from subforums which were judged as relevant to the topic (Kjellgren and Johnson, 2013).

In order to ensure a comprehensive collection of data, a combination of keyword searches (see Appendix G) and a download of the twenty most recent threads from each relevant subforum within each selected forum was undertaken. Initial downloaded files (discussion threads) totalled 12,043. This was deemed an unmanageably large dataset, and in order to reduce the number of files and to maintain the studies focus on contemporary phenomena, posts dated older than 2014 were then excluded from the larger dataset ( $n = 10,000$ ). As with previous studies, exclusion criteria was then applied, for example removal of duplicate posts (Van Hout and Hearne, 2014; Kjellgren and Jonsson, 2013) discussion irrelevant to the research topic (Van Hout and Hearne, 2015; Van Hout and Hearne, 2014) and incomprehensibility (Kjellgren and Jonsson, 2013). Following exclusion of incomprehensible text and data not relative to injecting use of PIED ( $n = 940$ ) 1113 files remained. The final data set of records was stored in an online, password-protected computer in an NVivo software file.

## **5.5. Data analysis**

### **5.5.1 Previous online research approaches**

One method of data analysis for online research previously seen in the literature is the Empirical Phenomenological Psychological (EPP) five-step method (Karlsson, 1995) derived from Husserl's (1970) phenomenology theory (Van Hout and Hearne, 2015; Van Hout and Hearne, 2014; Van Hout, 2014a; Kjellgren and Jonsson, 2013; Kjellgren, Henningson and Soussan, 2013; Kjellgren and Soussan, 2011). The EPP method allows for the person's subjective experience of the topic to direct findings, which is a useful tool in investigating the phenomenon of injecting PIED use.

The EPP method and inductive thematic analysis require the researcher to have a completely open mind with no prior assumptions, theories or concepts to direct or contextualise data analysis. However, within the context of this study this clearly is not the case. Layder states that due to the descriptive nature of qualitative research, such an approach may result in “*concept overload*” - where the researcher attempts to navigate an overwhelming number of concepts or themes (Layder, 1998 pg 154). Additionally, in its entirely unbiased approach, EPP does not recognise the impact of pre-existing sociocultural settings or contexts. The role of cultural scripts and norms in relation to body ideals and injecting drug use is a key feature of injecting PIED use. According to Layder, consideration of systemic or structural concepts also serve to ‘rein in’ the development of concepts and give findings direction and context. Thus the utility of an EPP approach for the purposes of this study were adapted to take account of Adaptive Theory.

#### *5.5.2 Adaptive theory and data analysis*

In using Adaptive Theory, this research combines the elements of subjectivity which concern phenomenological approaches such as the EPP method, with an acknowledgement of how systemic concepts may shape an individual’s experiences, perceptions and meanings (Layder, 1998 pg 91). Adaptive Theory recognizes that both the subjective and the institutional are at the heart of the social world. In this regard, it utilises extant general theory concerning social life in general (e.g. Foucault, 1977), substantive theory relating to particular areas of interest (e.g. Rhodes, 1997) to inform prior concepts, or ‘*orienting*’ concepts, which then guide data analysis.

It is the confrontation of emergent concepts from the data with prior concepts taken from extant theory which generates new theoretical frameworks (Layder, 1998, pg 51). The injecting use of PIED within the general population, with the increased access and availability to an ever wider range of injectable products (Brennan, Wells and Van Hout, 2016) is an expanding trend which requires theoretical framing (Cresswell, 1998). Theory construction is an objective of this research. In combining the subjective and context features of social life in data analysis and theory construction, Adaptive Theory was upheld throughout data analysis and coding. For guidelines specific to ethnographic content analysis, Krippendorff (2004) was consulted and coding was conducted using NVivo 11 software.

### *5.5.3 Data analysis*

In order to systematically organise the process of data analysis and to produce an audit trail, which establishes the plausibility and trustworthiness of the study NVivo 11 was used for this study (see Appendix H). The use of qualitative data analysis software is a useful tool throughout coding, the development of a thematic framework and the use of annotations and memos. However, the hermeneutic task remains with the researcher. The phases of coding and analysis which took place using Krippendorffs phases of content analysis (2004), whilst maintaining an Adaptive Theory stance throughout will now be described.

Phase 1: Online discussion threads (n = 1113) were uploaded to NVivo 11.

Phase 2: ‘Pre-coding’ or ‘open coding’ (Krippendorff, 2004) first took place, which refers to making note of points of interest found in the data. General themes were coded and labelled.

Phase 3: As the research progressed, provisional coding of some of the data and associated it with a particular orienting concept (Layder, 1998), was undertaken. Where the researcher is unsure, provisional coding can be made until incoming data further informs the evolving new concepts (Layder, 2012). The general themes identified in phase one were reordered and coded into concepts. This involved labelling data according to its relevance to ‘orienting’ concepts e.g. ‘*health aestheticism*’ or ‘*the porn body*’, as well as the coding of newly emergent concepts. Through this process phase one themes were re-labelled and merged to accurately reflect the coded content (discussion forum posts). All concepts remained open to re-thinking, re-evaluating and re-classifying so that new ideas, explanations or angles could be produced in relation to the topic throughout the entire research process. The wider context of the data was kept in mind at all times, keeping coding relevant (Layder, 2012).

Phase 4: ‘*Coding on*’ (Krippendorff, 2004) then involved breakdown of the coded concepts to offer more in depth understanding and clearer insights into embedded meanings. In this regard, analysis occurred concurrently alongside coding. Although they are two separate procedures, they are mutually dependent. In Adaptive Theory, the researcher does not try to force data to fit the orienting concepts. Rather, the researcher is in a position where the validity of the orienting concepts may be questioned. The orienting concept may be deemed no longer useful. Alternative concepts may arise which are closely related to, or in opposition to, the orienting concepts. Thus new concepts do not emerge solely from the data but as a result of the interaction of the data with the orienting concepts.

Phase 5: Data reduction involved consolidating and refining codes into a more abstract and conceptual map of a final, higher level thematic framework of codes.

Phase 6: Analytical memos were written against the higher level codes. This involved consideration of the content, emergent patterns, how codes related to each other and to the research questions and sequencing the codes so as to organise them into results chapters (Chapters Six and Seven). The importance of reflective notes is underscored by Layder (2012). Kozinets (2002) also emphasised that the researcher write reflexive field notes where observations are documented.

Phase 7: I then revised and revisited the analytical memos in order to self-audit the proposed findings of the study. This process involves cross checking the data within categories of coded themes for similarities and differences and consideration of the relationship between the data across categories and to the extant literature. As content analysis is based on textual discourse, Kozinets (2002) notes that a certain amount of self-image preservation may be woven into the text posted online in discussion fora. However, Kozinets (2002) also acknowledges that it is the act or the behaviour that is under investigation and not the individual. Through process of validation, this phase resulted in evidence based findings.

Phase 8: Analytical memos were then synthesised into drafting results Chapters Six and Seven

## **5.6. Ethics – safeguarding subjects**

Ethical approval was sought and granted from the Research Ethics Committee at Waterford Institute of Technology, Waterford in November 2013. This required the submission of a research proposal to the committee and a subsequent panel interview. The ethics committee primarily focused on the safeguarding of the anonymity of individuals who post online. Mechanisms to ensure ethical practice in each phase of this research will now be discussed here.

### ***5.6.1 Ethical considerations***

The current ethical consensus for online research appears to be that consent should be obtained in circumstances where it cannot be assumed (Barrett and Aldridge, 2016). Therefore, consent in this study was requested from forum moderators where the forum required registration to restrict the public from accessing discussion posts (n = 2). Consent was denied in both cases. Only data from forums which were publicly accessible through Google search (n = 8) was then used.

In line with previous published studies which used discussion forums postings, data collection and analysis within this study were regarded as observations of publicly accessible online behaviour. In order to uphold observational status, no contact was made with forum discussants (Kozinets, 2010; Soussan and Kjellgren, 2015). It can be argued that forums which are open and accessible to anyone with an internet connection can be seen as a public space (Bilgri, 2016; Davey et al., 2012). However, several steps were made to protect forum discussants. Identifying details i.e. IP addresses, placenames, names and aliases were either not collected, or were removed. This includes pseudonyms and names of selected forums, in recognition of the potential value of online identities in the offline world (Bilgri, 2016; Barrett, 2011).



### **5.7. Concluding comments**

This chapter outlines the process that was followed using Layder's Adaptive Theory as a methodological approach for this online study of the injecting use of PIED in the general population. In particular, an emphasis on the online research setting to matters of ethical consideration, data collection and rigour were explored. The qualitative data analysis process was then discussed using Krippendorff (2004) eight stages of coding for ethnographic content analysis, managed through NVivo 11. The core tenets of Layder's Adaptive Theory were consistently maintained throughout the process of investigation. These are consideration of both systemic and individual influences and dynamics on the phenomenon under investigation and the concept of both orienting concepts and fluid theory construction through newly emergent concepts. The results of this process of analysis are presented in Chapters Six and Seven.

## **Chapter 6: Results: Motivation for PIED use, health outcomes and sourcing routes**

### **6.0 Introduction**

This chapter describes and thematically organises the findings of the study according to the research objectives. Where appropriate the new evidence is compared to *a priori* theoretical concepts, introduced in Chapter Four, which underpinned data collection. Section 6.1 presents the findings of this study in relation to the first research objective, to investigate motivators for use in forums where individuals discuss PIED injection. Section 6.2. addresses the second research objective; to identify product endorsement and estimate popularity of specific PIED injectables. Section 6.3 presents health outcomes as reported by forum discussants to include short and long term physiological and psychological side effects, acute events, dependency symptomology and desirable side effects, the fourth research objective. Section 6.4 addresses the fifth research objective in describing online sourcing routes for PIED and their impact on risk as discussed in forums. 6.5 concludes the chapter.

Detailed demographics of individuals who inject PIED accessing online websites cannot be presented due to the sporadic nature of details given, a lack of verifiable information and duplicate screen pseudonyms. However, with the exception of Botox and dermal filler injecting, typically forum posts included statements that indicated the discussant identified as male (*'I'm a man'*, *'As a male...'*). Posts which specified oral use of PIED were not used to retain the study's focus on injecting. However, where information on oral use of PIED was deemed useful for comparison purposes it was included. Those who identified as female and who used AAS typically opted for orals (e.g. Anavar) so it was not possible to compare injecting with oral use in this instance.

Discussion forums originated in the U.S.A. and in the U.K.; however, the geographical location of forum discussants could not be ascertained.

## 6.1 Motivators for PIED use

**Table 2 Motivators for PIED use in the recreational weighttraining lifestyle**

| <i>Type of PIED injectable</i>                                                                  | <i>Motivators for use</i>                                                                                                                                                                         |
|-------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AAS, SARMS                                                                                      | fitness performance and strength increase, i.e. lifting heavier weights and beating personal records or PRs (the highest weight an individual has used in a particular lift e.g. squat, deadlift) |
| AAS, SARMS                                                                                      | to enable the individual to train certain body parts with heavier weights                                                                                                                         |
| AAS, SARMS                                                                                      | competing in an upcoming amateur event e.g. iron man, amateur sports e.g. rugby, cycling                                                                                                          |
| AAS, SARMS                                                                                      | to overcome “plateaus” where the individual was encountering difficulty in progressing to heavier weights                                                                                         |
| AAS, SARMS, GH                                                                                  | frustration at spending time working out without much reward i.e. muscle development and strength increase                                                                                        |
| AAS, SARMS, GH                                                                                  | expediting recovery from injuries to enable the continuation of training                                                                                                                          |
| AAS, GH                                                                                         | increasing appetite so as to eat enough calories to add muscle mass and train more                                                                                                                |
| AAS, SARMS                                                                                      | to perform in the gym in the same way they had when younger                                                                                                                                       |
| AAS                                                                                             | as a preworkout/stimulant                                                                                                                                                                         |
| AAS, SARMS, GH                                                                                  | fatigue from heavy training sessions which impeded future workouts                                                                                                                                |
| AAS, SARMS, GH                                                                                  | to achieve the muscle gain they desired having trained for years and now ready to “take it to the next level”                                                                                     |
| AAS, SARMS                                                                                      | adding “size” (significant muscle mass)                                                                                                                                                           |
| AAS, GH                                                                                         | impatience in seeing results                                                                                                                                                                      |
| AAS, GH, insulin                                                                                | to achieve a lean but muscular appearance, where each muscle group can be seen through the skin, also known as being “shredded” or “cut”.                                                         |
| AAS, GH peptides such as TB500 and BP157, GHRP, Mod GRF 1-129 and Ipamorelin and types of SARMS | recovery after training                                                                                                                                                                           |
| AAS, GH peptides such as TB500 and BP157, GHRP, Mod GRF 1-129 and Ipamorelin and types of SARMS | to treat injuries which had been treated unsuccessfully by professionals                                                                                                                          |

### 6.1.1. A Recreational Weighttraining Lifestyle

The recreational weightlifter may be conceptualised as a ‘prototype’, or an ideal example, (Hogg, 2001) of the group accessing forums to discuss physique sculpting

PIED (the 'ingroup') e.g. anabolic-androgenic steroids (AAS), human growth hormone (GH) and other PIED such as insulin, GHRP and injectable SARMS. Melanotan injection was also reported by this group. (Individuals who injected Botox and dermal filler kits were a distinct group from these and comparably small in number).

Recreational weightlifters as a cohort who inject AAS have been previously identified in the literature (Ip et al., 2011; Petrocelli, Oberweis and Petrocelli, 2008; Cohen et al., 2007), with a lifestyle characterised by engagement in non-competitive weighttraining several times a week, adhering to specific training programmes and typically following a strict dietary, supplementation and sleep regimen which consumes a significant amount of time and energy.

Hogg (2001) theorised that group membership is a key component of self-conception and, as group members, we categorize ourselves as well as categorizing others. Behaviours in a group will seek to conform to a concept of a 'prototype' of the 'ingroup's' attitudes, beliefs and actions. Through this prototypical set of behaviours, the individual forms a concept of self, informed by the shared qualities within the group. In this regard, forum discussants typically identified as recreational weightlifters in posts regarding physique sculpting PIED. Several motivators for PIED use were identified within this group (see Table 10).

An *a priori* theoretical concept introduced in Chapter Three was that of hegemonic masculinity (Connell, 1987). It was previously theorised that societal gender ideals may act as motivation to create musculature, fitness and strength through PIED use. Indeed, having an unusually muscular physique was perceived within forums as commanding

respect from others and as a display of manhood. However, prototypical body ideals tended to be subversive to those upheld in mainstream society, with idealised muscular hypertrophy beyond what is propagated in popular media. In this context, a collective identity (Floridi, 2010) in relation to body ideals (hypermuscularity) may be supported in the online discussion forum space. Lupton and Tulloch's (2002) theory of voluntary risk taking, also introduced in Chapter Three, can be applied here to describe how risk taking helps individuals embody attributes of gender idealism. Lupton and Tulloch's theory (2002) frames the transcendence from the everyday to the unusual in body transformation in forum discussants endeavouring to digress from the norm,

*"I personally like the freaky size look ... So it's what I'm working towards."*

*male who injects AAS*

The 'supernormal body' (Brey, 2008) was discussed in Chapter Three, where Lynch's (2012) theory of 'upping the ante' extremism was described in relation to the creation of a body which stands out from the crowd using PIED. Bodies which are subversive to societal norms have been conceptualised as 'risky' by Lupton (2013), as they embody rebellion and lawlessness. These bodies can be highly emotive, inciting fear and disgust from others, but also curiosity and desire. Confronting the boundaries of tradition or convention can be a liberating and freeing experience in the construction of selfhood (Lupton, 2013). Members of the general public (the 'outgroup') who conformed to a more mainstreamed body ideal were perceived as being inferior to the 'in group' and negative opinion towards huge hyperbolic physiques perceived as being grounded in weakness, fear or insecurity,

*“..that's why it will never ever be accepted by the general population, just like potheads, junkies, drunks, bums etc. etc. Humans are extremely afraid of just about anything that goes beyond the "normal". It's pathetic”  
male who injects AAS*

The goal for forum discussants wishing to engage in ‘edgework’ (Lupton and Tulloch, 2002) – risky or radical behaviour on the fringes of what may be deemed socially palatable - was to create an outlandish appearance, sometimes to the point of attracting negative attention from the ‘out group’. Pleasure can be derived from transgressing societal boundaries and exhilaration can be experienced through embodiment of the ‘*culturally forbidden*’ (Lupton, 1999 pg 171). Rebellion against the ‘*civilised body*’ – late modernity’s valued body which is self-contained and controlled - affords individuals the excitement associated with the more corporeal, liberated ‘*grotesque body*’; seen as almost carnivalesque in its fascination with pleasure and deviance (Lupton, 1999 pg 171). This pleasure is compounded by the emotionality of engaging in risk behaviour (injecting drugs) coupled with the purposeful deviance from societal norms in pursuing an unusual body,

*“Fella, we don't care about kids or a family, we're freaks.”  
male who injects AAS*

While the word “freak” was used in a positive manner to describe a body ideal, there were parameters in the group to how outlandish this ideal could become. Injection of Synthol and other muscle enhancement oils into the muscle, often creating a swollen, cartoonish appearance, was discussed in forum threads and criticised,

*“Lol what a fucking nob, he has a pair of nads on his shoulders”  
male who injects AAS*

Synthol injection was a deviant behaviour within forums, associated with laziness and an unwillingness to put the required work into building muscle. It was perceived as disconnected from use of other PIED and as threatening the ‘prototypical integrity’ of the group, poorly representing individuals who inject PIED as lazy and comical to outgroups (Hogg, 2001).

Forums were environments where displays of machismo were common, e.g. claims of great strength, aggressive outbursts and misogynistic discourse. While hegemonic masculinity was considered in Chapter Three in relation to PIED use in men who have sex with men (MSM), no references to this were found in the data for this study.

Emphasized femininity as part of hegemonic masculinity was posited in Chapter Three as framing use of AAS in females as a strategy of resistance or noncompliance (McGrath and Chananie-Hill, 2009). It was also suggested that mainstream gender norms may develop from uptake of subversive trends (Lynch, 2012); for example, female musculature as an example of a phenomenon transitioned from the bodybuilding subculture and diluted into a sexualised fit body ideal (Andreasson and Johanson, 2013). In this study, extreme musculature in females was typically portrayed as subversive in forums,

*“There’s something very wrong with women who have muscular arms, chest and shoulders. It makes them look manly and un-natural.”*

*male who injects AAS*

In this regard, the female who used PIED to create musculature was typically cast as a 'liminal figure' (Lupton, 1999 pg 134) within the male dominated online space. The *liminal* is that which blurs the lines between accepted societal categories. As such, female engagement in behaviour which is culturally coded as male - building muscle and, by extension, injecting drugs to build muscle - incited negative emotionality in others who accessed the forums. Liminal figures may threaten a social group (Lupton, 1999 pg 134) and the hegemonic masculinity discourse which typically defined PIED forum groups may have been threatened by discussions of female AAS use. Conversely, engagement in typically 'male' behaviour can instigate a pleasurable empowerment experience for a female who conceptualises her behaviour as resistance to appropriate femininity (Lupton, 1999 pg 162). In forums, females who used AAS typically embraced the subversive muscular ideal,

*"I'm a female..on steroids...just a girl who lives to lift and eat and be in the gym amongst the brahs..(term used to describe a male recreational weightlifter). We all just want to look good naked and lift heavy shit"*

*female who uses AAS*

However, females who used AAS in forums typically opted for orals e.g. Anavar or Dianabol and in this case it was not possible to compare statements made by females who use orals with those who inject.

It is of note that while body dysmorphia was mentioned in forums as a side effect to AAS injection, there were no reports in forums of dysmorphic thinking as a motivator for PIED use. As stated in Smith, Rutty and Olrich (2016) dysmorphia should only be diagnosed where there is functional impairment e.g. disruption to work life and relationships and should not be confused with a dedicated recreational weighttraining



lifestyle. Similarly exercise addiction as found in Mooney et al (2017) was not indicated by forum discussants in this study.

### ***6.1.2 Lifestyle recovery***

In Chapter Three the theory of PIED bodywork as an act of agency and an intervention to embody self-image was introduced (Davis, 1995). Emergent from the data is a theme which builds on this negotiation of sense of self, to include transformative healing from past discord in an individual's relationship with his or her own body. Identity experimentation in '*prosthetic culture*' – a culture where objects, mechanical or perceived, are seen as extensions of self-identity, is explained by Lury (1998) as being grounded in potential. The individual is encouraged in prosthetic culture to imagine what they could be. In this regard, an individual explores self-knowledge and the potential for selfhood through prosthesis: "*not I think, therefore I am, but I can, therefore I am*" (Lury, 1998 pg 3). Enhancement of the physical or psychological self through PIED use may be conceptualised as a prosthesis, which is a technology of the self (Foucault, 1988).

### ***Recovery from alcohol and psychoactive drug addiction***

Forum activity centred on the replacement of psychoactive drug and alcohol addiction with AAS and other physique sculpting PIED. Use of PIED in this context was characterised by exchanging a detrimental drug regimen with a beneficial routine to focus on an enhancement of the self. An individualistic construction of the self is discussed in Vitellone's (2017) thesis of the social science of the syringe (pg 104-5) where he considers notions of 'self-care and self-responsibility'. While he conceptualises acts of perceived safe, careful injecting as self-reflexive and as constituting a positive self-identity, he also cites Lury's (1998) theory of prosthetic

culture, which describes the development of identity through experimentation and displays of self-knowledge (Vitellone, 2017 pg19). A positive self- identity was a catalyst for continuance of AAS injection during recovery from drug addiction,

*“It's not a coincidence that many AAS user were once drug addict users. I believe we all just switch our addiction from those drugs to this...and we are better persons compared how we were before.”*

*male who injects AAS*

The concept of AAS as a health conscious behaviour was supported in discussion threads centred on former psychoactive drug use,

*“I was smoking coke in my late 20's gave it up for AAS and caring about my health.”*

*Male who injects AAS*

Lupton and Tulloch (2002) highlighted that in voluntary risk-taking, experiences of suffering such as ill health or crime may inform risk understanding. In forums, a recreational weightlifting lifestyle, including PIED, was understood as an outlet and a release for negative emotionality that may have led to abuse of narcotics in the past. Enhancement in this context may be a form of self-actualisation, the conquering of fear and the seizing of personal agency (Lupton and Tulloch, 2002).

Forum communities acted as a support system for those who had drug and alcohol histories, offering encouragement through sharing of similar stories. The provision of emotional support has also been found in forums with a focus on psychoactive drug use (Bilgrei, 2016). AAS dependence symptomology was indicated where relapsing on psychoactive drugs upon cessation of AAS use was feared,

*“My concern is what if I stop cycling. Will I just go back to being a socially acceptable alcoholic? It’s like I need something and I feel and look great now.”*

*Male who injects AAS*

In contrast to the theory of the ‘*docile body*’ (Foucault, 1977), described in Chapter Three in relation to motivation to inject PIED, individualisation in late modernity is the production of biographies by individuals who negotiate and renegotiate their identities and ‘destiny’ with autonomous action, distinct from institutional and societal power structures (Lupton, 1999, pg 69). This is a process of agential decision making, which Lupton states is characterised by risk (1999, pg 71). She discusses Foucault’s ‘technologies of the self’ (Foucault, 1988) and how people seek to transform themselves to increase their social and human value and achieve pure, eternal happiness.

In this regard, individuals who inject PIED to change course and re-write their life story, from opioid and stimulant abuse to fitness and body enhancement, are applying technologies of the self, transformative actions on the soul and body. However, Lupton also states that risk avoidance is a technology of the self, in that self-government and self-control hold social value and represent the internalisation of institutional dictates. So a duality exists where the individual is both conforming and deviating from social control. A duplexity of societally desirable lifestyle recovery and engagement in risky and ‘uncivilised’ (Lupton, 1999) behaviours exists here.

*Corrective Purposes*

**Table 11 Corrective purposes**

| Type of PIED | Used to correct |
|--------------|-----------------|
|--------------|-----------------|

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AAS                | <p>Weakness<br/> Libido<br/> Low testosterone as determined by a doctor<br/> Low testosterone self-diagnosed by the following symptoms:<br/> -Anxiety<br/> -Depression<br/> -Aches and pains<br/> -Lack of recovery<br/> -Lack of motivation<br/> -Difficulty concentrating<br/> -Water retention<br/> -Bloating/puffing up<br/> Pubertal gynecomastia<br/> Stiff joints<br/> Perimenopausal symptoms:<br/> -Lack of libido<br/> -Night sweats<br/> -Sore breasts<br/> -Heavy constant periods<br/> -Irregular periods<br/> Thinning hair<br/> Thinning eyebrows</p> |
| GH                 | <p>Loose skin<br/> Nasolabial lines<br/> Downturned mouth<br/> Weak abdominal muscles after surgery<br/> Shortness in stature<br/> Acne<br/> Scarring<br/> Mood<br/> Irregular sleep patterns<br/> Tiredness<br/> Wrinkles<br/> Dull skin</p>                                                                                                                                                                                                                                                                                                                        |
| Melanotan I and II | <p>Burning after short sun exposure<br/> Peeling after sun exposure<br/> Reddening of the skin after sun exposure<br/> Vitiligo<br/> Uneven skin tone</p>                                                                                                                                                                                                                                                                                                                                                                                                            |
| Botox              | <p>The smile so that gum does not show<br/> Horizontal lines in the forehead<br/> Fine lines around the eyes<br/> Vertical lines around the mouth<br/> Lines between eyes</p>                                                                                                                                                                                                                                                                                                                                                                                        |
| Dermal fillers     | <p>Facial wasting<br/> Folds in the skin<br/> Facial symmetry<br/> Indent in lip after mole removal<br/> Circulatory problems in hands</p>                                                                                                                                                                                                                                                                                                                                                                                                                           |
| CJC 1295, GHRP     | <p>Acne scarring</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

Forum activity in this case centred on use of PIED to correct a medical condition or flaw (see Table 11). Problem areas were identified as needing correction, often using emotional language,

*“I am quite aesthetic and look in a really good condition with a tank top on, but when the shirt's off, the abdomen area is still pathetic.. I'm thinking of jumping on cycle to get a perfect midsection to finally finish my transformation...the abdomen area is quite demotivating...my midsection is making life miserable”*

*Male interested in injecting AAS*

Lupton and Tulloch (2002) describe emotions as relational, cultural and subject to context in relation to risk. Negative affect with regard to physical appearance is compounded and perpetuated in the forum space, where emphasis is given to self-improvement. In this regard, risk which is underpinned by emotion is collectively understood; forum discussants share experiences of body dissatisfaction. The rhetoric of correction circulates in forums as a remedy for discontent.

Low testosterone was typically diagnosed within forum discussion in individuals identifying as males who described a variety of symptoms e.g. low sex drive, dry skin, fatigue, low mood. A general sense of diminishing quality of life was often discussed as low testosterone even where testosterone levels had been found to be normal by a medical professional,

*“That's why I decided to stay on. In my early 30s, I noticed a decline in my sex drive and overall motivation to accomplish my goals in life. ..My total and free testosterone numbers weren't clinically low, but they were towards the bottom end of the normal range. I decided I'd rather live the rest of my life with high testosterone levels. It was the right decision for me. No regrets. I noticed a big difference in how I felt starting with the first injection.”*

*Male who injects AAS*

In addition to being a means to conform to valued gender attributes, risk taking can also be a strategy to rebel against gender restrictions (Lupton and Tulloch, 2002). This was seen in forums where questions centred on testosterone injections as a remedy for perimenopausal symptoms such as night sweats and to correct loss of libido in females. A risky decision can be a pursuit of the authentic self (Lupton and Tulloch, 2002) and may lead to feelings of achievement as the risk taker negotiates their self-identity. Self-improvement and the pursuit of one's full potential is understood as a valuable life experience in overcoming negative emotionality borne of a fractious relationship with the body, by exercising self-mastery, pushing the boundaries of possibility and assuming control of the body through edgework (Lupton and Tulloch, 2002).

Lury (1998) in her analysis of photography, states that in individualisation, the potential of an individual is a definitive aspect of their identity. However, potential is not decided before the process of identity construction begins. It is seen in hindsight, when the outcome determines what the potential was. This can be applied here, where forum discussants report an outcome – enhanced wellbeing and life satisfaction – which was not anticipated before initiation of the process of self-development and identity formation by correcting a flaw or physical symptom through injecting PIED. It is in their reports to others in discussion threads regarding the increased quality of their lives that 'life satisfaction' becomes a potential to be reached through PIED use.

### ***6.1.3 Life satisfaction***

In forums, pursuit of quality of life and physiological and psychological wellbeing motivated PIED use. Boredom and finding day to day life mundane was commonly given as a reason for searching forums for information on PIED. The quest for life satisfaction was a common theme which ran through many threads. Williams and Copes

(2005) theorised that in a fractured society with increased conflict and stress and a search for meaning can lead to people being drawn to subcultural participation, even when facing stigmatization for doing so. The internet supports this phenomenon, eradicating the need for geographical proximity or co-presence to interact with likeminded people.

Vitellone (2017 pg 90) refers to Foucauldian “*heterotopias of deviance*”, which are places created for and by people who deviate from certain societal norms, for example, through drug use. An individual must conform to prototypical group behaviours to access these heterotopias, which act as escapism from power structures, help construct sense of self and “*challenge the space where we most feel at home*” (Vitellone, 2017 pg 92). The journey to enhance wellbeing and achieve life satisfaction was supported in forums and PIED use was encouraged to transform an individual’s perspective on their existence.

Forum posts described both male and female use of PIED to combat feelings of demotivation, depression, low mood, apathy, lack of decision making, general listlessness and drive. ‘To feel good’ was a common desire when sourcing PIED, which manifested in narratives as enhanced self-esteem, self-image, improving the experience of aging through enhanced vitality and longevity, clarity of mind and a positive evaluation of life,

*“Life in almost every aspect has improved...I'm serious by the way, quality of life has literally doubled. No regrets.”*  
*male who injects AAS*

*“I build my body to build my soul, my mind and become the alpha that I've always strove to be. Lifting takes away my stress, sets my mind at ease lets me into a meditation that I can't get anywhere else. Making my body into the shape that I want it has*

*granted me confidence and independence allowed my leadership skills to shine through. Now when I look in the mirror I see strong, healthy, confident man where there once stood a sad, depressed, fat, sick, cowering beta."*

*male who injects AAS and GH*

Use of the terms 'alpha' and 'beta' by males accessing online forums to discuss PIED use has been described previously in the literature (Underwood, 2017). Males who accessed forums used the term 'alpha' to mean 'the dominant male' and 'beta' when describing subordinate men and women as display of masculinity through gendered PIED use. This rhetoric is situated in a forum hegemonic masculinity discourse which was described earlier in this chapter in relation to use of AAS in females and motivation to use PIED in males. Hegemonic subordination will also be discussed in relation to beliefs and values around the practice of injecting in Chapter Seven.

An understanding of risk as contributory to self-actualisation and concept of the self as a personal development project of improvement (Lupton and Tulloch, 2002) is demonstrated in forums. Forum discussion centred on life enhancement by improving sleep and mood through use of growth hormone and feelings of refreshment, revitalisation and heightened self-esteem through use of Botox in females. Rejection of aging, considered as a Foucauldian conception of the aging body as deviant (1977) in Chapter Three, was also evident where retention of physiological and psychological youth states such as strength, energy, drive and vitality was discussed,

*"As we reach the numbers our body prepare to die. I feel if we want to have a life of vitality then we have to take some risk. We have tools to extend our health and vitality. Those tools have some risk. If one does not use the tools the outcome is certain. Loss of muscle mass loss of coordination loss of body functions. Become feeble and die. That is not the path I choose. I know one can preserve what we have thru using what we have and to use chemistry to counter act the decay that will come to us all. I don't want to be reckless but I also don't want to be fearful. I have chosen to live my life without fear. Our bodies are just biological machines that need a tune up sometimes"*



#### **6.1.4 Aesthetic idealisation**

Aesthetic idealisation as a motivator for PIED use can be conceptualised as a drive to conform to socially prescribed body ideals, portrayed by media and celebrities. This is the arena where *a priori* theories (introduced in Chapter Three) ‘cultural doping’ (Davis, 1995) and Foucault’s theory of the docile body (1977) comes into play; where media propagated bodies are idealised and coveted. The primary function of an aesthetic ideal is to achieve sexual attractiveness or popularity. Aesthetic idealisation is situated in social media ‘likes’ and ‘selfie’ culture (Barry et al., 2017; Kuss and Griffiths, 2011).

#### *The Porn Body*

“The porn body” was a prior theoretical concept described in Chapter Three which related to the sexualisation of body ideals through media and the use of PIED to achieve such an ideal. Females who injected Melanotan, Botox and dermal fillers, typically subscribed to the porn body ideal. The ideal female body discussed in forums was gym-honed but not too muscular,

*“why should you guys be the only ones allowed to enhance your physiques with some help from AAS... we want some of that extra edge too, even if it's just to look super-hot in a bikini.”*

*female interested in injecting AAS*

A lean and muscular male body was reported as a tool in attracting sexual partners,

*“Pick your poison. I pick test (testosterone) Deca (Nandrolone deconate)... and not to forget the babes that come along with it who just can't get enough of those muscles”*

*male who injects AAS*

Use of Melanotan I and II to tan the skin was also reported by females as being motivated by appearing more sexually attractive,

*“When dating online I used a picture of myself tanned when I'm usually pale...I look better with a tan (in my opinion) and so presented that best version of myself. I don't think that's false, as that's how I look when tanned.”*

*female who injects Melanotan*

The role of media, including pornography, in informing body ideals was acknowledged in forums,

*“As a whole, it would seem that society loves muscle and is in fact pretty obsessed with it. Just look at the movie stars, models, athletes, performers, porn stars etc.”*

*male who injects AAS*

Increased attention from others emerged from the online data as an element of aesthetic idealisation. Contemporary emphasis on uploading pictures on social media for ‘likes’ was described as increasing self-consciousness about the opinions of others (Barry et al., 2017) and creating a narcissistic climate for attention where people strove to greater and greater lengths for peer approval and others act as the ‘judges of normality’ (Foucault, 1977). Social media was described as instigating a preoccupation with self-image and as a tool for image promotion.

While motivation to use PIED within forums was evidenced as grounded in negotiation of sense of self and agential rationality, ideals such as the porn body were inevitably informed by institutional constructs (e.g. media). Lury (1998 pg 221) explains the experimental individual as ‘*partial*’ – self determined, but also determined by society and culture. In turn, society is determined by the individual, in a process of negotiation in which the individual creates a reflexive biographical narrative (Lupton, 1999), an

identity and destiny which both informs and is informed by its social and cultural context.

### *Health Aestheticism*

Lastly, a prior theoretical concept considered in Chapter Three was that of ‘health aestheticism’, framing the use of PIED to create the outer appearance of health. In health aestheticism, a healthy ‘look’ is prioritised over actual health and health compromising behaviours may be utilised to achieve this aesthetic. However, results from this study indicate awareness in forums of the duality of a fit body experiencing negative health consequences associated with PIED use,

*“I look like a healthy muscular guy while I have the testosterone of a 90 year old....just lifting and being lean is healthy, but abusing hormones / gh (human growth hormone)/ slin(insulin) / diuretics etc. + being extremely big + bodyweight fluctuating isn’t healthy”*

*male who injects  
AAS , GH and  
insulin*

*“I had small acne at first in my arm pits. Then cysts showed up. cysts were in the arm pit also. one on each side of my body in almost the exact same spot. They were huge!! Bigger than a quarter. I got them to drain, so gross!!”*

*male who injects GH*

Health aestheticism theory was upheld in one case, in a female using Melanotan,

*“I stay with a healthy glow for my complexion”.*

## **6.2. PIED product endorsement**

Typically and in line with extant prevalence data (Sagoe et al., 2014) AAS was the most popular PIED injectable discussed in forums. Different types of AAS were favoured according to their functionality. For example, Deca-Durabolin or ‘Deca’ was often

chosen to relieve joint pain. Typically, a simple testosterone cycle was popular amongst beginners, whereas more experienced injectors were interested in AAS such as Trenbolone or ‘Tren’, known for its impressive muscle and strength ‘gains’. GH although popularly discussed, was limited in its use to forum discussants who could afford the significant associated financial cost. Melanotan injection was infrequently described in the data compared to AAS and GH, as were growth hormone releasing peptides (GHRP), CJC 1295 and insulin. Typically SARMS were described as being ingested in oral form, so data on injecting SARMS use was very limited. Data on DIY Botox and dermal filler kits was limited to one forum specific to skincare. The type of PIED which was least commonly discussed in the data was Synthol.

### 6.3. Health outcomes

This section is descriptive and reports on the short and long term physiological and psychological side effects as reported by forum discussants in this study in relation to their PIED injection. For the purposes of this study, short term side effects were defined as symptomology experienced during or in the weeks following injection of PIED. Long term side effects were defined as lasting months or years after injection. This section will also present desirable side effects experienced, acute events described by individuals who inject PIED in forums and signs of potential dependence.

#### 6.3.1. Short and longterm physiological side effects

**Table 3 Short and long term physiological side effects**

| Type of PIED | Short term side effects                                                                                                                                  | Long term side effects                                                                                                                                                    |
|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AAS          | bloating<br>night sweats<br>frequent urination<br>discoloured strong smelling urine<br>kidney pain during urination<br>hair loss<br>foul smelling breath | enlarged heart<br>enlarged prostate<br>enlarged liver<br>masculinising of features (in females)<br>voice deepening (in females)<br>testicular shrinkage<br>lack of libido |

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                  |
|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p>slight muscle paralysis<br/> flu like symptoms ('test flu')<br/> increased sweating during the day<br/> foul smelling sweat<br/> blood in ejaculate<br/> vivid dreams<br/> gynecomastia<br/> shaking<br/> agitation<br/> panic attacks<br/> premature ventricular contractions (PVC)<br/> sudden drop in body temperature<br/> leaking nipples (in males)<br/> sensitive nipples<br/> itching nipples<br/> nose bleeds<br/> high blood pressure<br/> 'white coat syndrome'<br/> body hair growth (in females)<br/> throat congestion (in females)<br/> clitoris enlargement (in females)<br/> increased libido<br/> lack of libido<br/> changes in the menstrual cycle (in females)<br/> increased appetite<br/> breast tissue atrophy (in females)<br/> joint pain<br/> exhaustion<br/> painful muscle 'pumps'<br/> insomnia<br/> post injection pain<br/> fevers<br/> lumps<br/> injection site swelling<br/> abscesses<br/> chest tightening<br/> chest pain/fullness/heaviness<br/> cough<br/> testicular pain<br/> cellulitis<br/> decreased cardiovascular fitness<br/> ankle swelling<br/> nerve pain<br/> increased lipids in blood<br/> bleeding from injection site<br/> hematoma<br/> heart palpitations<br/> facial flushing<br/> light-headedness<br/> acne<br/> metallic taste in mouth<br/> dehydration<br/> back pain<br/> muscle cramping<br/> dry skin</p> | <p>sexual dysfunction<br/> loss of fertility<br/> gynecomastia<br/> scar tissue<br/> scarring at injection sites<br/> greying of facial hair<br/> left ventricular hypertrophy<br/> premature ventricular contractions (PVC)<br/> exhaustion</p> |
|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                    |
|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                  | <p>blurred vision<br/>         itchy skin<br/>         breathlessness<br/>         sore throat<br/>         masculinising of features (in females)<br/>         enlarged heart<br/>         enlarged prostate<br/>         oily skin<br/>         elevated resting heart rate<br/>         dry mouth<br/>         anxiety<br/>         urinary tract infection (in males)<br/>         pockets of fluid build-up under skin<br/>         wheezing</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                    |
| <b>GH</b>        | <p>water retention<br/>         weight gain<br/>         swollen face<br/>         swollen feet<br/>         vivid dreams<br/>         stiffness in fingers<br/>         lethargy<br/>         exhaustion<br/>         hand tingling<br/>         hand numbness<br/>         cramped feet<br/>         acne<br/>         cysts<br/>         enlarged feet<br/>         enlarged clitoris (in females)<br/>         skin tightening<br/>         enlarged hands<br/>         photosensitivity<br/>         migraine<br/>         light-headedness<br/>         vertigo<br/>         localised fat loss at injection site<br/>         carpal tunnel syndrome<br/>         stiff wrists<br/>         itching<br/>         weals or welts at injection site<br/>         purple bruising<br/>         swelling at injection site<br/>         rash<br/>         dents in skin<br/>         neck pain</p> | <p>temporomandibular disorder<br/>         elevated blood sugar</p>                                                                                                                                                                |
| <b>Melanotan</b> | <p>increased appetite<br/>         nausea<br/>         vomiting<br/>         indigestion<br/>         increased libido<br/>         excessive skin darkening<br/>         darkening of existing nevi<br/>         eruption of new nevi<br/>         facial flushing<br/>         darkening of body hair<br/>         new freckles<br/>         exhaustion</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <p>darkening of existing nevi<br/>         eruption of new nevi<br/>         white patches of skin<br/>         loss of vision in one eye<br/>         hearing problems<br/>         hair loss<br/>         drug induced lupus</p> |

|                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                      |
|----------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                              | diarrhoea<br>intense orgasms<br>spontaneous erections<br>burping<br>throwing up during sleep<br>blackening of fingernails and nailbeds                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                      |
| <b>Botox and dermal filler</b>               | rash<br>unevenness of facial features<br>lumps<br>facial swelling<br>abscesses<br>bruising<br>nausea<br>facial drooping<br>facial sagging<br>heavy feeling in face<br>drooling<br>seeping of product into other facial areas<br>'electrical feeling'<br>nerve pain<br>dark circles under eyes<br>blue tinge under eyes<br>bags under eyes<br>speech affectations<br>difficulties eating<br>difficulties chewing<br>difficulties brushing teeth<br>difficulties using a straw<br>weight loss | chronic pain<br>chronic infection requiring longterm antibiotic treatment (three years)<br>longterm fluid retention requiring drainage<br>disfigurement<br>damage to facial muscles<br>lumps<br>bluish tones in skin |
| <b>Other peptides e.g. GHRP6, ipamorelin</b> | increased appetite<br>lethargy<br>burning sensation at injection site                                                                                                                                                                                                                                                                                                                                                                                                                       | none reported                                                                                                                                                                                                        |
| <b>SARMS e.g. Ostarine</b>                   | insomnia<br>flushing<br>unpleasant tingling<br>high blood pressure                                                                                                                                                                                                                                                                                                                                                                                                                          | none reported                                                                                                                                                                                                        |
| <b>Insulin Growth Factor (IGF)</b>           | increase in body fat<br>hypoglycaemia<br>increased libido                                                                                                                                                                                                                                                                                                                                                                                                                                   | none reported                                                                                                                                                                                                        |
| <b>Synthol</b>                               | purple bruising                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | none reported                                                                                                                                                                                                        |

A wide range of physiological side effects were reported in relation to the injecting of PIED (see Table 12). The majority of these related to use of AAS. Attitudes towards short term side effects were grounded in acceptance and most were perceived as an inconvenience rather than as a serious issue. The presence of side effects was sometimes seen as a positive thing as it indicated product effectiveness. Negative emotionality was associated with long term side effects, generally characterised by regret and remorse

around past PIED use. Intensity of side effect symptomology increased with certain compounds, primarily AAS Trenbolone, which was said to be unpredictable in its effects.

### 6.3.2. Short and longterm psychological side effects

**Table 13 Short and longterm psychological side effects**

| Type of PIED | Short term side effects                                                                                                                                                                                                                                                                                                                                                                                                                                          | Long term side effects                                      |
|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|
| AAS          | aggression<br>euphoria<br>increased relaxation<br>reduced tolerance for others<br>road rage<br>paranoia<br>depression<br>mood swings<br>jealousy<br>anxiety<br>lack of motivation or drive<br>obsessive thoughts<br>irritable<br>emotional coldness<br>emotional detachment<br>body dysmorphia<br>lack of empathy<br>lack of sympathy<br>increased empathy<br>increased connectivity<br>laziness<br>emotional outbursts<br>increased outspokenness<br>impatience | depression<br>lack of connectivity<br>detachment<br>anxiety |

Short and longterm psychological side effects were reported in individuals who injected AAS (see Table 13). There were no reports of psychological side effects other than enhanced general wellbeing associated with the injection of other types of PIED. Of interest is that while a perception existed amongst individuals who inject AAS that



‘roid<sup>3</sup> rage’ was a sensationalistic myth, many described symptoms pertaining to increased aggression and outbursts of rage.

### 6.3.3 Desirable Side Effects

In addition to the intended effects of PIED, some additional desirable side effects were noted by forum discussants who injected certain types of PIED (see Table 14),

*“But I must state again, never in my life had I felt so amazing. Strength, size, vascularity, sex drive, wellbeing, blood pressure, my god did I feel like a well lubed high performance machine. I had gained 10lbs of pure size and no water in just 4 weeks”*  
*male who injects AAS*

**Table 14 Desirable side effects**

| <b>Type of PIED</b>       | <b>Desirable side effects noted</b>                                                                                                                                                                                                                                                                                                                                                                         |
|---------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>AAS</b>                | increased libido<br>feeling of being more productive<br>appetite increase<br>increased relaxation<br>increased happiness<br>enhanced sleep<br>younger looking appearance<br>increased confidence<br>increased attractiveness<br>increased motivation<br>enhanced mood<br>clearing of rosacea<br>less grey hair<br>increased drive<br>decreased depression,<br>sense of being self-assured,<br>sense of calm |
| <b>GH</b>                 | hair thickening<br>skin clearing<br>increased concentration<br>hair growth<br>enhanced sleep<br>enjoyable dreams                                                                                                                                                                                                                                                                                            |
| <b>Melanotan I and II</b> | increased libido<br>enhanced wellbeing                                                                                                                                                                                                                                                                                                                                                                      |

<sup>3</sup> controversial phenomenon propagated by media associating bouts of rage with AAS use

|                |                                                                                                 |
|----------------|-------------------------------------------------------------------------------------------------|
|                | enhanced sleep<br>enjoyable dreams<br>reduction in desire for alcohol<br>increased mental focus |
| <b>Insulin</b> | enhanced wellbeing                                                                              |

#### 6.3.4. Acute events

Some acute events described regarding AAS injection included what was described as a shock reaction to injecting a foreign body, resulting in chest tightening, heat rash and shallow breathing. Similar events, characterised as a sudden onset of symptoms e.g. throat closing, itching, cough, wheezing, were referred to as “tren cough” and were reported as occurring when a vein had been accidentally injected with any type of AAS. This sudden onset of shock like symptoms sometimes occurred where a vein had not been ‘pinned’ (injected) and the cause unknown. There were also reports on the occurrence of clots, where the leg was “*blue, rock hard and double the size with crippling pain*” and there were three reports of congestive heart failure,

*“Later in the evening after going to bed I woke up to get a snack and I felt like I couldn’t breathe, as if I had pressure in my chest or like I was drowning. I called 911 and they came and got me treating me as if it’s no big deal. After a short drive in the ambulance things went south. I lost almost all lung capacity to breath in air and started violently spitting up fluid from my lungs. I heard the driver change hospitals and say something about critical condition, not the words you wanna hear as you’re fighting for your life. At this point he bags me to force air into me. I’ve never suffered like this before in my life. I was laying there violently thrashing fighting for air and wondering why am I not dying yet. I get to the ER and I’m surrounded by doctors cutting off my clothes and I was swelling in my midsection. Last thing I remember was them telling me they are inserting a breathing tube and me screaming for them to knock me out because I was running out of fight left in me. They fought constantly for four hours to save my life and I almost died in the back of that ambulance.”*

*male who injected AAS, who has now ceased use.*

### **6.3.5 Dependence symptomology**

Statements which indicated the presence of dependence symptomology in relation to AAS were seen in forums. Disclosures were centred on attachment to the persona created by use of AAS, anxiety around loss of muscle and onset of symptoms associated with cessation of use e.g. loss of libido, loss of wellbeing. Many forum discussants expressed intent to stay ‘on’ all their lives,

*“I blasted and cruised for a year and a half, came off and turned into a bitch I was suicidal....Sorry if this isn't what you want to hear and all people are different but once we hit a certain age it's time to pin for life.”*

*male who injects AAS*

Indirect psychoactive effects of AAS were reported as being grounded in peace of mind, increased confidence and wellbeing and clarity of thought. Some forum discussants reported feeling as though they were reliant on these effects,

*“Hi your comment about steroids being addictive made me think I should comment on this thread...I'm 43 years old and have been on steroids without break for 6 years every time I've tried to of come off but my psychological not physical dependency made me stay on”*

*male who injects AAS*

## **6.4. Online sourcing and associated risk**

This section presents the results of this study in relation to PIED sourcing routes in an online context; the impact of sourcing routes on risk; presentation of PIED products purchased online and the phenomenon of homebrewing AAS as reported in forums. The PIED market is considered illicit by wider society (Van de Ven and Mulrooney, 2016), however such transactions are part of normal life in forums in this study. Particularly in the use of physique sculpting PIED the sale, purchase and use of PIED is not deviant in forums. Studies have shown how PIED use and supply has been subject to a ‘cultural

normalisation' within certain bodybuilding subsets (Van de Ven and Mulrooney, 2016; Antonopoulos and Hall, 2016). This was also evident in forums where representatives for PIED selling underground laboratories (UGL) were socialised into forum groups.

#### ***6.4.1 Sourcing routes***

A review of vendor websites identified in forum discussion posts (see Table 15) found that they ranged in presentation. Some sites appeared amateurish in design, with text misspelled and stock pictures, sourced online, depicting office meetings or uniformed doctors and nurses, used to portray a professional or medical image. Others presented with highly functional, professional and polished website interfaces. Bitcoin was accepted as currency on many websites. Typically websites contained sections dedicated to injectable and oral PIED products. Some also provided raw steroid powders, with photographs of bagged powders, 'cook recipes' and step by step instructions for how to 'homebrew'. More general guidelines for new customers were provided by some sites, including how to make purchases online, what compounds to use for a beginners cycle and how to inject safely.

The often transient presence of these unregulated websites and the threat of removal was acknowledged by many sites, some of which displayed messages containing a backup plan e.g. *"This domain name may be suspended at any time. In the event that it is, we will email all customers with a new domain name"*. Many sites were already offline by the time the researcher visited the urls. However, some websites claimed to be running successfully, despite this unstable environment, for up to ten years.

Many features of PIED vendor websites appeared similarly to that of mainstream online businesses, for example, the provision of discount codes, free shipping, and product

reviews. Submission of product reviews and testimonials are encouraged by many website moderators, and were typically positive reviews, referring to specific products,

*“I got four of these (NPP 100; Nandrolone Phenylpropionate) and I will be running these again. I’m on my third week of running 1ml e.o.d. My joints feel great, I started feeling rested. THANKS naps for carrying biomex. This is another great product”*

Review, [napsgear.org](http://napsgear.org)

Reviews also referred to customer service provided by the websites,

*“Me and Jensen get on very well, she is one nice person. And she always gets back to me, day and night”*

Review, [landmarkchem.com](http://landmarkchem.com)

Claims of authenticity and quality ranged from the ambiguous – *“holograms on each product which guarantees that it comes directly from the manufacturer and combats counterfeiting”* to the detailed, *“Our Warehouse is built strictly in accordance with the GSP specifications and equipped with temperature controlling refrigerating room, for ensuring the special raw material storage conditions”*. Although typically sites adapted a pro-drug use position, as seen in previous research (Brennan et al, 2013) a warning was seen on one site,

*“This store was developed for professional bodybuilders who legally have the right to use anabolic steroids for their professional goals. We do not encourage the use of any medications mentioned on this website. Please do your own research before purchase.  
The information presented here should not be considered medical recommendation in any way”*.

Some sites provided a “supplier checking” service, where customers could enter details of a vendor and have them verified by that website.

**Table 15 Online sourcing routes (reported by forum discussants)**

| As referred to by forum discussants | url                                                                                                       |
|-------------------------------------|-----------------------------------------------------------------------------------------------------------|
| “naps”                              | <a href="https://www.napsgear.org/">https://www.napsgear.org/</a>                                         |
| “stealth”                           | <a href="http://www.stealthjuice.com/">http://www.stealthjuice.com/</a>                                   |
| “alin”                              | <a href="http://alin-shop-steroids.in/">http://alin-shop-steroids.in/</a>                                 |
| “holy biological”                   | <a href="http://www.holybiological.com/">http://www.holybiological.com/</a>                               |
| “muscle depot”                      | <a href="http://www.muscle-depot.ws/">http://www.muscle-depot.ws/</a>                                     |
| “ycphar”                            | <a href="http://ycphar.com">http://ycphar.com</a>                                                         |
| “maxsourcechem”                     | <a href="http://maxsourcechem.com/">http://maxsourcechem.com/</a>                                         |
| “landmarkchem” , “LMC”              | <a href="http://www.landmarkchem.com/">http://www.landmarkchem.com/</a>                                   |
| “shanghai”                          | <a href="http://chinataigui-steroid.com/">http://chinataigui-steroid.com/</a>                             |
| “pharmade”                          | <a href="https://shenzhenshijingudotcom.wordpress.com/">https://shenzhenshijingudotcom.wordpress.com/</a> |
| “bruce group”                       | <a href="http://www.roid-eurobio.com/">http://www.roid-eurobio.com/</a>                                   |
| “dragonpharm”                       | <a href="http://www.dragonroids.com/">http://www.dragonroids.com/</a>                                     |
| “anabolic lab”                      | <a href="https://anaboliclab.com/">https://anaboliclab.com/</a>                                           |
| “vit amino”                         | <a href="https://vit-amino.com">https://vit-amino.com</a>                                                 |
| “radjay”                            | <a href="http://radjay.com">http://radjay.com</a>                                                         |
| “vermodje”                          | <a href="http://vermodje.com/">http://vermodje.com/</a>                                                   |
| “kalpa”                             | <a href="http://kalpapharmaceuticals.com/">http://kalpapharmaceuticals.com/</a>                           |
| “geneza”                            | <a href="http://buy-geneza-steroids.com/">http://buy-geneza-steroids.com/</a>                             |
| “uklab”                             | <a href="http://www.uklabsupply.com/">http://www.uklabsupply.com/</a>                                     |
| “wildcat”                           | <a href="http://cheaperpharma.com/wildcat-labs">http://cheaperpharma.com/wildcat-labs</a>                 |
| “rohmlabs”                          | <a href="http://www.rohm-labs-uk.com/">http://www.rohm-labs-uk.com/</a>                                   |
| “neuro pharma”                      | <a href="http://www.everpharma.com/products/">http://www.everpharma.com/products/</a>                     |
| “pharmacom”                         | <a href="http://pharmacomlabs.com/">http://pharmacomlabs.com/</a>                                         |
| “malay”                             | <a href="http://malaytiger-shop.org/">http://malaytiger-shop.org/</a>                                     |
| “baltic”                            | <a href="http://baltic-pharmaceuticals.com/">http://baltic-pharmaceuticals.com/</a>                       |
| “taylormade”                        | <a href="https://taylormadepharma.com/">https://taylormadepharma.com/</a>                                 |
| “RaWpOwEr”                          | <a href="http://ww2.rawpower4u.com">http://ww2.rawpower4u.com</a>                                         |
| “Balkan”                            | <a href="https://balkanpharm.com/">https://balkanpharm.com/</a>                                           |
| “gymlabs”                           | <a href="http://gymlabs.net/">http://gymlabs.net/</a>                                                     |
| “Apollo”                            | Website unavailable                                                                                       |
| “Ganabol”                           | Website unavailable                                                                                       |
| “Androgen Pharmaceuticals”          | Website unavailable                                                                                       |

Typically forum discussants who discussed sourcing AAS, GH, Melanotan and DIY Botox and dermal filler kits had ordered them by mail from an online seller. There were posts indicating sales which occurred through friends or sellers in local gyms but online sourcing was described as cheaper and easier,

*“If I couldn't buy online I wouldn't be pinning. I couldn't afford the 2x mark up on the gym guys shit or would I trust them since they also fuck around and selling pills.”*

*male who injects AAS*

The online market presents two primary options for individuals who inject AAS, GH and other muscle building PIED – Pharmaceutical grade (pharm grade) and underground laboratory (UGL). Pharmaceutical grade (pharm grade) PIED are sourced from a licensed pharmaceutical distributor supplying pharmacies, hospitals and clinics with many medicines including steroids and growth hormone for medicinal use. These products are high quality, very expensive and difficult to purchase for individuals who inject PIED for non-medical reasons. While some forum discussants reported sourcing pharm grade PIED, the majority sourced from underground labs known as UGLs.

Finding a reliable UGL source was described as very difficult with many accounts of losing money through being scammed by unscrupulous sellers and receiving underdosed, mislabelled or counterfeit products (“bunk gear”). It was described as common for a UGL to disappear suddenly offline and new UGLs to appear frequently.

“Source checking” – where people enquire about the legitimacy of PIED sources on through forum threads was recognised as an unreliable and controversial practice. Many forums simply stated “no source checks” and issued warnings about how asking for source recommendations was likely to result in being contacted by scammers. Where source checks were allowed, they were subject to forum etiquette, e.g. only members who had posted over one hundred times could request a source check from established forum discussants considered to be trusted steroid gurus, known as ‘vets’ (veterans).

These ‘vets’ may be seen as prototypical members, who embody group norms and hold influence over others in the group. Prototypical members are empowered as they are typically liked and complied with by other group members (Hogg, 2001). In this regard, ‘vets’ engage in empathic interactions and bonding with the rest of the group, as well as acting out displays of prototypical behaviour. One example is the ‘outing’ of deviants who threaten the group identity e.g. individuals or UGL selling under quality products. Once a UGL had been identified as trustworthy and being “gtg” (good to go), there were no guarantees that this would remain a reliable source, with the underground market in a state of constant change. Reports from forum discussants indicated that mainly UGLs sourced their “gear” from the same suppliers in China, reselling it online, often with several websites being ran by the same people,

*“Not everyone can find pharm grade sources and have to rely on UGL. It takes a while to find the right sources and sometimes it is easier to gamble on something online or to take a gamble at your local gym bro who makes it obvious he's peddling. Obviously, good sources are well guarded and if you are new to this game and don't know people, finding pharm grade is going to be difficult. So I'd suggest considering what is more important, putting in due diligence until someone sets you on the right path which could take a lot of time, or taking the gamble on what is easier to access and hoping for the best. I could be very wrong, but if you put the time in and show that you are working hard toward your goal (which doesn't even have to be cycle oriented), get to know folks and let them get to know you, someone will direct you and take you under their wing. Or you could gamble on the UGL for instant result, you just don't know what the result will be.”*

*male who injects AAS*

#### **6.4.2 Identified sourcing risks and sourcing risk navigation strategies**

**Table 16 Identified sourcing risks and risk navigation strategies**

| <b>Identified sourcing risk</b>                                                          | <b>Sourcing risk navigation strategies</b>                                                                |
|------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|
| unreliable nature of the online PIED market                                              | Scrutinising the packaging, cross checking batch numbers online                                           |
| potential of contaminated PIED products sourced online                                   | looking at the colour of the product                                                                      |
| Reliance on sellers to store PIED products correctly before they shipped to the customer | smelling and tasting the product for familiar signs<br>testing products using AAS testing services online |



|                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Particular difficulty was reported in sourcing good quality GH, with the majority of products available online being counterfeit or a “<i>mystery peptide</i>”</p> <p>Customer service provided by sellers was reported to be of an unpredictable nature</p> | <p>Self-monitoring of symptoms over the course of seven to ten days after injecting</p> <p>A lack of side effects often indicated to people who had injected PIED that the product was understrength or counterfeit</p> <p>If lumps or red marks appeared at the injection site this was often understood as a sign of contaminated product</p> <p>Post injection pain (pip) indicated a sign of poor quality product</p> <p>getting bloodwork done to check levels of hormone in the blood (AAS)</p> <p>consulting online discussion fora and customer reviews online for particular sellers</p> <p>consulting discussion forums if a PIED product arrived looking ‘unusual’</p> <p>products being exposed to weather elements, cold and heat, over long journeys (GH)</p> <p>sellers would often not pack GH vials with dry ice as recommended as this would draw attention to their activities</p> <p>Warnings of unscrupulous practices carried out by sellers were issued via forum discussion threads as they became known</p> <p>Home testing kits known as Labmax Test kits were widely used to check the legitimacy of an AAS product</p> |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### 6.4.3 Product presentation

**Table 17 Product presentation**

| Type of PIED      | Product presentation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>AAS</b></p> | <p>1ml vials or amps with AAS were sent in packaging which ranged from discreet to where the AAS were barely concealed</p> <p>vials were generally labelled, with leaflets enclosed, batch numbers for authenticity verification online and expiry dates</p> <p>some labelling was easily spotted as fakes through misspelling. Some packaging and labelling appeared very authentic compared to others</p> <p>vials could arrive vacuum packed or not and sometimes had dirt on the lids</p> <p>it was common for “gear” to arrive “crashed”, where the product had separated from the oil, appearing cloudy, whitish or crystallized</p> <p>heating the vial to reconstitute the product was advised</p> <p>in one instance, bacteria growing inside a vial was mistaken for crashed gear by an individual who posted a picture of a vial with what appeared to be cotton ball-like spores growing inside</p> <p>accounts were given of vials arriving by mail with “floaties”, unidentified floating pieces of material that looked like fish food flakes, or plastic chunks, in the product</p> <p>congealed lumps where the product seemed to have solidified were also reported and one individual described a sharp object or a micro needle floating in the vial</p> |
| <p><b>GH</b></p>  | <p>the vast majority of GH discussed in forums was generic GH manufactured in laboratories in China</p> <p>vials were referred to by the colour of their lids e.g. green tops, blue tops, yellow tops</p> <p>they typically arrived in 10iu clear vials with no labels</p> <p>some sellers provided copies of blood tests, stating these were indications of a patient’s growth hormone serum level after taking the product</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

|                                         |                                                                                                                                                                                                                                            |
|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Melanotan</b>                        | Melanotan products were sold as 10 or 20mg freeze dried peptide within a vial no complaints were found in forums about counterfeiting or poorly packaged vials, however, one forum discussant commented that a vial had smashed in transit |
| <b>DIY Botox and dermal filler kits</b> | high quality production e.g. two 10cc vials of Juvaderm 4, an “ <i>authentic, hermetically sealed package</i> ”, with “ <i>manufacturer’s stamps</i> ”.                                                                                    |

#### **6.4.4. Homebrewing AAS**

In order to navigate the unreliable and high risk online AAS market, some forum discussants, known as ‘homebrewers’, concocted homemade AAS (‘homebrew’) using raw AAS powder, a solvent such as grapeseed oil, peanut oil or cotton seed oil, an amount of benzyl acetate (BA) and heat from a stove, hob, microwave, autoclave or pressure cooker to dissolve the powder into oil. This oil was then filtered into vials using a syringe filter (a ‘whatman’ .22um filter) and sometimes baked in the oven as a final sterilisation step.

Rhodes theory of risk (1997) was an *a priori* theoretical construct introduced in Chapter Three and his theory of the risk environment can be applied here to homebrewing. The macro risk environment relates to structural factors such as culture and law whereas the micro risk environment refers to individualistic decision making as well as community norms (Rhodes and Simic, 2005).

##### *The homebrewing macro risk environment*

A recent study (Hanley Santos and Coomber, 2016) highlighted how the prohibitionist landscape where AAS is situated impacts on health risk for people who use AAS as they are forced to source from an illicit market. Many home brewers in this study lamented the dangers of sourcing AAS products from UGL, which comprise the bulk of the unregulated AAS available through the online market.

The macro risk environment also contains cultural influences (Rhodes, 1997). Pertinent to this study is the cultural backdrop of “*kitchen chemistry*” (Van Hout, 2014a) where individuals who inject drugs are opting to manufacture them in their own homes. Similarities can be seen in the homebrewing of AAS, where the unlegislated online market for AAS may have diversified a portion of its consumer base to the arena of kitchen chemistry. This divergence may have been instigated through the internet’s facilitation of unscrupulous businesses in their marketing and distribution of unregulated and untested injectable products and the problematic nature of their consumption, including lack of desired results through understrength product and infection or allergic reaction through contaminated or counterfeit goods (Brennan, Wells and Van Hout, 2016; Evans Brown et al., 2012). Homebrewers in this study also expressed a belief that the product manufactured at home was safer and less likely to result in harm than products sourced online.

#### *The homebrewing micro risk environment*

Rhodes (2002) posits that risk is the result of an interplay between individual and social factors. He highlights the process of context dependant social meanings being ascribed to risk behaviours through community norms and values. One aspect of Rhodes’s theory which can be applied to the home brewing phenomenon is the concept of the physical environment where injection occurs. The micro risk environment (Rhodes, 2002) in this case is the individual’s own home, where familiar surroundings and self-confidence is intrinsic to risk perception and navigation. In line with Rhodes (1997), the social meanings attached to manufacturing AAS in the home dictate that homebrewing is a safer method of injecting AAS than buying from an unknown source online. Risk in this scenario is a result of the interplay between the individual (the desire to achieve

personal goals through AAS injection) and the social (the desire to circumvent untrustworthy online sources) through the security of 'brewing' product in one's own home.

This helps to shape the perception of risk on the part of the individual who injects drugs. In home brewing the familiar surroundings of an individual's own home is the environment where the drug is both manufactured and injected. The home environment often provides an individual with a sense of security and hence potentially reduces risk perception on the part of the home brewer. Thus the individual retains autonomy through the home brewing process from the beginning, where the raw powder and oils are blended, to the end, where the AAS is injected, often following years of experience. Self confidence in the ability to produce a good quality and safe product is high amongst home brewers as a result.

Hanley Santos and Coomber (2016) call this risk navigation strategy the 'rhetoric of competency' where people who use AAS perceive their own ability to make healthy decisions to be high and predict that they will circumvent risk in terms of negative health outcomes where others have failed. Rhodes (1997) identifies another element of risk behaviour as risk priorities, that is risks which are considered more important and given more attention than others – 'the main risk'. Consequences which are felt immediately tend to become risk priorities whereas risks where the benefits are seen to outweigh the cost are rationalised and therefore are not prioritised. Within this context of risk priorities, risk perceptions may be shaped by social norms and what is negotiated within a group of individuals. This theory can be applied to home brewing groups, who in this study prioritised minor side effects such as post injection pain. Post injection pain

is prioritised as a consequence which would interfere with subsequent injection of AAS. The same priority would then be given to abscesses and skin infections, as they pose an immediate threat to future successful injecting.

This focus on relatively minor side effects because of their potential impact on PIED use rather than discussion of more serious outcomes which may occur is comparable to the concept of ‘denial of harm’ as described by Hanley Santos and Coomber (2016). Here the authors found that people who used AAS described their use as beneficial to their health rather than detrimental. This is evident in this research, where home brewers expressed confidence that home brewed AAS was of a very high quality and safe to use. Rhodes (1997) describes how people who use drugs may normalise what society deems risky behaviour as it becomes routine and habitualised in their trajectory. This can be seen in the trivialisation of the home brewing process itself, despite a complex range of sterilisation, heating and filtering techniques described. This potentially high risk series of steps in this context is ‘normalised activity’ (Hanley Santos and Coomber, 2016),

*“You guys are way over thinking this lol. A 5 year old could brew better gear with simple instructions than most of the sources guys take for gospel. It's that fucking easy.”*

*male who homebrews AAS*

A benefit outweighing the costs is an overarching theme in the rhetoric of homebrewers, with many describing great results from homebrewed gear and less dialogue evident on risk by comparison.

## *Potential issues associated with homebrewing*

### **Sterility**

Disagreement over the necessity of recommended sterilisation steps was evident in forums. Many home brewers contested the need for filtering and use of heat preferring other longstanding techniques to ensure sterility. One perception documented was that UGL cut corners also during the sterilisation process. This may have acted as justification for a high risk home brew. Concerns with regard to the injection of homebrewed AAS were largely centred on the successful manufacture of an effective and full dosed product. While sterility was a conversation point, dialogue was dominated by issues of quality control.

### **Dosing**

While high dosing occurs in individuals who inject AAS who do not home brew (Chandler and McVeigh, 2014; Cohen et al., 2007), those who buy from UGL are likely to be sold understrength products (Brennan, Wells and Van Hout, 2016; Brennan, Kanayama and Pope, 2013). Homebrewers in this study maintained a stance that once a ‘settling in’ period of testing the strength of their raw powder and adjusting their recipes had taken place they were guaranteed full strength AAS. In this regard, the potential for high dosing is increased in the home brewing space. Thus, as one home brewer admitted, the temptation to dose higher with home brewed product once physique results are apparent was notable.

### **Injecting harms**

Some injecting issues for concern described by home brewers included post injection pain knots in the muscle; an acute allergic reaction to a solvent and accidentally injecting pieces of a vial membrane. Injecting AAS is a self-directed practice with high

risk of skin and soft tissue infection (SSTI) as evidenced in the data of this study. Transmission of bloodborne virus (BBV) has been seen in home brewers of new psychoactive drugs (Grund, Latypov and Harris, 2013) and in individuals who inject PIED (Rowe et al., 2017; Hope et al., 2016). These findings highlight the potential for significant risk of harm among home brewing groups.

### **Isolation from health services**

Similarly to the communal folk pharmacology described in the literature with regard to psychoactive drug home manufacture (Hearne et al., 2016; Van Hout and Hearne, 2016) home brewers viewed themselves as conscientious and educated practitioners. While respect for the process and protection for the safety of individuals who home brew was expected, the view that home brewing was a relatively simple task was expressed multiple times. In this regard, home brewers expressed a high level of self confidence in the task of manufacturing and injecting a high quality and sterile AAS product at home. When comparisons were drawn with home cookers of methamphetamine, comments were of a disparaging and dissociative nature. This reaction would suggest that AAS home brewers may be a hard to reach group with regard to harm reduction information,

*“Homebrew is the way to go IMO. It is almost like another hobby, like reloading ammo or making wine. Once you find good powder source, you know what you are getting, because you brewed it. Man, since I tried for the first time, there is no way back for me. I now have years’ worth of supply of good gear, since it doesn’t take much.”*

*male who injects AAS*

### **6.5 Concluding comments**

This chapter presented the results of this study in relation to motivators for use, health consequences and sourcing routes. *A priori* theoretical concepts posited in Chapter

Three which underpinned data collection were discussed with regard to their relevance to data. While Foucauldian power structures (1977) of cultural norms around gender, sexual attractiveness and health were useful in framing the motivators for use in a subset of individuals who injected PIED in this study, typically forum discussants injecting physique sculpting PIED were motivated by a recreational weight training lifestyle, with its own distinct and subcultural ideals and values. Other motivators which had not been considered prior to data collection included lifestyle recovery and wellbeing enhancement under which use of other types of PIED such as DIY Botox and dermal filler kits also fell. A range of short and long term physiological and psychological symptoms relational to PIED use were described in discussion forums and presented here. Group dynamics with regard to dissemination of sourcing routes and the introduction of a new risk environment where individuals who inject AAS 'homebrew' their injectables was also described here. In addition to these findings, new evidence specific to the phenomenon of injecting was generated and it is to this I now turn in Chapter Seven.



## Chapter 7: Results: Beauty through the Eye of Needle – PIED injecting

### 7.0 Introduction

This chapter focuses on injecting as the phenomenon of interest. It describes and thematically organises the findings of the study according to the research objectives and compares the new evidence to *a priori* theoretical concepts introduced in Chapter Three which guided the data collection. Section 7.1 reports on contemporary PIED injecting practices as described in forums, the third research objective. Section 7.2 addresses the first research objective and focuses on beliefs and perceptions of injecting drug use within forums discussing PIED. Section 7.3 introduces key concepts which emerged from the data in relation to the phenomenon of injecting PIED use and concludes the chapter.

### 7.1. Injecting practices

Findings in relation to cycling and dosing of injectables are presented in Table 18.

**Table 18 Cycling and dosing**

| Type of PIED | Cycling                                                                                                                                                                   | Dosing                                                                                                                                                                                              |
|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Overall      |                                                                                                                                                                           | Overall, it was noted that some people who inject PIED posted inappropriate units of measurement with regard to their dosages. This may indicate an ambiguity around the exact dosages administered |
| AAS          | Evidence of moderated use was seen where forum discussants reported shorter cycles between four and twelve weeks                                                          | As with cycle duration, dosages of AAS were dynamic, ranging between 150mg and 3g per week                                                                                                          |
|              | AAS cycles described here were typically longer than the recommended 10-12 weeks originally stated in steroids handbook LLewyllens Anabolics (Chandler and McVeigh, 2014) | Generally it was recommended amongst forum discussants that a first cycle should be simple and a relatively low dose, e.g. 250mg-500mg of testosterone weekly                                       |
|              | The majority of cycles were between twelve and twenty four weeks long                                                                                                     | Moderated use was evidenced where forum discussants reported great results from lower doses of                                                                                                      |

|  |                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                  |
|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  |                                                                                                                                                                                                                                                                                                                                                                                                                      | AAS with no desire to increase their dosing                                                                                                                                                                                                                                                      |
|  | Incentives for long cycles reported included seeing better “gains” (muscle growth and weight gain) and perceptions of shorter cycles being “a waste of time” as testosterone only begins to take effect after six or seven weeks of use                                                                                                                                                                              | Those whose main goal in using AAS was to improve recovery after training also often used lower doses in the range of 50 – 200mg per week                                                                                                                                                        |
|  | Many individuals acknowledged that contemporary AAS cycles had become longer and more frequent per annum than longstanding recommendations                                                                                                                                                                                                                                                                           | Many that adapted a blast and cruise cycling pattern also reported a moderated approach to dosing                                                                                                                                                                                                |
|  | “Blast and cruise” is a practice where people who use AAS “blast” high doses for short periods i.e. several weeks and then “cruise” on a relatively low dose for several months until the next “blast” (Underwood, 2017). The result is that the person essentially “stays on” AAS all year round, with no break. “Blast and cruise” was commonly described in this study as more effective than traditional cycling | Dosing over 600mg a week was considered in the high range                                                                                                                                                                                                                                        |
|  | Blast and cruise was also perceived by many as being a safer method of taking AAS, particularly when many people who cycle in the traditional manner were seen as cycling for too long, too often, and with insufficient breaks for recovery                                                                                                                                                                         | Those that dosed high tended to normalise their regimens and did not perceive them as excessive                                                                                                                                                                                                  |
|  | Despite increased safety being stated as a motivator for blast and cruise regimens, high risk use was evident within this cohort, with some opting to “high dose cruise”, effectively injecting high dosages all year round with no rest                                                                                                                                                                             | Motivation to increase doses of AAS was grounded in achievement of superior results                                                                                                                                                                                                              |
|  | Many individuals reported “staying on” AAS with no break for several years                                                                                                                                                                                                                                                                                                                                           | A lack of faith in the efficacy of smaller doses was also reported                                                                                                                                                                                                                               |
|  |                                                                                                                                                                                                                                                                                                                                                                                                                      | Experimentation on the self through increasing AAS dosages was also evident, <i>“While 2g test and 1g of the others is more than I’ve ran in the past, the whole point of this is to push my personal boundaries and break some new ground, I’ve fancied a true high dose cycle for a while”</i> |
|  |                                                                                                                                                                                                                                                                                                                                                                                                                      | Some described high AAS dosing as engagement in                                                                                                                                                                                                                                                  |

|    |                                                                                                                                            |                                                                                                                                                                                                             |
|----|--------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|    |                                                                                                                                            | deliberate and reckless behaviour to cope with life stressors                                                                                                                                               |
|    |                                                                                                                                            | Attitudes to very high doses were often disparaging amongst those who chose lower doses as this cohort generally expressed high dosing to be a waste of “gear” (AAS), ineffective and detrimental to health |
|    |                                                                                                                                            | The decision making process in relation to dosing was often grounded in self-experimentation, with people injecting a certain dose and gauging side effects (“sides”) in a trial and error fashion          |
|    |                                                                                                                                            | Others reported taking advice from others in an internet discussion forum                                                                                                                                   |
|    |                                                                                                                                            | Some donated blood and took blood thinners to help the body cope with higher doses                                                                                                                          |
|    |                                                                                                                                            | Some ran large amounts of AAS for a short period (e.g. 2-4 weeks) alongside eating a very high calorie diet to initiate a muscle growth spurt                                                               |
|    |                                                                                                                                            | Some increased dosing if the AAS product was sourced from an underground lab (UGL) as these sources were considered likely to underdose their products                                                      |
|    |                                                                                                                                            | AAS dosing in females was reported as significantly less than males, and was typically stated as 10-20mg injected every few days alongside careful monitoring of virilisation effects                       |
|    |                                                                                                                                            | One female reported being advised to inject 100mg weekly of Trenbolone, a powerful AAS, by a personal trainer                                                                                               |
| GH | It was commonly stated that cycles of GH should be a minimum of six months in duration to see desired results, with year round use optimal | Dosages reported ranged between 1iu to 15iu per day or every other day                                                                                                                                      |
|    | Due to the associated financial cost, many individuals undertook shorter cycles e.g. three or four months                                  | The most popularly stated dose was 4iu per day                                                                                                                                                              |
|    | Others reported longterm use of GH, up to fifteen years                                                                                    | Typically individuals slowly tapered up the dose as the cycle progressed so as to avoid the onset of severe side effects                                                                                    |
|    |                                                                                                                                            | Desired outcome often dictated the dose chosen, as lower doses (e.g. 1-3iu) were thought to be                                                                                                              |

|                                                |                                                                                                                                                                                       |                                                                                                                                                                                                  |
|------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                |                                                                                                                                                                                       | appropriate for anti- aging effects and fat loss, while higher doses resulted in muscle growth                                                                                                   |
|                                                |                                                                                                                                                                                       | In addition to muscle building, some people reported using high doses of GH due to the six month waiting period it reportedly takes to see results, and not wanting to waste time on small doses |
|                                                |                                                                                                                                                                                       | However others criticised the use of higher doses <i>“The liver can only put out so much IGF-1 and above that it won't produce anymore no matter what dosage of GH used”</i>                     |
| Melanotan I & II                               | Varying regimens were reported in relation to tanning peptide Melanotan II                                                                                                            | People using Melanotan I and II reported a wide range of doses from 150mcg to 10mg per week                                                                                                      |
|                                                | Some people reported sporadic use, injecting only on days where sunbeds were used                                                                                                     | Lower dosing was grounded in not being able to cope with side effects such as fatigue or nausea, maintaining a natural colour skin tan or reversing a too dark result                            |
|                                                | Some individuals reported injecting Melanotan for up to six weeks at a time, with others describing cycling the tanning injection every two to three weeks                            | Doses were administered every day to build the tan initially, and then many people tapered down their dosing schedule to once a week, once every two weeks, or even once a month                 |
|                                                | Some longterm use was described, up to six years                                                                                                                                      | Some people reported achieving a dark tan on a low dose (e.g.100mcg per week), whereas others preferred to dose high                                                                             |
|                                                | Generally the “loading phase” previously described (Van Hout, 2014a), where high doses of Melanotan are injected in the first week of cycling, was dismissed by people as unnecessary | Mistakes regarding dosing were also recorded                                                                                                                                                     |
| Insulin                                        | Forum discussants reported using insulin for periods between four and twelve weeks at a time                                                                                          | One regimen described as 15iu every other day, gradually increasing per week by 5iu until the “sweet spot” or optimum dose was discovered                                                        |
|                                                | It was recommended to discontinue use for “a few weeks” and then recommence, with some adapting a four weeks “on”, four weeks “off” approach                                          |                                                                                                                                                                                                  |
| Selective Androgen Receptor Modulators (SARMS) | People taking SARMS reported cycles between four and twelve weeks in duration. Longer cycles were recommended as effects were reported to be “slow and subtle”.                       | Use of SARMS included Ostarine, dosed at 25mg per day                                                                                                                                            |
| CJC 1295 and GHRP                              | Some cycles were reported as one month on, one month off                                                                                                                              | 100mcg – 200mcg twice a day                                                                                                                                                                      |

Results generated with regard to the injecting process are presented below.

### ***7.1.1 Preparation for injection***

#### *Storage of products*

Forum activity centred on how to store vials of AAS, GH or Melanotan. Typically they were stored in the fridge and warmed to room temperature before injection. It was generally agreed that GH must be refrigerated and kept cold. In the case of a Norditropen (Somatropin) Simplexx pen (a type of pharmaceutical grade GH which comes as an injection pen), the seller hand delivered the pen to one person packed with ice to keep it cold. Pre-filling and storing of syringes was also reported. However, concern was raised in forums regarding the storage of preloaded syringes,

*“Never keep gear (AAS) in syringe. it’s been in contact with air outside the vial/amp, is likely contaminated and a matter of time for bacteria to thrive AND the solvents in the gear could eat away at the plunger in the syringe”*

*male who injects AAS*

Questions centred on whether it was safe to store a vial which had already been opened, with responses reporting storage of opened vials for up to a year, before using the remaining contents,

*“If there's no fur growing inside it then slap it in. Let us know if you get infection though”*

*male who injects AAS*

One measure to ensure sterility of an opened vial before injection was stated as resting the vial in a pan of “*just boiled*” water.

#### *Reconstitution of PIED products*

Some reconstitution (making required or unrequired changes to the PIED product at home before injection) practices described included adding bacteriostatic water (usually

between 0.4ml and 0.8ml) to a GH vial, adding 1-3ml of water to 10mg vial of Melanotan and cutting high dose testosterone with grapeseed oil before injection to lessen the dose.

### *Learning to inject*

Dissimilar to the ‘apprenticeship type’ process described by individuals who inject opioids and psychoactive drugs (Vitellone, 2017), where family, friends or lovers initiate and teach injecting (Mars et al., 2014), self-sufficiency in learning how to inject through researching within discussion threads, studying Botox injection maps available online and watching YouTube videos (“how to inject” and “how to aspirate”) was typical in forums. Injecting into an orange was also recommended. While individuals who inject opioid and new psychoactive drugs typically transition from oral use to injecting through a process of staged destigmatisation, dependence and tolerance (Mars et al., 2014), injecting was favoured as the superior route of administration for people who use PIED and typically forum discussants opted to initiate their PIED use with injecting rather than with orals (AAS), nasal sprays (Melanotan), patches (GH) etc.

### *Purchase and disposal of needles*

While trends and level of uptake of needle exchange services vary between geographical regions (Harm Reduction International (HRI), 2016), typically forum discussants described purchasing their needles online, with the remainder collecting from needle exchange services or pharmacies. Conversations where disapproval of needle exchange services was expressed took place within forums, due to a perception of adding to statistics regarding negative societal opinion towards AAS and as previously found (Bates et al., 2015; Kimergard and McVeigh, 2014; Kimergard, 2014; Monaghan, 2001), an aversion to socialising with individuals who inject psychoactive

drugs. Disposal of needles occurred either through a needle exchange service if used, or at home,

*“Empty protein container once full seal it with tape and it goes with the rubbish”*

*male who injects AAS*

### *Type of Needles*

Individuals who inject AAS reported using needles sized between 18 and 27g and 0.5 inch to 1.5inchs long. Many recommended use of the smallest needle possible per injection site to avoid post injection pain (pip) and injury. The preferred needle sizes stated were 21-23g, with lengths used varying according to injection site, such as 0.5 or 5/8 inch in deltoid muscles and 1 and 1.5 inch needles in glute and quad muscles.

Additional factors which influenced preferences for needle gauges and lengths included level of body fat and how thick the AAS product for injection was. Insulin needles, typically 27g (“*slin pins*”) were reported as being used with GH and Melanotan products. Types of needles found in DIY Botox and dermal filler kits were not specified in forum discussion.

### *Injecting regimen*

Elements of injecting regimens described in forums included splitting the dose into two or more injections per week, which was advised with AAS, in order for the “gear” to work more efficiently and to avoid mood changes some experienced when injecting less frequently due to instable levels of hormone. Although it was agreed working out an aggravated muscle was inadvisable, some chose to inject AAS pre-workout,

*“I inject right before working the muscle I pinned, to get the oil flowing and because I am a sadist and enjoy the pain”*

In line with previous findings, use of tanning peptides such as Melanotan I was described as injecting every day until the desired skin tan was achieved (“loading phase”) and then reducing injections to twice a week and once a week for maintenance. The necessity of a loading phase was typically dismissed as a sales ploy. Some described “jabbing” (injecting) right before using a sunbed in order to prevent burning and before sleep to avoid the onset of nausea.

Injecting GH was reported as taking place during the early hours of the morning to avoid having to inject at work, an hour before breakfast, before a workout, splitting doses between the morning and evening and smaller doses injected throughout the day. Injecting at night was advised against,

*“You’re wasting your gh if you take it at night. Best to boost your natural pulse with Peptides and take all your GH in the morning upon waking”*

*male who injects GH*

### *Cocktail injecting*

The combining of different substances into one syringe for injecting purposes (known as a ‘cocktail injection’) has previously been described in the literature pertaining to opioid and stimulant drug injection (Turkmen et al., 2017; Ojha et al., 2014). This is done to achieve a stronger psychoactive effect (Recovering Nepal, 2009). However, a motivating factor for cocktail injecting reported in this study was the avoidance of injecting too often for those who did not enjoy the process.



PIED cocktail injecting typically referred to the combination of different types of AAS. Conversations centred on whether it would work to mix water based PIED such as ‘winny’ (Winstrol) with oil based steroids such as ‘test’ (testosterone), with some posts indicating that individuals had done so with success. Enquiries and reports regarding the combination of GH with AAS in one syringe were also found; as was an interest in the combination of several substances in one injection,

*“Can I pin test p, test e and HCG at the same time or would that be too much volume for one pin?”*

*male who injects AAS*

While definitive inference of causality cannot be made, feeling unwell after a cocktail injection was reported,

*“I’ve had similar from tren ace (I think mixed with 1 ml testE and 1 ml mast E)*

*Mad sweats, tight chest, awful cough - then after 10mins just passed. I then had to walk out of the disabled toilets at work (a school) and walk back to the staff room pale as a ghost and shirt soaked with sweat. Took a bit of explaining.”*

*male who injects AAS*

### *Site of injection*

Consistent with previous findings with regard to AAS injection sites (Chandler et al., 2014) most popular sites for intramuscular injections (IM) included the quadriceps (“quad”); ventrogluteal (“ventroglute”); gluteus maximus (“glute”); deltoid (“delt”) and, less commonly, pectoral muscles (“pecs”). Decision making with regard to sites was grounded in ease of injection, experience of pip, rotation of sites and volume of AAS being injected (larger amounts in larger muscles such as quad). Strategies to aid the injection process included shifting weight onto the opposite leg for quad injection, injecting while sitting or lying down and injecting while in bed.

### *Subcutaneous injection*

Subcutaneous injection, while typical with use of GH and peptides such as Melanotan, was described in this study in the use of AAS, with some forum discussants declaring it as a superior option to intramuscular (IM) injection. Motivation to inject AAS subcutaneously was grounded in reducing pain and avoidance of a muscular abscess for some,

*“SubQ (subcutaneous) abscess you can just drain like a zit, not much worse than falling off your bike when you're little and dealing with the scab. Piss easy. Animals deal with those kinds of abscesses instinctually all the time. You don't need a doctor for most dermal abscesses. An abscess lynch down... Now that's a different story”*

*male who injects AAS*

It was also described as an option for those who did not enjoy injecting IM,

*“It is so much easier and no pain at all...Just think this is a rest of your life thing and having thousands of injections in muscle just didn't seem fun.”*

*male who injects AAS*

Preferred sites for subcutaneous AAS injection were the abdomen and inner thigh. However, stinging and bruising was also reported by people who injected AAS subcutaneously. Localized injecting was reported in the cases of growth hormone releasing hexapeptides (GHRP) such as ipamorelin, where injecting directly into the area with a “niggle” (minor training injury) to promote healing was described. Localized fat loss in the injection of GH, while discussed as a myth within the forum, was also reported as being experienced by some individuals.

### *Self-injection/peer injection*

Typically, forum discussants in this study self-injected. Of those who were injected by another person, this was typically a girlfriend or wife, sibling, or friend. Vitellone

describes syringe handling as a means of expressing relationship intimacy (Vitellone, 2017 pg 95), seen in this study also,

*"I don't hide anything. Like it or not. I can't lie to her. She's been pinning me since I started and life is good."  
male who injects AAS*

One forum discussant reported injecting multiple friends at a time (with AAS).

#### *Do It Yourself (DIY) Botox and dermal filler kits*

Bilgrei (2016) described how when new drugs come on the market, people who are interested read 'reviews' online in discussion forums and in this way, forum posts become marketing tools. Forums act as a platform for raising awareness and, typically, a perceived lack of harm is associated with a new drug when it first emerges (Bilgrei, 2016). In line with this, data analysis revealed only positive reviews of Botox and dermal filler kits with little associated harms reported. All forum discussants in relation to DIY kits self-identified as female. Kits were sourced online, often from China, with forum discussants swapping sourcing details. Steps to ensure a quality source included ordering a small test amount before ordering in bulk,

*"Guys I found a great source for Botox, I just ordered a lot because the more I order the more I save, I tested out a small amount first, I knew it was real but just had to double check twice  
I can honestly say, it's better result than from the doctor's office!  
I only wish I've done it years earlier... I went all crazy and injected 4 bottles so far lol"  
female who injects DIY botox*

Motivation to self-inject was largely grounded in reduction of financial expense,

*"I know self-injection is chancey. I have done it once and it hurt a lot. For those of you who are professionals and do this type of thing for living...I feel pretty certain most of you are speaking out against people doing this, if the prices of having it done weren't so damn high we wouldn't be forced to this measure. If*

*the prices were lowered enough for the average patient, those of us who have other bills and don't have 2000 or 3000 to spend and yet still want to look a little better, make your prices fair!"*  
*female who injects DIY dermal filler*

Motivation to self-inject was largely grounded in reduction of financial expense and a lack of satisfaction with results obtained from professionals and the sourcing and self-administration of cosmetic injectables was experienced as an act of self-mastery and autonomy by females. Practices included use of lidocaine in the syringe to reduce pain and swelling and smoothing and massaging the product under the skin for a period of days until the desired look was achieved.

An interest in reconstituting and manufacturing product at home was evident, with forum discussants describing ordering “*raw powder*” from China and requesting “*a formula*” so that Botox and dermal filler could be made at home. One forum discussant reported experiencing lumps in the lips from mixing together two types of filler at home and injecting,

*“You might see that I asked for a formula for mixing it myself. This added risk which I, myself, alone, am willing to take”*  
*female who injects DIY dermal filler*

In this regard, the construction of a feminine identity through both facial enhancement and claiming personal agency through autonomous action on the self is in contrast to the lack of power in narratives of females who inject in Vitellone (2017 pg 106-107). This is consistent with *a priori* theory introduced in Chapter Three (Davis, 1995) which conceptualised PIED injecting as embodiment of power and agency and renegotiation of self-reflexivity rather than a passive act of self-objectification. Dominant ideals of femininity include risk avoidance and sensibility, which may incite rebellious action in

females who feel constrained by notions of conventional/ socially appropriate femininity (Lupton, 1999 pg 161).

### *Injecting Safety*

Safe injecting was seen in this study to include high levels of sterilisation, use of clean needles and equipment and avoiding sharing of needles, vials or PIED. Amongst those who injected AAS, antibacterial swabbing of vial, needle and site of injection was reported and changing needles between drawing, injecting and between injection sites was recommended. Use of low dead space needles which are evidenced to reduce disease transmission was also reported.

However, some issues of concern arose. Many forum discussants described using the same needle to draw and inject between multiple sites, a practice which increases risk of infection through bacteria being picked up by the needle and transferred to the vial. Re-using needles was also reported. One forum discussant described noticing his syringe appearing stained before he used it. However, he theorised that some oil from the vial he had stored it with had leaked on it and he decided it was safe to use.

However, typically unsafe injecting practices were denounced in forums. Vitellone (2017 pg 131) cited Probyn (2000) in theorising that when the person who injects drugs ‘casts out’ the syringe through the spoken word by denouncing it, the person disconnects from uncomfortable aspects of the injecting act,

*“Once the needle has entered your body, its garbage 100%”  
male who injects AAS*

Differences of opinion arose within forums with regard to whether aspirating during intramuscular injecting was necessary. Some felt it to be an intrinsic part of AAS

injecting, whereas others doubted whether it was essential. “Crashed gear” or AAS vials which appeared to contain cloudy or crystallised product sometimes arrived from the source. Some forum discussants advised heating the solution to reconstitute it for injection. However, others described doing so with adverse outcomes,

*“You’ll heat it up and get it to mix and everything and the pinning goes smoothly. Then after a an hours or so you’ll slowly start feeling a sore feeling coming on, then it gets really sore. You feel like you had to most brutal workout of your life mix with having a feeling on knots in your muscles...except they are not knots they are crystals from the oils. The feeling is there for days, you are in pain, you hate yourself, you’ll hate life and then it goes away.”*

*male who injects AAS*

Another method of using crashed gear was described as drinking it rather than injecting, to avoid wasting the AAS.

*Injecting Injury, injury navigation and polypharmacy in injury management*

**Table 19 Injecting injury, injury navigation and injury management**

| <b>Injecting injury</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <b>Injecting injury navigation</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>Polypharmacy in injecting injury management</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| injecting into a nerve resulting in muscle spasming<br>injecting into scar tissue resulting in abscesses lumps and severe pain<br>injecting into a vein resulting in bleeding dizziness<br>a bad taste in the throat and coughing<br>blood shooting from the injection site (“a squirter”)<br>abnormal swelling of the muscle “almost like it filled up with air” during injection<br>resistance to the needle including discomfort and pain with bleeding<br>knots<br>infection<br>bruising<br>hematoma<br>allergic reaction to product injected<br>red bumps at injection site | rotation of sites to avoid injury, pip or scar tissue<br>using smaller needles e.g. insulin needles (‘slin pins’) to avoid hematoma and pip<br>inserting the needle deep enough to avoid causing infection under the surface of the skin<br>use of alcohol wipes on the skin and equipment, using sterile mats<br>sterile gloves<br>using a fresh needle for every ‘pin’.<br>injecting at a slower pace (30-60 seconds per ml)<br>relaxing<br>disinfecting the area before and after<br>rotating sites letting the needle “sit” in the muscle after injection<br>massaging the injection site<br>heating the product beforehand (in the case of AAS)<br>filtering the product beforehand (in the case of AAS)<br>use of “the z track injection method” ( <i>The z-track method is a type of intramuscular injection technique used to prevent the injected substance leaking into</i> | alcohol and anxiolytics to calm the nerves<br>painkillers ibuprofen, naproxen and tramadol to ease injection pain<br>antibiotics as a preventive measure for infection<br>antihistamines to treat post injection welts, flushing and itching<br>dextromethorphan (DXM), a cough suppressant to hold off “tren cough”, a violent cough when injecting AAS in the incidence of hitting a vein<br>Albuterol inhaler for tren cough was also reported.<br>taking a broad spectrum antibiotic prior to injection and finishing the course<br>use of painkiller<br>Lidocaine during injection |

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                       |
|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
|  | <p><i>subcutaneous tissue. During a z-track injection, skin and tissue are pinched/squeezed and held during insertion of the needle, releasing afterwards)</i></p> <p>letting the disinfectant dry completely before injecting</p> <p>heating the vial in hot water before injection</p> <p>needles bought online were thought to be superior to those sourced elsewhere in preventing injury</p> <p>drawing around the reddened area of skin if infection was suspected with a marker and monitoring the spread of red skin</p> <p>avoiding water based product as it was associated with lumps</p> <p>aspirating to avoid ‘pinning’ a vein</p> <p>avoiding injection of ‘crashed gear’ which sometimes meant drinking it</p> <p>getting massages on frequent injection sites to avoid formation of lumps</p> <p>injecting SubQ if unsure of how to inject IM.</p> <p>practicing on an orange</p> <p>using a separate needle to fill up the syringe as inserting the needle into the vial blunts it</p> <p>ensuring that there was the correct amount of ml for in the injection site (not too much as this would cause pip)</p> <p>injecting without hesitation,</p> <p>pushing the product into the muscle slowly as ‘slamming’ would cause pain</p> <p>removing the needle quickly</p> <p>rubbing the site with an alcohol pad</p> <p>sterilising needles by ‘<i>rinsing with fairy liquid</i>’. warming the oil and avoiding injecting hairy areas, as the hair could get pushed into the site, causing infection</p> <p>injecting into the top part of the gluteal muscle to avoid nerves and making sure there were no air bubbles in the syringe</p> <p>using online Botox maps</p> <p>using a surgical tattoo pen and lighting to gauge the structure of the face</p> <p>marking out important arteries and vein locations to avoid</p> <p>watching professionals inject Botox and fillers on YouTube</p> <p>injecting a test amount of the product sourced online into a non-visible area, e.g. the foot</p> | (botox/dermal filler) |
|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|

Novel and “*creative responses to harm reduction*” (Vitellone, 2017 pg 7) included various injecting strategies such as injecting subcutaneously to avoid an intramuscular abscess, and use of ‘the z track injection method’ to avoid leakage of the injectable substance subcutaneously and subsequent lesions. These harm reduction measures were supported and shared in forums, where harm reduction knowledge is “*experienced interactively*” (Vitellone, 2017 pg 113). Prototypical group behaviour in forums was that of safe injecting – avoidance of needle sharing, clean needle usage and sterilisation. While indigenous and reciprocal care for the drug using self and others (Keane, 2003) was typically evidenced, some risk behaviours were also identified. Floridi (2001) discusses ‘disinformation’ in technological environments, when information is given incorrectly, for example, through propaganda or censorship. Both may occur within the online discussion forum space, where unsafe injecting practices are described and potentially normalised. The known high risk nature of the online AAS market was described as influential in some forum discussants decision making with regard to sterilisation techniques and use of fresh needles,

*“It's about me being lazy. I can't be bothered with getting another one, taking it out of the packet etc... Given you are probably injecting UGL oil into your muscle I think some people take certain things a bit too seriously. Most labs cook the oils in a kitchen. We are not talking about sterile environments here”*

*male who injects AAS*

Re-using needles, using the same needle to draw and inject and between injection sites was commonly reported, increasing the likelihood of skin and soft tissue infection (SSTIs). Poor injecting technique was also common, with many reports of accidentally injecting a vein, a nerve and scar tissue. Profuse bleeding, bruising and bent and broken needles through forceful injection were also described.



Engagement with medical professionals to treat such injecting injuries was not described or encouraged within forum discussion. A reticence to present for medical treatment has been documented with regard to individuals who inject PIED (Zanhow et al., 2017; Chandler and McVeigh, 2014; Pope et al., 2004). In this regard, the discussion forum is an “*enabling environment*” (Vitellone, 2017 pg 81); a connective space which both supports the individual and accommodates their risk behaviours. The forum may perform a duality in acting as a pivotal harm reduction source and also a motherhouse for risk normalisation.

Keane (2003) in Vitellone (2017 pg 65) discusses how people who use drugs practice self-care and care of others through novel harm reduction strategies and decision making. Successful injecting and demonstration of injecting knowledge has value in forums as prototypical group behaviour. Mastery of injecting where conceptualised as an achievement may enhance self-esteem and help construct a positive self-identity (Vitellone, 2017 pg 107). Performing injecting competence through forum posts is to comply with the ingroup prototype and strengthen group membership (Hogg, 2001).

Self-monitoring of symptoms, side effects and health outcomes along the continuum of PIED use was utilised to navigate risk. Assessing bodily tolerance for the drug and gauging the interaction between the body and the PIED were essential to decision making regarding dosing and use of compounds for some. Modification of the PIED regimen would occur according to the outcome experienced. The individual’s subjective experience, i.e. “*what works for you*” was at times given priority over recommended dosing or practices,

*“I do everything based on feel. I pay close attention to everything I feel and adjust things in my life accordingly. It’s*

*worked in my workouts and almost every other area. I wish I had realized this at a younger age rather than subscribing to this or that method of doing things because it worked for someone else. It took years for me to realize I wasn't someone else. I had to consider everything then apply things that might work, pay attention, invent what I could and be ready and willing to adjust as needed. It's the way I live now."*

male who inject AAS and GH

### *Bloodletting*

Self-phlebotomy, a practice known within forums as “bloodletting” or “self-bleeding”, was described in discussions as a solution to high blood pressure and high red blood count (RBC) in people who opted for higher doses of AAS. It was also reportedly used to “*clean the blood*”, or remove AAS from the system before blood testing and to reduce blood viscosity. Equipment required included a 16g needle; a 4mm piece of clear tubing purchasable on Ebay; a manual blood pressure cuff and an empty bottle. The blood pressure cuff was then worn to force the veins to protrude in the arm and a needle threaded completely into a vein while attached to the tubing,

*“Stick the needle into the forearm vein where they do blood tests / donations. It needs to be threaded in and along into the vein so it is completely in. The needle is big, so your veins need to be nice and pumped from the cuff... Make sure you don't go through the other side of the vein. The blood will immediately start to pour into the bottle as soon as you're in. Once the blood flow is established, reduce the pressure on the cuff to around 20 mmHg... just to keep a slight amount of pressure to speed things up. The blood should then drain into the bottle over 3 - 10 minutes. When it's full, just pull the needle out and bandage up. Press hard on the area for around 10 minutes to prevent bruises and internal leakage of blood... Careful when taking the needle out, blood will go everywhere!”*

*male who injects AAS*

Historically, bloodletting holds ritualistic meaning, used to swear pledges, connect people deeply as ‘blood brothers’ (Oschema, 2006) and secure group bonding through “*pacto de sangre*” (Franco, 1987). However, blood is a fluid of life force and its shedding is also associated with “*disgrace, disgust, impotence, sickness and tragedy*”

(Titmuss, 1970 pg 20). Of interest here is the association of blood loss with increased health amongst individuals who inject high doses of AAS. Vitellone (2017 pg 72) discusses how what is considered morality may differ within situational contexts, deeming acceptable that which may be unacceptable in societal structures. The situational context here is the online discussion forum, where bloodletting is not stigmatised. As social agreements were often made using figurative blood speech, blood has had social bonding qualities historically (Meyer, 2005). Bloodletting may be conceptualised as part of a repertoire of behaviours which signifies a distinction between a casual and a committed PIED lifestyle and a hallmark of membership of an elite group of 'serious' AAS injectors who can handle high levels of risk (Lupton, 1999).

In addition to potential '*collective effervescence*' (Lupton, 1999 pg 153), where communal engagement in risk taking results in pleasurable feelings of belonging and group bonding, displays of masculinity may be performed through acts of bloodletting within the discussion forum context. Many ancient initiation rites which involved bloodletting were conceptualised as illustrations of male dominance and endurance or as acts which '*grew boys into men*' (Meyer, 2005 pg 2). Historians theorise that as women's (menstrual) blood is conceived as a life giving force, men have competed with this power through sacrificial bloodletting, which allows them to assert patriarchy (Meyer, 2005 pg 119).

Social constraints on masculinity may also underpin engagement in high risk behaviours, as posited in Lupton (1999), which states that late modernity as a sociocultural context places high value on a civilised, self-controlled male body.

Performance of risk behaviours may act as conformance to societal notions of autonomy and self-containment or they may provide a temporary escape from it (Lupton, 1999 pg 160). While many individuals who inject AAS are against donating blood due to the presence of drugs in the bloodstream, many others reported doing so to reduce blood pressure and RBC. It is of interest that donation of blood is an altruistic act of civility and social servitude which bloodletting groups disconnect from when they self – bleed (Bennett, 2008). This may indicate reduced social connectivity through perhaps perceived discrimination or alienation. Through mastery of feelings of fear, anxiety or vulnerability, risk taking can lead to a greater and more defined sense of self (Lupton, 1999 pg 160).

## **7.2 Perceptions, belief and values in relation to injecting within online discussion forums**

### ***7.2.1 Risk perceptions***

It was considered in Chapter Three, prior to data collection, that where injecting drug use is positively conceptualised as bodywork, risks may be underestimated and minimized. Risk theory introduced in Chapter Three included Rhodes (1997), Peretti-Watel (2003) and Miller (2005). This section presents the findings from the data on risk perceptions and compares these to *a priori* theoretical constructs.

*“In my mind- although taking PIED come with risks, the risks are far less than if you chose to sit at home and do fuck all like most of the population”*

*male who injects AAS*

There was evidence to suggest that risk minimisation (Rhodes, 1997) did occur within online communities of individuals who inject PIED and were sometimes grounded in transference of blame for negative symptomology onto other lifestyle factors excluding

PIED use. Disclosure of medical symptoms was often met with advice that there must be another causal factor for such conditions. “White coat syndrome” or anxiety when having a blood pressure test performed, was often blamed for high blood pressure readings. Anxiety was often claimed to be the cause of chest pain or heart palpitations. Media coverage of adverse outcomes relational to PIED use was typically dismissed as sensationalism or propaganda.

Prior theoretical constructs of risk minimisation (Rhodes, 1997) were relevant to the risk perceptions of individuals who inject PIED in this study. Accommodation of risk through scapegoating and risk comparison (Peretti-Watel, 2003) and the rhetoric of luck or fate (Miller, 2005) are evident here, where individuals compare the risks associated with PIED injection to other high risk lifestyle choices.

In AAS, concept of moderated use was ambiguous. Those who were over twenty five years old, hadn't been cycling for many years, cycled between one and four times a year, kept their dosages relatively low, took time off, used post cycle therapy (PCT) and used minimal compounds and who had trained for many years ‘naturally’ before initiating AAS use tended to perceive their AAS use as moderate. Some AAS were considered harsher than others, for example Trenbolone or “tren” was often referred to as the strongest steroid available and not appropriate for people who were new to AAS. It was sometimes called ‘the junkie steroid’, perhaps due to being typically abused and used in large amounts. Testosterone, Boldenone Undecylenate and Deca Durabolin alongside some oral AAS (e.g. Anavar) were referred to as ‘healthy AAS’ which should be used before graduating to use of Trenbolone. Accounts given from forum discussants with regard to these compounds indicated that these AAS caused fewer side effects.

The prototypical (Hogg, 2001) mindset towards physique sculpting PIED within forums was that PIED injection was part of a dedicated lifestyle (recreational weighttraining) and while conscientiousness towards maintenance of good health was important, a certain level of tolerance for side effects, minor symptomology (e.g. acne) and for risk, was expected. Forum discussants, in enacting ingroup prototypical behaviour to validate group membership, typically conformed to this mindset.

In many forums, 'sticky' threads (threads which remained in the top few, regardless of time passed, due to importance of content) were determined by forum moderators or core members (Hogg, 2001), known as 'vets'. These threads contained essential information with regard to responsible PIED use, e.g. "safe injecting" and 'vets' would often refer new forum discussants to these threads, requesting that they educate themselves prior to interacting in discussion threads with others. Many would comply, eager as marginal members (Hogg, 2001) to validate their group membership. This was typical behaviour; however, as described in Hogg (2001) there were varying degrees of prototypicality, with some forum discussants performing as deviants. Deviants can be perceived as failing to meet prototypical attributes of the group, or meeting them only weakly (Hogg, 2001).

One example of deviance in forums is the forum discussant who is reckless in attitude towards health consequences of PIED injection ("*WHO CARES if it's healthy?*"). This type of forum discussant is cast as deviant as their 'negligent' approach to using PIED compromises the integrity of the PIED community (the ingroup) in the eyes of the outgroup (wider society).

*“I get a little prickly when people take steroids as casually as you do. Why? Because you are probably going to fuck up, like get hurt or something and then tell everyone it was because of the steroids. This community takes enough heat about steroids as it is”*

*male who injects AAS*

Prototypical behaviour (respectful use of PIED and safe injecting) in this regard can be conceptualised as collective action “*action that aims to improve the status of the ingroup as whole*” (Becker et al., 2012) and action which seeks to produce a collective identity, one of tacit knowledge and responsibility. Due to the perceived stigmatisation within wider society that was often referenced in forums, forums self-identified as a unique group distinct from the general public,

*“we aren't here because we represent the opinions of the 'general public'”*

*man who injects AAS*

Being unable to talk about PIED use to loved ones or friends was often discussed. In this regard, the forums provided a space for group membership where individuals could explore their authentic selves. There is also the element of elitism in groups which perform ‘edgework’, the belief that the group possesses a special skillset which allows them to outwit danger when engaging in risk behaviour (Lupton, 1999 pg 152).

As described in Peretti-Watel’s (2003) theory of risk, self-efficacy in the avoidance of danger was notable in forums. However this self-confidence was not solely grounded in lay epidemiology. The importance of research prior to injecting PIED was underscored by forum discussants who advised studying every available YouTube video relational to their intended injectable, familiarising oneself with the human body and muscle

structures, nervous system, reading reviews online, reading discussion fora posts and careful self-monitoring throughout the process of injecting PIED,

*that do the injections “I have researched many hours of regulations on the day spa in my state. I found that I have taken more training hours via YouTube trainings (which you can search) and searched anatomy of face nerves, muscles etc.. than what the spa professionals have! I have been doing my own fillers and wrinkle care for 6 years but just lost my supplier thanks to customs.*

*For the judgers and haters, don't read the thread. But I am certain I am more qualified to do my own than most spas in my state.”*

*Female who injects DIY Botox*

Injury or death was often ascribed to the incompetence of the individual concerned, or their failure to prepare and conduct adequate research, as seen in Peretti-Watel's (2003) theory of scapegoating,

*“I wish everybody would realize you have to be MENTALLY challenged to kill yourself on insulin. There are SO many symptoms of going hypo that if you don't notice then you don't deserve to live. I don't understand how people f\*\*k themselves up on insulin. I'm surprised they don't starve themselves or forget how to breathe.”*

*male who injects insulin and AAS*

This kind of pathologizing – diagnosing deviants as dysfunctional - is indicative of how a group may strategically clarify what is expected (what is prototypical) and also, how the group distances from failures within the group (Hogg, 2001). In order to protect the group, collective decision making with regard to risk often results in responsibility for disaster being allocated to the individual who fails (Lupton, 1999 pg 50)

Minimisation of risk (Rhodes, 1997) was commonly seen in dialogue between forum discussants, where adverse injecting events such as accidentally ‘pinning’ a vein were seen as “*not a big deal*” and normalised. This extended to diminishment of the



significance of major medical conditions, including an enlarged heart. Changes to emotional states through AAS use i.e. “roid rage” were often said to occur only if the individual was predisposed to react in that way and not the fault of steroids. Some forum discussants felt certain PIED were more dangerous than others,

*“Side effects of Botox are almost always paralysis and death, as opposed to getting bunk juice which basically is placebo...”*

*male who injects AAS*

Lack of awareness amongst people who injected Melanotan regarding the risks associated with changes to nevi was evident and a perception that Melanotan offered protection from sunburn and cancer was often expressed.

Lupton (1999 pg 111) discusses how people negotiate their identities through responses to expert opinion, choosing to ignore advice, rather than being unaware or ignorant. Where a high risk situation was acknowledged, forum discussants typically felt that risk taking was a human right, as with a female self-injecting Botox who was seeking a formula to mix it herself at home,

*“This added risk which I, myself, alone, am willing to take, doesn't mean that because I am considering this choice, would necessarily recommend it to others. Your mileage may vary and as you rightly state, your individual rights and liberty grant you freedom to embrace your own philosophy and take your own risks.”*

*female who injects DIY Botox*

Krimsky and Golding (1992 pg 77) risk hypothesis states that when people are autonomous in voluntary risk taking, acceptable harms are created. Harms posed to forum discussants in this study were seen to be accepted where risks undertaken were navigated through personal choice, lived experience and constructed belief systems. As

members of a social group, forum discussants response to risk is collective (Lupton, 1999 pg 111). The collective ‘risk position’ adapted by the forum is part of their subcultural identity and the group may define themselves through their engagement in risk that which the rest of society avoids (Lupton, 1999 pg 112).

### ***7.2.2 Beliefs and values around injecting***

#### *Normalisation*

In Chapter Three, Parker, Aldridge and Measham’s (2002) theory of normalisation was applied to the transition of PIED use from subcultural groups, i.e. competitive bodybuilders and sex workers, to mainstream society. The promotion and normalisation of a muscular ideal by media was acknowledged by forum discussants. However, while use of AAS and other PIED to achieve these increasingly popular archetypes was described as “*a little more accepted*” than in previous years, it was still largely perceived by people in this study as a stigmatised behaviour and a counter culture in the general population.

In this regard, Chapter Three was concerned with macro level normalisation in injecting PIED use, whereas the online data showed normalisation within a micro context, the discussion forum (Barratt, 2011). Micro level normalisation refers to the constructed belief system a person who uses drugs refers to in order to accept their drug use and perceive it as normative (Barrett, 2011).

Injecting was described in forum discussions as a superior method to oral ingestion of AAS, due to the harsh side effects e.g. lethargy, stomach pain, liver and kidney damage associated with orals. A theory was also found in forums that the product was more

potent in injectable form and yielded better results. In addition to those perceived benefits to injecting, many threads focused on enjoyment of the injecting process. Injecting enthusiasts reported minimal or no pain and described injecting as exciting and addictive, once the individual had got “*a taste for that needle wielding fast life*”.

Vitellone (2017 pg 60) suggests that in seeking to understand injecting we ‘hand the syringe back’ to the person who injects. In this regard, it is not the sociologist’s role to suggest the physical experience of injecting (pg 78) but it is the individual who injects who interprets. Gendered injecting was seen in my study, where injecting without the presence, or at least the disclosure, of fear was associated in forums with a masculine identity (Connell and Messerschmidt, 2005). The association of injecting with masculine identity has been seen in the literature where injecting was perceived by young males to signify a rite of passage towards maturity and identity construction (Plumridge and Chetwynd, 1999; Collinsons, 1996).

In contrast to discriminating connotations of illness and dysfunction with injecting drug use sometimes seen in wider society (Simmonds and Coomber, 2009), Vitellone (2017 pg 60) invites us to consider the syringe as an “*apparatus of passion*”. Emotional, sensual and visceral associations made with risk can include pleasure, excitement, adventure, a heady loss of control, but also increased control of the self when the risk does not result in serious harm (Lupton and Tulloch, 2002). When the task is successfully completed, this incites a feeling of self-mastery and autonomy for having overcome the fear, in addition to intense emotionality which can be intoxicating. The complex relationship between risk and emotion as described by Lupton (2013) can mean that risky experiences can create a potent sense of selfhood. Injecting pleasure

was evident in forums where certain acute events were understood as adventuresome and thrill seeking rhetoric was used to describe injecting injury,

*“I actually enjoy hitting some of my veins (not on purpose of course!) because you know the ass-whoopin about to come-- Hit a vein w/tren like Big Paul said.. you'll love it!!!! –  
male who injects AAS*

*“Call me nuts but I actually like when I bleed from an injection.  
Can't tell you why”- -  
male who injects AAS*

The glee afforded by injecting here may be grounded in media propagated “heroic life” deeds of male courage e.g. depictions of movie characters fearlessly risking their lives for adventure (Lupton, 1999 pg 156).

Vitellone (2017) describes ‘the physical experience of injecting’ (pg 78) including hedonistic elements of sensory stimulation, pleasure anticipation, positive reinforcement through positive outcome and visual cues. Sexualisation of the syringe can occur through transference of masochism and lust onto the injecting process (McBride et al., 2001), with sexual comparisons also seen in this study,

*“now it's like sex, the more you do it, the better you get”  
male who injects AAS*

Comparisons to imagery from popular culture were made signifying potential glamorisation of injecting,

*“It's kinda cool to see the spike stick out (during an injection in the deltoid muscle) - reminds me of Pulp Fiction”  
male who injects AAS*

Purposeful engagement in high risk behaviour and a visceral ‘brush with danger’ turns away from the civilized body and embraces the liberation and pleasure of the grotesque

body (Lupton, 1999 pg 149). Despite the disordered appearance of risk behaviour, control of the self is performed through skilful avoidance of disaster, resulting in feelings of mastery over fear and display courage (Lupton, 1999 pg 153). This leads to an empowered sense of self, which is compounded by the group bonding which occurs through shared experiences in the discussion forum space (Lupton, 1999 pg 153). Pleasure and enjoyment derived from a task may lead to minimization of any risk involved (Lupton, 1999 pg 116)

Men who injected without fear assumed a position of power over those who could not. Policing of the injecting process was seen within forums. In the concept of hegemonic masculinity, the subordination or even exclusion of certain subsets of men through hegemonic policing can occur (Connell and Messerschmidt, 2005). Similar gender orientated teasing was seen in Kimmel and Mahler's (2003) and Messerschmidt's (2000) discussion of hegemonic mechanisms, where school boys were called "sissies" by their peers. The social positioning of one group of men above another was described in Demetriou (2002) as 'internal hegemony'. In this study, the act of subordination resulted in self-regulation and emotional conflict in men struggling with the injecting process. They questioned their own masculinity and were rejected as deviant by injecting enthusiasts who had normalised the injecting process within forum discussion. As deviants, these men could not access support around their injecting from the forum community,

*"I know you are scared of needles and want to snort the gear.  
Grow up be a man and pin yourself."*

*male who injects AAS*

Responses to posts which confessed injecting anxiety were typically accusatory in tone, diagnosing the nervous individual to be pathologically anxious, with irrational fear. Posts which questioned whether the nervous individual was suited to the AAS 'lifestyle' were seen often, as injecting was perceived as a necessary skill within forums. The belief that injecting was an indelible part of AAS culture was commonly expressed. While other routes of administration were available, injecting was the more respected method,

*“There is a stigmatization against the use of needle, but it's an important part of our beautiful anabolic army.”*  
*male who injects AAS*

Intergroup stigmatisation between individuals who inject AAS and individuals who inject opioids and stimulants has been noted in the literature which describes needle exchange socialisation (Bates et al., 2015; Kimergard and McVeigh, 2014; Kimergard, 2014).

### *Injecting anxiety*

A fear of needles was described in forum discussion as an obstacle to injecting. Some were averse to the pain involved, as can be seen in strategies such as 'cocktail' injecting to reduce frequency of injections and injecting subcutaneously to avoid increased pain associated with IM injecting, but others described an association with “*sick, bad things*” e.g. childhood trips to the doctor or hospital. Feeling “*like a junkie*” was also reported. This fear was sometimes characterised by anxiety attacks before and during injection, including shaking and sweating, imagining the occurrence of acute events such as embolisms, palpitations, dizziness and fainting and being unable to complete the injection. In AAS injecting, this was often accompanied by indications of low self-

esteem, perhaps due to the culture of masculinising fearless injecting within discussion forum peer groups,

*“I’ve actually gotten more nervous the more injections I do, not the opposite. Shit is really stressing me out actually. Maybe I’m a bitch.”*

*male who injects AAS*

Advice given within forum discussion centred on relaxing, slowly applying pressure or conversely, darting the needle suddenly, having someone else do the injecting, choosing gluteal muscles as the injection site due to decreased difficulty injecting here, taking an anxiolytic and removing some steps of sterilisation to simplify and speed up the process,

*“Removing the sterile gloves and sterile matt was helpful. It created less build-up/anticipation...less time to get nervous”*

*male who injects AAS*

Reports of sudden onset of unexplained anxiety around injecting after successfully injecting for long periods of time were found. There were those that reported no injecting anxiety, but that disliked the injecting process, who accepted it as a necessary evil. Injecting was also reported as causing relationship and family conflict where loved ones disapproved of injecting.

Men who could not conform to the fearless injecting prototype may experience dissimilarity (Becker et al., 2012), a negative state where individuals perceive themselves as different to the ingroup, experiencing feelings of isolation and potentially may exit the group,

*“I skipped on my injection today. It was even worse than last night.... I might have to figure out another plan unfortunately”*

*male who injects AAS*

### *Societal stigmatisation*

Vitellone (2017) suggests that an individual who injects drugs may internalise the notion of the syringe as deviant, therefore the needle stands between the individual and the rest of society from the very first injection. To be visible as a group of injectors to institutions such as legal and healthcare systems is to be labelled ‘at risk’, which as Lupton states, marginalises and victimises groups through placing them under surveillance and interventionist monitoring (Lupton, 1999 pg 114). While expert voices govern risk and construct self-regulating norms for individuals to comply with, resistance to such governmentality was seen in forum discourse.

Within forums increased stigmatisation was felt to exist with regard to use of AAS and other PIED than exists for alcohol and recreational drugs such as cocaine. Individuals who inject psychoactive drugs were also seen as being treated better by services than individuals who inject AAS. Frustration around published research portrayals of individuals who inject AAS as “*HIV spreading cokeheads*” was also expressed.

*“It would be great to see some research actually communicate the proportion of AAS users that are very healthy, functioning members of society who don't only use steroids to conform to body image expectations. However from my understanding it's very difficult to get this profile of person engaged in research due to stigma and the fact that they do what they do and don't care to influence the research agenda”*

*male who injects AAS*

Vitellone (2017) suggests that being ‘*overwhelmed by the syringe*’ may impact on how individuals who inject access drug services and engage in research. Negative concepts of injecting coloured forum discussants opinions of needle exchange services. Bodily control and governmentality over substances ingested into the body are symbolic for



social control (Douglas, 1966). The needle exchange space represents a regulation of impure and ‘polluting people’ (Lupton, 1999 pg 49) which forum discussants rebelled against and sought to disconnect from,

*“She starts off asking "how long have you been injecting for? I tell a white lie to get past this "I've done a few cycles years ago". Then her face drops... "Steroids" she growls with a glare! From that moment on - in her eyes I was scum. Then comes the beauty - "you will be needing 10ml barrels". "What, look no - I'm only shooting up 0.75ml at a time I'd rather 1ml or 2ml". So I've walked away with a load of junk - and feeling like a scumbag. ...You guys have been proven right - some of those smack shops are run by scumbags”*  
male who injects AAS

*“Of course, there are a lot of anti-steroid groups and anti-doping moralists who see the increasing number of AAS users seeking needle exchange services as an opportunity to further stigmatize steroid users. After all, what better way to paint steroid users negatively than to compare them as similar to cocaine and heroin addicts who share needles and spread deadly viruses? That will generate additional support for their war on doping/steroids”*  
male who injects AAS

Recent published studies around the presence of HIV antibodies in PIED injectors (Hope et al, 2016) was a focal point for discussion,

*“The concern for blood-borne virus transmission among AAS users is overblown. I think it would be a mistake to over-allocate resources for this issue when there any many more pressing issues of greater concern affecting a much broader group of AAS users.”*  
male who injects AAS

Demonization of AAS in the media and associated negative, threatening stereotypes e.g. ‘roid rage’ were indicated as sources of stigma,

*“this reflects a "fear of muscle". Given all the negative stereotypes associated with bodybuilders, the fear of a muscular individual may be much greater than fear of an intoxicated individual.”*  
male who injects AAS

Such stigmatisation was seen as threatening the social position of the group (Hogg, 2001) and led to derogatory commentary in forums towards the outgroup (wider society),

*“What makes it worse is the public believes whatever the media says which shows how uneducated some of them are”  
male who injects AAS*

Female use of AAS was felt to be particularly stigmatised, in part due to reduced knowledge on the subject and also due to deviance from gender ideals,

*“Muscles, women, weightlifting...no matter how trendy it is - which it is very much so at the moment - it will still be a niche interest amongst women.  
Women have more at stake - it's an illegal and dangerous activity to experiment with drugs, especially for a hobby. We are upheld to a different standard than men because more often than not, we are mothers, caregivers, career women.  
The old saying is 'boys will be boys' and it carries over even into adulthood”*

*female who injects AAS*

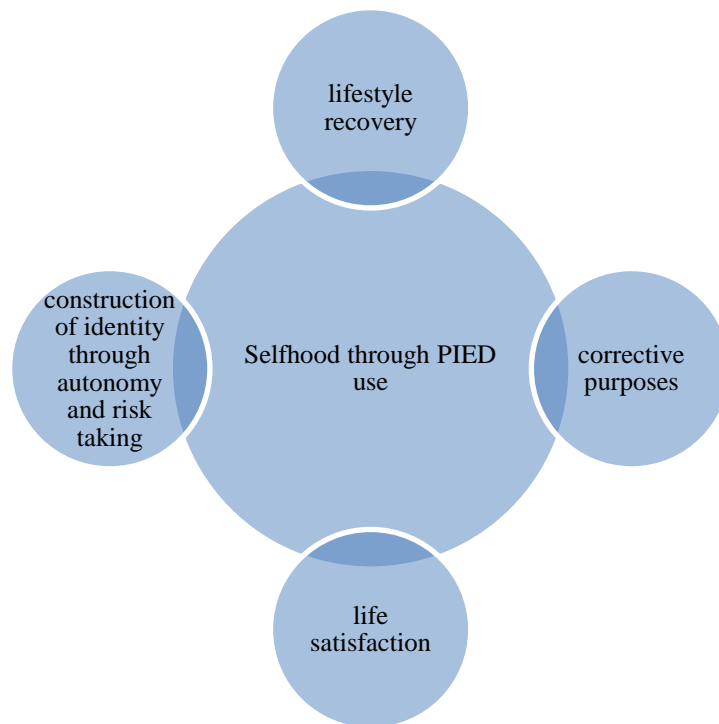
A lack of knowledge on the positive effects of AAS amongst the general population was also cited as a reason for negative public opinion. One forum discussant coined the phrase “*beefier madness*”, derived from “*reefer madness*”, the 1936 propaganda film about social hysteria surrounding marijuana. Forum discussants described concealing their physiques while at work, e.g. through baggy clothing, to avoid their use being exposed. Denial of AAS use was also reported when in the gym setting and to potential sexual partners. It was commonly advised within discussion fora threads not to disclose use of AAS to doctors, as it would remain on medical records indefinitely and cause problems in the future. Some forum discussants felt unable to disclose their use to loved ones. However, others reported being supported in their use by partners and family.

Normalisation theory, while useful in explaining some of the extant literature on the development of injecting PIED use in society, was found to be inappropriate to describe the experiences in forums where rhetoric of stigmatisation described societal attitudes towards PIED use. However, micro normalisation occurred in the context of the forum, where injecting was used to construct gendered identities. Vitellone's (2017) thesis on the social science of the syringe was applied to perspectives on injecting in forums. Theories of risk (Rhodes, 1997; Miller, 2005; Peretti-Watel, 2003) proved useful in underpinning risk perceptions and navigation. Findings from this study have produced three new theoretical concepts:

*Selfhood through PIED injection*

Emergent from the data is a concept which builds on the prior theoretical concept of negotiation of sense of self and embodiment of identity, to include transformative healing from past discord in an individual's relationship with his or her own body, identity construction, gender displays and enhanced life satisfaction. This was seen in people who injected AAS and other physique sculpting PIED to recover from psychoactive drug use and in people who carved out a lifestyle and image from PIED use which they felt superior to any previous existence they had inhabited. For these people, PIED use is more than enhancing the appearance, but enhancing the self. Although they are often changing the body past its natural limitations, the individual feels they are pursuing their most authentic self.

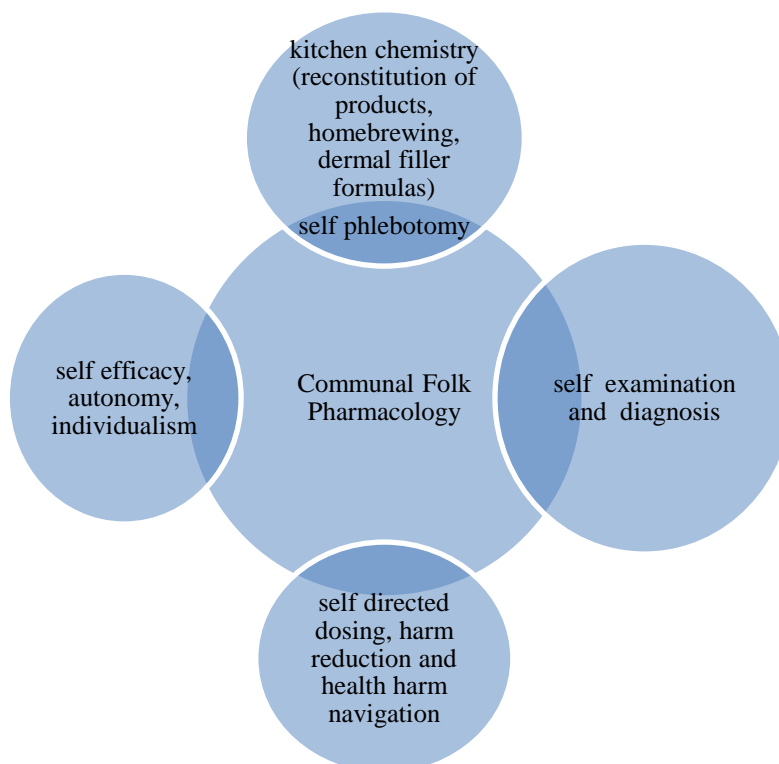
**Figure 3 Selfhood through PIED use**



*Communal folk pharmacology in online discussion forums*

An overarching theme across all areas of data collection was the individual's exercise of autonomy in self directing PIED regimens, grounded in subjective experiences and goals. People in this study demonstrated rhetoric of competence and self-efficacy in their decision making processes, which involved experimenting on the self in order to monitor the outcome and inform future decisions. Newly emergent PIED practices homebrewing AAS and use of DIY Botox and dermal filler kits are consistent with contemporary drug trends involving home production of drugs (Van Hout, 2014b), which extended to performance of medical procedures at home in the cases of self-phlebotomy or bloodletting in AAS injectors. Trial and error experiments and self-medication for self-diagnosed illnesses were evident in the data from this study and the concept of self-medication was grounded in the individualistic right to choose a particular course of action over their own bodies, regardless of outcome.

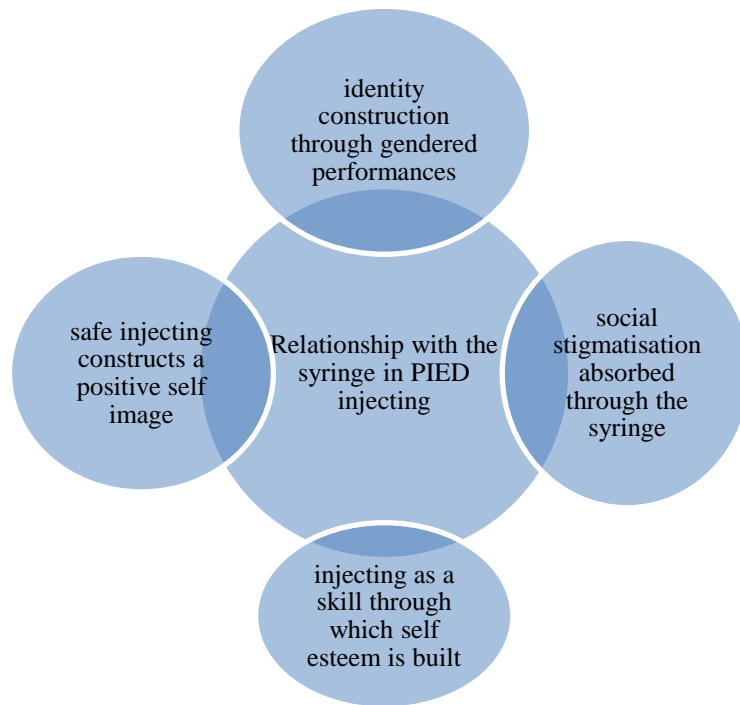
**Figure 4 Communal folk pharmacology in online discussion forums**



*The relationship with the syringe in PIED injecting*

Perspectives of individuals who inject PIED on their injecting habitus have rarely been studied. Identity construction occurs through the act of injecting in this study. Findings indicate that the physicality of injecting is of value to forum discussants identifying as male. Construction of an empowered feminine identity is of value to forum discussants identifying as females. The extension of self through the syringe may mean that social stigmatisation has been absorbed by forum discussants who reject use of needle exchange services. Safe clean injecting helps construct a positive self-image through the syringe.

**Figure 5 Relationship with the syringe in PIED injecting**



These theoretical concepts will now be discussed in relation to the study's findings in Chapter Eight.

## **Chapter 8: Discussion**

### **8.0 Introduction**

Chapters Six and Seven presented themes from the data and examined the utility of a prior theoretical framework that was constructed from analysis of the extant literature in chapter two and introduced in Chapter Three. Adaptive Theory considers that while these prior theoretical concepts shape data collection and are considered throughout the research journey, they will adapt and expand according to the emergent evidence (Layder, 1998 pg38). The results of this study contribute to understanding of contemporary injecting PIED culture in the online discussion forum space. Online discussion forums are of crucial importance to people engaged in newly emergent PIED trends as they attempt to navigate a drug market in a state of constant change (Bilgrei, 2016). This study uses discourse from several discussion forums to document empirically for the first time injecting practices such as self-injection of Botox and dermal filler kits, homebrewing AAS and ‘cocktail injecting’, as well as the newly discovered practice of self-phlebotomy or bloodletting in individuals who inject AAS and beliefs and values around injecting in PIED related online discussion forums.

In this regard, three newly emergent concepts were introduced in the concluding comments of chapter seven. This current chapter will now discuss in depth how these new concepts relate to the data, to prior theoretical concepts of this study and to the extant theoretical literature and discuss all of these aspects of the thesis in relation to the empirical literature on PIED injecting and other types of injecting drug use. Section 8.1 will discuss constructions of selfhood through PIED injection. Section 8.2 will explore communal folk pharmacology in online discussion forums, embedded in a

contemporary culture of self-medication. 8.3 will examine the relationship with the syringe in PIED injecting. Section 8.4 will conclude the chapter.

### **8.1 Selfhood in PIED injection**

The reviewed literature in chapter two described a wide range of motivators for use including appearance enhancement (Van Hout, 2014a; Petrocelli, Oberweis, and Petrocelli, 2008), sporting achievement and strength (Sagoe, Andreassen and Pallesen, 2014; Smith and Stewart, 2012), occupational functioning (Van Hout and Brennan, 2013) and enhanced self-confidence (Vassello and Olrich, 2010). While all these were seen in the data, a common theme overarched the narratives of forum discussants in this study as they described what motivated them in initiation and continuance of PIED injection.

While developing prior theoretical constructs for the study in Chapter Three I suggested that a function of PIED use may be to navigate a sense of self through embodiment of identity, as seen in people who undergo cosmetic surgery (Davis, 1995), tattooing and piercing (Measham, 2002). Davis (1995) conceptualised body enhancement through cosmetic surgery as acts of agency and self-empowerment, where the individual constructs a new and positive relationship with their body. Through body enhancement, the individual can circumnavigate passive acceptance of their natural birth-given physical form, especially where relational distress is experienced and autonomously create the body they desire. Creation of an extraordinary body is then understood as an exercise in self-mastery in which the purposeful transcendence of fate occurs. Elevating the physical self past its natural limitations was framed with



transhumanistic theory in Chapter Three (More, 2013; Hughes, 2002). These prior theories prove useful now in illuminating this study's findings.

### ***8.1.1. Healing and selfhood in PIED injecting***

Cognition around transformative change through PIED bodywork in forums was in line with transhumanistic ethos: that we need not accept the body or mind we are born with and that we can revise, improve and become our concept of 'better' (Hefner, 2009). Many individuals who inject PIEDs in this study had a negative relationship with their body image prior to commencing use, seen also in women who had cosmetic surgery procedures (Davis, 1995). PIED use functions in this regard to correct a perceived or actual bodily flaw, which typically results in enhanced wellbeing and a more positive self-image. The notion of a construction of a 'better self' is also seen where forum discussants transitioned from injection of opioids and stimulants to an AAS injecting lifestyle and celebrated the distinct increase in life satisfaction and resolution of emotional pain or unease experienced in their past lives. While a connection between illicit drug use and AAS has been previously described in the literature (Sagoe et al, 2015c; Cornford, Kean and Nash, 2014), the focus has largely been on polypharmacy and the creation of a more muscular, healthy appearance in men to combat the wasting effects of heroin. In this study, injection of AAS and other muscle building PIEDs were used as part of lifestyle recovery from psychoactive drug and alcohol addiction. In this regard, in addition to bodily enhancement, forum discussants ascribed inherent value to PIEDs as a pivotal intervention in a reconstruction of sense of self and individualism.

A previous discontent was also expressed by forum discussants in relation to a lack of fulfilment of individual potential, an impulse to pursue the realisation of selfhood and to self-identify in a positive way. Bostram (2003) described transhumanists as pragmatic

thinkers who prefer to take action and problem solve where there is an undesirable situation or issue, rather than to complain. This philosophy was echoed in the disclosures of forum discussants in this study, who often claimed superiority over people who were unhappy with their bodies and lives, but failed to act on their discontent.

As described in transhumanistic literature (Hefner, 2009), the boundaries between healing, improvement and enhancement are not clearly defined in the rhetoric of forum discussants. Often, all of these elements co-existed in PIED experiences. The modality of enhancement was that of overall life satisfaction and not contained solely in bodywork. Societal moral value attached to staying natural was described in Conrad (2002 pg 91) who discussed why ‘hard work’ to achieve a transformation is deemed a more worthy enhancement by society. Additional humiliation is given to those who achieve an objective by drug use or through medication (pg 92). However, Conrad concludes that this is a social definition of authentic enhancement that is without merit. In this study it was seen that where malcontent is experienced, positive outcomes which arise from autonomous action over the body transcend the act itself. Rather than merely a change in appearance, self-hood and a sense of rebirth is experienced by the individual who injects PIED.

Rodner (2005) theorised that people who use drugs may adhere to the “*individual identity discourse*” intrinsic to contemporary Western society, which prioritises an individual’s desires and goals above that of the social world. In relation to PIED use, this autonomy over the body may be conceptualised as the construction of a “*reflexive biography*” (Beck, 1992 pg 135 in Lupton, 1999) where individuals forge their own

destiny and actualize their identity or selfhood. Although this identity construction occurs through connection with the inner desires of the self, it does not occur in a vacuum. It may also be informed by internalized societal constructs (Beck and Beck-Gernsheim, 1995 pg 7 *in* Lupton, 1999). Layder (1997 pg 236) understood that although people are not directed in their actions by the influence of power structures alone, nor do they act completely in isolation from them. Additionally, Adaptive Theory acknowledges that people in turn influence and impose order on the world, through their interpretations of it (Layder, 1998 pg 151). “*Biomedical enhancements*” such as PIED, were classified by Conrad (2002 pg 94) as strategies which may seek to transform the individual in line with societal expectations, therefore reinforcing those very social values. Thus, it is at the interplay between individual and institutional forces i.e. societal gender roles and expectations of “*the civilised body*” (Lupton, 1999), that identity construction through injecting PIED occurs.

### ***8.1.2. Gender and selfhood in PIED injection***

One facet of identity construction seen in this study is the performance of gender. While the gender of forum discussants cannot be determined, gender identification occurs in discussion forum posts through use of language such as “*as a male...*” and “*I am a woman...*” In this regard, information can be derived from the online data which pertains to the interplay of gender and PIED injection, from the perspective of forum discussants in this study. Masculinity performances were seen in extant online studies (Underwood, 2017; Smith and Stewart, 2012) and so, the role of gender identity in injecting PIED use was considered in Chapter Three using Connell’s theory of hegemonic masculinity (1987). The role of societal constructs, in this case, popular culture and the social reality (Layder, 1998) was conceptualised as being a core element of hegemonic masculinity evident in individuals who inject PIEDs, primarily through

media dissemination of a muscular, fit physique ideal for men (Ricciardelli, Clow and White, 2010; Atwood, 2005). Cultural realities such as gender roles and societal body ideals were accounted for when guiding the data collection as “*orienting concepts*” (Layder, 1998 pg 101). However, while it was envisaged prior to data collection that hegemonic masculinity might be relevant in online narratives describing body ideals, it instead was during discussions relational to the injecting process itself that gender identity came into play. Measham (2002) posited that people who use drugs can construct their gender identity through facets of drug use itself. In this study, injecting without the presence, or at least the disclosure, of fear is evident as a body practice associated with a masculine identity (Connell and Messerschmidt, 2005).

Forum discussants who perform masculinity through injection of PIEDs revel in the ‘*needle wielding fast life*’, embracing pain and risk. Displays of masculinity are also seen in online accounts of bloodletting in ‘serious’ users of AAS, with the act of bloodletting having historical connotations of male bonding, but also of separating men from boys (Meyer, 2005 pg 2) and immortals from ordinary beings (Franco, 1987). Similar ideologies were seen in the literature on PIED and injecting drug use in general. In Smith and Stewart’s (2002) online study of males who used AAS, one way in which embodiment of masculinity was demonstrated in forum discussant disclosures was through the glamorisation of pain suffered during training. Also in Monaghan (2001), masculine connotations were made with certain AAS health risks and controlled pain. In Stanistreet (2005), men who injected psychoactive drugs were discussed as being more likely to construct their masculinity through risk behaviours, as successful risk taking was understood as a display of dominant masculinity.

Vitellone (2017), in her analysis of injecting drug use, found that while males may construct their identity through injecting, in a “*prosthetic biography*” (Lury, 1998), or sense of self constructed outside the body through an object (e.g. syringe) this ability evaded females who inject. Vitellone noted a lack of power in the narratives of females who inject, who did not connect their selfhood with the syringe (pg 107). However, in this study, the narratives of forum discussants that identified in posts as female suggested differently. Traditional gender roles (e.g. in storytelling, film and media) have portrayed males as celebrated risk-takers, whereas the female is cast in the role of caretaker, avoiding risk and experiencing feelings of guilt when engaging in acts of rebellion (Lupton, 1999 pg 157). While male transgression of rules and norms is often perceived as “*heroic achievement*” (Lupton, 1999 pg 160), historically, this has been less commonly applied to females. Due to these societal constraints, females may experience risktaking as a liberating expression of their sexuality (Lupton, 1999 pg 161), particularly when engaging in activities which are “*coded as masculine*” (Lupton, 1999 pg 162).

Issues of power and negotiation in injecting drug use (Rhodes, Greenwood and Robertson, 2001) have been previously highlighted in the literature where it is shown that females are more likely to be injected by their male partners or to be “*second on the needle*” as the males are often in charge of the injecting equipment (El- Bassell et al., 2014; MacRae and Aalto, 2010). In fact, Southwell (2005) found that when free from the constraining influence of male partners, females will often opt for an alternative route of administration to injecting. Therefore, female self-injecting in PIED culture, such as that described in discussion forum posts on DIY Botox and dermal filler kits may be understood as challenging the gendered power dynamic in injecting. However,

a duplexity of female oppression and agency seems to exist in injecting PIED use, where limitations and boundaries are placed on the scope of female body enhancement. This is best illustrated by the casting of female AAS injectors as “*liminal figures*” (Lupton, 1999 pg 134) in male dominated discussion forums. Although females are increasingly weighttraining (Andreasson and Johanssen, 2013), the female body which injects AAS to create more musculature is seen to threaten the social order (Lupton, 1999 pg 133) where female bodies are contained and restricted to that which is sexually enticing to men. Negative comments around the physicality of females who inject AAS are grounded in the lack of sexual attraction which they inspire in the male forum discussant. In this regard, expression of disgust or fear in discussion threads may serve to increase the “*escape status*” (Lupton, 1999 pg 164) of AAS injecting for women and to strengthen its power in creating selfhood through transgression of cultural boundaries.

### ***8.1.3. The body and selfhood in PIED injecting***

Pursuit of selfhood through the “*grotesque body*” (Lupton, 1999 pg 166), or the body which is risky and embodies what is culturally forbidden and contaminated, was seen in the narratives of forum discussants who described their desire to create a freak-like physique which had the potential to shock others. Lupton describes how pleasure can be derived from transgressing social boundaries and how the visceral excitement associated with this may increase sense of self. This notion of “*edgework*” is seen throughout the dataset.

Conversely, correction of perceived flaws to comply with societal standards of beauty and attractiveness, or ‘normality’ and associated social implications was also seen to be a facet of the discontent experienced by some individuals who inject PIED in this study.

Davis (1995) discussed the duality of women's experiences of renegotiating their relationship with their bodies, their self-image and quality of life and the subordination of women through bodywork through which they essentially conformed to a societal ideal. She concluded that the female in this regard was both an agent and a dupe. Conrad (2002) noted that physical traits seen to deviate from societal beauty standards were often medicalized and deemed fit for 'treatment' or 'correction' through enhancement procedures, in order to 'normalise' them. This concept may be underpinned with Foucault's theory of hierarchal ordering of normal bodies, where conforming to cultural ideals raises the social value of the body (Featherstone, 1991 pg177).

In this regard, the creation of selfhood through a combination of body enhancement and engagement in risk taking may be a hybrid of visualisation and consumption of societal and industrial ideals and individualisation. As PIED injectables themselves are industrial products, an individual who injects PIED is the "*ultimate consumer*", making their very body part industrial (Lury, 1998). In this manner, the construction of self is "*partial*"; in part informed by social constructs (Lury, 1998 pg 221). As Christiansen (2016) in his typology of AAS users notes that although some may seek to stand out, they have a concurrent need to fit in.

#### ***8.1.4. Risk and selfhood in PIED injecting***

Discussion forum groups were seen to have a sense of elitism (Lupton, 1999 pg 152) where skilled performance of PIED injecting is a personal responsibility and has value in relation to social status within the group and individual self-esteem. The skilled negotiation of risk is conceptualised as mastery of the self. A "*collective effervescence*" (Lupton, 1999 pg 154) was seen to take place in discussion forums where individuals

identify and relate to each other as skilled risk takers and the acquisition of the skill of injecting may lead to enhanced self-esteem. Emotional, sensual and visceral associations made with risk can include pleasure, excitement, adventure, a heady loss of control, but also increased control of self when the risk does not result in serious harm (Lupton and Tulloch, 2002). Injecting pleasure was also seen in our study, which contributes to positive perceptions of injecting.

Control of the self is paramount to the individual identity (Rodner, 2005) and preservation of control is important in the construction of a positive self-concept for the person who uses drugs. This is particularly true where an individual feels societal stigmatisation exists towards a particular behaviour e.g. high dosing of AAS (Griffiths et al, 2016). . External influences, such as the disapproval of others, can be devalued where the individual constructs their own acceptable risk boundaries (Rodner, 2005). Transhumanists also value individual freedom and choice with regard to enhancement (Bostram, 2003). What enhancement entails for the individual is highly subjective, as seen in the extant literature which portrays individuals who inject PIED as a heterogeneous group with dynamic goals and values. However, Conrad (2002) gave a broad definition of enhancement as taking the body to a place “*where it has never been before*” (pg 86). It was seen in this study that in the case of many forum discussants, that desired place was commonly envisaged as selfhood.

## **8.2 Communal folk pharmacology in online discussion forums**

Discussion forums may be conceptualised as Foucauldian “*heterotopias of deviance*”, places where people with special interests on the fringes of social norms come together to construct their own reality (Vitellone, 2017 pg 90). These places can ‘*draw us out of*



*ourselves*' (Vitellone, 2017 pg 92) and help us to self-identify on a deeper level, as seen in the pursuit of selfhood through PIED. The discussion forum may also act as an “*enabling environment*” (Vitellone, 2017 pg 81), where risk behaviours are supported and as a harm reduction nucleus, where lay expertise is collectively produced, debated and disseminated.

### ***8.2.1. Self-medicalisation in PIED injection***

Conrad (2002) described medicalisation i.e. the process through which human conditions come to be defined and treated as medical conditions, as occurring in western society and impacted by social factors such as individualism and advances in technology (pg 8). Fainzang (2016) describes how self-medicalisation occurs through a process of self-examination, where bodily signs are understood as symptoms. In online PIED culture, self-medicalisation occurs within contexts of individualism (as discussed by Rodner, 2005), the expansion of the online drug market (McBride, Cullet and Coward, 2016), cultural trends for home manufacture of drugs (Van Hout, 2014b) and administering previously professionalised procedures at home (Pickett, 2011; Pickett and Mewies, 2008).

One such example documented by Conrad (2002) was the medicalisation of the aging male body in contemporary society and the widespread use of testosterone supplements to combat hypogonadism (low testosterone). In this study, many forum discussants self-diagnose low testosterone based on varying and sometimes minor symptoms, such as lack of motivation and generalised fatigue. AAS are then sought as treatment. Conrad (2002) also underscored the role of special interest groups in promoting the medicalization of a particular problem, using the example of Alcoholics Anonymous (AA) and their influence on medicalising alcoholism. Fainzang (2016) also describes

the social aspect in self-medication culture, where processes of self-examination and the understanding of bodily signs as symptoms, can lend themselves to group cohesion and unity. She states that symptoms of illness are culturally established and may be decided collectively. It may be argued that online discussion forums as support groups and information points can act as a platform to promote the medicalization of physical and psychological life states. This is seen in the narratives of forum discussants who describe sourcing PIED to correct minor physical flaws or to simply enhance mood, motivation or to increase energy.

### ***8.2.2. Self-directed injecting***

The PIED injecting process as described in this study is self-directed, grounded in self-experimentation and largely conveyed as a solitary activity, yet embedded in a social group context in the discussion forum space. Consistent with previous studies (Brennan, Wells and Van Hout, 2016; Van Hout, 2014a; Cohen et al., 2007) and as theorised in Rodner (2005) in relation to individuals who inject psychoactive drugs, the culture of the discussion forum is to be “*drug wise*”, knowledgeable on PIEDs through personal experience, online research or peer discussion within forum threads. Lay expertise may be conceptualised as a strategy of empowerment of the group, as self-educating and research with regard to products, injecting and potential harms prior to commencement of use of PIED injectables were expectations of the forum community.

The notion of ‘reckless’ practice in PIEDS use is perceived as a failure to control in forums and as a flawed personality, rather than an indication of danger associated with the drugs themselves (Rodner, 2005). The ‘*notion of control*’ and the importance of individualistic free will in injecting PIED use is evident in the data. Rodner (2005) underscores the importance of reflexivity and consciousness in the individuals response

to knowledge accrued, in order to navigate risk through self-awareness and self-reflection. Some forum discussants demonstrate these skills, through monitoring of side effects and bodily responses. However, the '*notion of control*' is strengthened by practising self-monitoring. The '*notion of control*' is of inherent value and meaning to people who exercise their right to enhance their physicality, construct their identity and direct their own experience of PIED use. Due to high levels of knowledge, experience and research typically demonstrated forum discussants, decisions relating to PIED injecting are conceptualised as informed choices.

One example of the salience of a "*notion of control*" (Rodner, 2005) in PIED injecting is seen in use of DIY Botox and dermal filler kits. As posited in Peretti Watel and Moatti (2006) feelings of powerlessness, caused by such an inexorable force as aging, may increase tendencies to engage in voluntary risk taking in order to elevate the individual's sense of control. While Botox and dermal filler injections, to stave off the hallmarks of age are now semi-normalised in contemporary culture, some people may be motivated to seek less costly and more convenient options i.e. DIY kits online. It is evident in the rhetoric of forum discussants that use of Botox and dermal filler kits is seen as an act of autonomy over perceived obstacles (e.g. financial) in the pursuit of anti-aging goals.

Despite exhibiting knowledge of the increased risk associated with injection of potentially contaminated, counterfeit and over strength products sourced online, forum discussants adapt their core beliefs to accommodate a higher level of risk. As theorised in Peretti Watel and Moatti (2006) in relation to the risk perceptions of people who use drugs, people who injected PIED maintained self confidence in their own capabilities to

navigate hazards, despite demonstrating awareness of potential harm associated with sourcing products online and self-injecting. Peretti Watel and Moatti (2006) outlined that this type of self-belief may be accumulated through experience and is reinforced through peer discussion. In this regard, self-confidence to carry out PIED injecting is strengthened reciprocally within the communal dynamics of the forum.

### ***8.2.3 Self-medication***

Such autonomy over one's own health decision making and care is situated in a contemporary culture of self-medication, which has been described in recent studies which focused on topics such as diversification of over the counter medications for mood altering purposes (Carlisle Maxwell, 2015; Van Hout, 2014b) and home manufacture of psychoactive drugs (Hearne et al., 2016; Van Hout, 2014b). Home production of drugs for injection has been documented since the 1970s from the self-preparation of heroin using poppy heads in Poland to the current widespread professionalised manufacture of methamphetamine in the U.S (Grund, 2005). However, this study documented for the first time initial steps towards "kitchen chemistry" – home production of drugs - (Van Hout, 2014b) in injecting PIED culture, evident in threads concerning homebrewing AAS, reconstitution of PIED products, 'cocktail injecting', seeking dermal filler 'formulas' and mixing fillers at home for injection. The trend for individuals to take control of decision-making in their own health care and consumption of medication has potential to extend to the performance of medical procedures at home, as seen in the discovery of self-phlebotomy in individuals who inject AAS, where act of bloodletting is perceived as a valid intervention in the avoidance of health complications associated with higher doses. Within forums, the meaning of risk behaviour was reconstituted as a deliberate choice and experienced as

empowering where it was perceived that self-control of health had occurred (Lupton, 1999).

#### ***8.2.4. Disconnect from public health services and entrenchment in folk pharmacology***

The effect of governmentality on the embedment of PIED practices, harm reduction measures and health promotion messages in communal folk pharmacology was evident in the dataset. Recent studies (Underwood, 2017; Hanley, Santos and Coomber, 2016) highlight how the prohibitionist landscape where the AAS market is situated impacts on health risk for people who use AAS and other PIED as they are forced to source from an illicit sellers. While recent studies have commented on the social and localised context of AAS dealing networks (Van de Vena and Mulrooney, 2016; Antonopoulos and Hall, 2016), this study was concerned with online sourcing routes and associated risk. Many forum discussants in this study lamented the dangers of sourcing AAS products from the unregulated online market. This ‘hostile environment’ (Grund, 1993) provokes a response from individuals who then develop their own channels and produce their own indigenous rituals which facilitate the successful procurement and use of drugs (Grund, 1993) – seen in the case of homebrewing AAS. In addition to this, some forum discussants describe self-experimentation in the form of ‘test’ injecting products to gauge side effects and quality to be the only option in assessing the quality of products when sourcing PIED online from unregulated sellers.

The stigmatisation of drug use which accompanies prohibition also encourages a disconnect between individuals who inject drugs and social structures (Grund, 1993). Identifying as an ‘outsider’ has been described in the literature as a motivating factor for the initiation and continuance of injecting use of psychoactives (Southwell, 2005), as injecting holds status and value as an act of societal rebellion (McBride, Cullet and

Coward, 2001). Concepts of risk promoted by public health services act as surveillance and regulation over people who use drugs, particularly in relation to injecting (Lupton, 1999 pg 25). Risk is typically conceptualised by governmentality and institutions as a group phenomenon i.e. ‘at risk groups’ toward which interventions are designed (Lupton, 1999 pg 94). The nature of PIED injection is seen to be individualistic – injecting tends to be typically self-taught, rather than peer taught as with other forms of injecting drug use; self-experimentation; self-monitoring of symptomology – and this may add to the PIED community disconnect from public health services and healthcare practitioners where subjectivity and individual autonomy is not recognised. The ‘at risk’ and deviant labelling serves to instigate adherence to sets of subcultural and novel strategies, such as homebrewing and bloodletting, which support the continuance of drug use where society hinders and condemns. Collective risk positions may also be an important part of a social group identity (Lupton, 1999 pg 112). Such a subcultural group is likely to become self-reliant and independent from mainstream culture, to the extent that health promotion messages can be received with scepticism (Grund, 1993).

Discriminatory social discourse in wider society around PIED is impactful on how forum discussants feel about their social position, including demotivation to use needle exchange and “*add to statistics*”. Demonization of ‘syringe data’ amongst individuals who inject drugs was also seen in Vitellone, 2017 (pg 84) where the concept of statistics and social scientific facts was explored as constraining and denying injecting physicality, emotionality and intimacy contexts. The self-presentation of forum groups in our study acted as a strategy to offset perceived stigmatisation of PIEDS in the wider social space and preserve a positive self-concept (Rodner, 2005). Where individuals who inject AAS are cognizant of anti-drug sentiments directed towards them, rejection

of this socially prescribed deviant identity may present itself as a rationalising of potentially dangerous practices as normal and acceptable, using the ‘*notion of control*’ (Rodner, 2005) as justification. This type of rationalisation was evident in the forums where the competency of individuals surpassing that of professionals injecting Botox and dermal fillers was supported and the procedure of bloodletting was described as ‘*easy*’. Internalization of deviance labelling may also occur, which promotes separatism of the individual from the rest of society (Vitellone, 2017 pg 83) and any health promotion messages which it may generate.

### **8.3 The relationship with the syringe in PIED injecting**

*“What is politically at stake in describing the object of the syringe as an apparatus of passion rather than a ghostly sign imbued with alienation, separation and longing?”*

Vitellone, 2017 pg 59

Vitellone (2017 pg 1) comments that since the 1980s, harm reduction ethos and related services and models have been working to shift the concept of the individual who injects from disenfranchised deviant to responsible subject of public health. The notion of the first injection as an instant act of separatism from wider society (Fitzgerald et al., 1999 in Vitellone, 2017) is inaccurate and less useful than the idea of the individual who injects and negotiates risk, makes decisions and may construct their identity and selfhood through their relationship with the syringe itself. Through social processes of discrimination, labelling and stereotyping (Simmonds and Coomber, 2009), the use of a needle to inject drugs has been historically connoted with violence, sickness (Titmuss, 1970) self-destruction, chaos (Vitellone, 2017) irresponsibility and low morals (Simmonds and Coomber, 2009). Stigmatisation persists today (Brener et al., 2017;

Fraser et al., 2017; Rhodes et al., 2017). While some of this stigmatisation can be attributed to the act of drug use itself, discrimination against injectors can also occur in drug using groups who do not inject (Parker, Aldridge and Measham, 1998). Hence, while social science has mapped the ‘lived experiences’ (Karllson, 1995) of people who inject opiates and stimulants and their emotional relationship with the syringe (Vitellone, 2017), the perspectives of individuals who inject PIED towards their injecting had rarely been studied prior to this research.

In studies of groups of individuals who inject opioids and stimulants, use of the syringe has been described as more economical, more effective, reinforcing through the ‘rush’ effect and associated with less side effects compared to other routes of administration (Southwell, 2005; Pates and Wichter, 2005). It has also been said that pharmacological factors such as these do not suffice in explaining the lure of the syringe for individuals who inject and theories of ‘needle fixation’ have been offered to frame benefits experienced through injecting such as sexual excitement, masochism, ritual and status as a skilled injector (Pates, McBride and Arnold, 2005). Although needle fixators are in the minority of individuals who inject (Grund, 2005), elements of this phenomenon were seen in this study. Of particular interest is that in previous research, Pates, McBride and Arnold (2005) found that individuals who get tattooed also report symptoms of needle fixation, which may indicate that body modification or enhancement compounds any attachment to the syringe in injecting PIED use.

It has been acknowledged that individuals who inject PIED are a distinct and heterogeneous group of injectors, with a broad range of motivators for use. In forums, there were disparaging comments made about the injection of psychoactive drugs and



remarks of a dissociative nature were made to signify a distinct difference between the two groups of injectors. However, forum discussants in this study described feeling stigmatised by the general population at the same level as or higher than, individuals who inject opioids and stimulants. In both cases, in seeking to distance from the labelling of ‘injecting drug user’ and in being discriminated against by others, forum discussants have absorbed the ‘*social suffering*’ of the syringe (Vitellone, 2017 pg 25). This is also evident in the data where a negative perspective on needle exchange services is given in discussion threads. Vitellone (2017) posits that returning syringes to needle exchange reconstitutes individuals who inject drugs from ‘dirty’ drug users to conscientious public health citizens, however she notes that ‘*being overwhelmed by the syringe*’ and its negative social values may impact how people engage with services. While there are variations in the utilisation of needle and syringe programmes depending on country (Harm Reduction International (HRI), 2016), forum discussants in this study typically expressed scepticism towards the motivation of needle exchange services, perceiving them as modalities of governmentality and questioned the impact of ‘*syringe data*’ (Vitellone, 2017) on how the wider public perceive the PIED community. In this regard, forum discussants are incited to micro normalise injecting within the discussion forum space.

Vitellone uses Foucault’s concept of ‘*heterotopias of deviance*’ to describe meeting places for individuals who inject (Vitellone, 2017 pg 90) and I applied this to the discussion forum space in Chapter Seven. Rules which apply to heterotopias of deviance include requiring the acquisition of special knowledge for entry and submission to certain rules and regulations. Discussion forums are known to be hierarchal systems where experiential knowledge of PIED pharmacology and practices

is valued (Tighe et al., 2017). Heterotopias of deviance also act as escapism from institutional and power structures which may constrain the individual who is engaging in what is perceived as socially deviant behaviour (Vitellone, 2017). Within the safe space, the authentic self is found and enjoyed (Vitellone, 2017). As a subcultural place of escape for likeminded individuals to interact, discussion forums are a channel for expression and for identity construction through injecting PIED. Within discussion threads, descriptions of the physicality of injecting were found.

Vitellone (2017 pg 78) remarks that the sensory experience and physicality of injecting is often omitted from research, outside of negative portrayals of pathological types of *'needle fixation'*. The importance of physicality in injecting drug use was underscored in Vitellone (2017 pg 93), so much so that the author suggests that injecting drug use and harm reduction might be conceptualised as *'syringe sensation and affect withdrawal'*. Accounts by forum discussants identifying in posts as male centred on the often masochistic portrayal of injecting, with the capacity to endure pain and gore applauded as heroic. Visceral descriptions of injecting included use of emotional wording such as excitement, enjoyment, love. Those who could not inject without fear also attached emotionality to the syringe – disappointment, rejection, inadequacy. The syringe in this regard became a *'prosthetic object'* through which sense of self was constructed (Lury, 1998 in Vitellone, 2017 pg104). Construction of self through a prosthetic object can enfranchise the individual, as it makes change possible through experimentation and purposeful transformation (Lury, 1998). Once injecting has been performed successfully, technical competence and skill mastery is interwoven with self-esteem (Vitellone, 2017).

Vitellone underscores the value in identifying and acknowledging the innovative techniques, strategies and practices of individuals who inject drugs. The individual who injects makes decisions every day on their self-care, health care and bodily practices (Keane, 2003 pg 231 in Vitellone, 2017). The narratives of forum discussants in this study centred on well-known methods of safe injecting and also organic and indigenous techniques and strategies to reduce harm in PIED injecting, such as subcutaneous injection to avoid AAS related abscess, cocktail injecting to reduce frequency of injections, use of lidocaine in the syringe to reduce pain when injecting DIY cosmetic injectables. Only one of the reasons given for reusing syringes in online discussion forums were similar to justifications for sharing needles seen in the literature pertaining to opioid and stimulant injection – perceived lack of availability (Rhodes, Greenwood and Robertson, 2001). Other reasons such as withdrawal, intoxication and intimate relationships with sharing partners appear to be exclusive to injecting psychoactive drugs. When discussing the relationship with the syringe as seen in individuals who inject psychoactive drugs, Vitellone cited Bourgois (1999) conceptualisation of the syringe as a ready to hand object, used without thinking, rather than a present to hand object which is observed scientifically or theoretically (2017 pg 75). Due to the extensive research that individuals who inject PIED typically conduct in this study prior to and during their time spent injecting and also due to the nature of information sharing within the discussion forum space, it may be that the syringe is more present to hand in PIED injectors.

Processes of identity construction and individualism which occur through PIED use also occur through the act of injecting. Vitellone (2017) noted the presence of self-reflexivity in people who inject, in terms of their care of the self and notions of

responsibility, which she recognised as individualism occurring through the syringe. The syringe as a prosthetic object through which notions of the self are extended (Lury, 1998 in Vitellone, 2017) through processes of technical competence, performance of successful injecting and where safe, clean injecting is understood reflexively as a biography of the self, the self too is seen as safe and clean. Claiming ownership over the syringe and becoming skilled at injecting creates a sense of accomplishment (Vitellone, 2017).

#### **8.4 Revisiting the research objectives**

This doctoral research has presented an online study giving an illustration of contemporary injecting PIED use as described within discussion forums and documenting some previously undocumented practices. It contributes to our knowledge of fast moving and dynamic trends within injecting PIED culture. It also gives an insight into the phenomenon of injecting, in the context of PIED use and the functioning and dynamics of the online discussion forum space which houses a community of individuals who inject PIED.

This thesis began by stating that individuals who inject PIED present as a collective with a limited but expanding scientific evidence base on their injecting pathways and trajectories. The discussion forum space was highlighted as an important research setting due to its active role in educating and informing individuals who inject PIED on their sourcing routes, regimens and injecting practices and the access it provides to uncensored dialogue free from societal constraint or the potential bias introduced by the presence of a researcher. The aims and objectives of the research were outlined in Chapter One and I will discuss them retrospectively here.

*Research objective 1:* To build a detailed profile for cohorts of individuals who inject PIED in mainstream society to include motives for use, risk perceptions and risk navigation strategies

*Comment:* Findings demonstrate that consistent with the extant literature, the primary group of individuals who inject PIED in online discussion forums adhere to a recreational weighttraining lifestyle, which in its discipline and enthusiasm for body enhancement acts as the prototype for PIED injection in this context. Risk perceptions and risk navigation were typically informed through strategies of self-monitoring and self-care and safe injecting was prototypical group behaviour in forums. Deviant behaviour with increased risk e.g. unsafe injecting, high dosing was also seen in the data. However, this was not typically supported by online forum groups. Other groups of individuals who inject PIED were seen in this study to be motivated by lifestyle recovery after a history of illicit substance abuse, life satisfaction and wellbeing. These findings were elevated theoretically to an overarching concept of selfhood as a motivator for PIED injection when considered alongside evidence of identity construction through skilled injecting.

*Research objective 2:* To investigate attitudes and perceptions towards injecting PIED use amongst individuals who inject PIED

*Comment:* This study contributed evidence for perceptions, beliefs and values around injecting in PIED culture. Despite cognizance of discrimination in wider society towards injecting PIED use, normalisation of injecting within a micro context occurs within the discussion forum (Barratt, 2011). Injecting pleasure, particularly in men who inject PIED, was seen in the data, which contributes to positive perceptions of injecting

in the online space. Gendered identity displays in the data also showed that injecting was related to concepts of empowerment, skill refinement, individualism and hedonism. In this regard, identity construction and selfhood occurred through the syringe.

*Research objective 3:* To describe patterns of injecting in PIED use to include preferred site of administration, dosages and polypharming regimens

*Comment:* Several previously undocumented PIED injecting practices were discovered in the data for this study, including self-phlebotomy in individuals who inject AAS, ‘cocktail injecting’, subcutaneous injection of AAS, homebrewing of AAS for injection and use of DIY Botox and dermal filler kits. Of interest also is the preference for injecting over other routes of administration described online and the initiation of PIED use through the syringe rather than a pathway from oral to injecting.

*Research objective 4:* To review and build a profile of short and long term effects, side effects, risk of misuse and dependence for each product

*Comment:* A range of short and long term physiological and psychological symptoms relational to PIED use were described in discussion forums and presented in the thesis. While I was able to build profile of health outcomes for several PIED injectables, information on Synthol was limited.

*Research objective 5:* To identify product endorsement and estimate popularity of specific PIED injectables

*Comment:* Through gauging levels of interest through assessing volume of discussion posts relational to specific types of PIED and in line with extant prevalence data (Sagoe et al., 2015c) AAS were found to be the most popular PIED injectable discussed in

forums. GH was also popularly discussed but restricted to those who could afford the financial cost and locate a reliable seller. Melanotan injection was infrequently described, as were growth hormone releasing peptides (GHRP), CJC 1295 and insulin. Data on injecting SARMS use was very limited due to oral consumption of these PIED being more common. Data on DIY Botox and dermal filler kits was limited to one forum specific to skincare. The type of PIED injectable least commonly discussed in the data was Synthol.

*Research objective 6:* To identify sourcing routes and explore the relative diffusion of PIED injectables in non-registered online pharmacies and other online shops.

*Comment:* Typically PIED injectables for physique sculpting purposes were sourced through underground laboratories (UGL). Risks identified by forum discussants associated with this type of sourcing included understrength or contaminated ‘gear’. Diversification occurred through the practice of homebrewing AAS for injecting by some forum discussants. Information on sourcing of DIY Botox and dermal filler was limited to descriptions of ‘Chinese sellers’ as forum discussants were reluctant to name their sources publicly in threads. Similarly, I was unable to garner any new information on the sourcing of Melanotan.

*Research objective 7:* To provide a theoretical framework for future research and investigation in the field of injecting PIED use

*Comment:* Emergent from the data were new theoretical concepts of selfhood through injecting PIED use, communal folk pharmacology in online discussion forums, and the relationship with the syringe in PIED injecting. Despite cognizance of discrimination in wider society towards injecting PIED use, ‘micro normalization’ occurs within the

discussion forum. Central to this new theoretical framework was the concept of injecting as a tool to negotiate a gendered identity, achieve skill refinement, empowerment and mastery of the self. This theoretical contribution is useful in conceptualising the individual who injects PIED as individualistic, autonomous and innovative.

### ***8.5 Implications for practice and policy***

While several recent studies investigating PIED have utilised the online space (Underwood, 2017; Tighe et al., 2017; Van Hout and Hearne, 2016; Hall, Grogan and Gough, 2015), this research had a unique focus on injecting as the phenomenon of interest. Findings identified a number of key issues which have potential implications for current drug policy, healthcare practice and future research.

Recent netnographic research has underscored the need for a shift of policy focus away from prohibition to facilitate enhanced harm reduction awareness and public health outcomes (Underwood, 2017). One example of an outcome of the unregulated online market with poor quality and understrength PIED products is the phenomenon of ‘homebrewing’ AAS and kitchen chemistry such as self-reconstitution of DIY dermal fillers, seen in our study. This PIED kitchen chemistry may have added an additional layer of risk to the PIED environment. For people who inject AAS, ‘home brewing’ may present as a rational alternative to a problematic climate for purchasing well sourced and high quality AAS products. Diversification of the AAS online market in this regard increases potential for increased risk of infection, contamination and high strength dosing in the home environment. Policy makers and treatment providers



should be issued with clear guidelines and cognisant of the presentation of harms associated with homemade PIED production and use.

This study provided the first snapshot of online communal activity around practice of self-phlebotomy or bloodletting amongst people who inject AAS. Within this phenomena may be a new, hard to reach group of individuals who perform self-phlebotomy, self-isolating from medical professionals and at risk from contamination through unsterile conditions in the home and injecting harms. Risk potential for infection, fainting, head injury through collapse and cardiac arrest can be assumed.. The potential for lay conduction of medical procedures on the self in a space where people assume autonomy over their knowledge and understanding of the body and engage in self-medication and self-experimentation warrants further investigation. As posited by Titmuss, how blood is treated in the eyes of society may also influence on how “*human hearts, kidneys, eyes and other organs of the body may also come to be treated*” (Titmuss, 1970 pg 179). Self-phlebotomists are likely to be a hard to reach group with regard to health service intervention due to the potentially stigmatising nature of self-bloodletting as an AAS related behaviour and the situation of this phenomenon in PIED injecting culture, a subpopulation evidenced in the extant literature and in the data for this study to be estranged from the scientific and medical community.

Health services should be aware of the presentation of harms associated with the self-injection of Botox and dermal fillers. Those who engage in high risk injecting practices such as mixing products at home, or using unsterile equipment, may benefit from targeted harm reduction interventions intended to protect their safety and health. Development of specific harm reduction initiatives for people who inject DIY Botox

and dermal filler kits will be of benefit to healthcare workers, treatment providers and policy makers.

The aforementioned reticence to engage with medical professionals documented in the literature concerning people who inject PIED (Zanhow et al., 2017; Chandler and McVeigh, 2014; Pope et al., 2004) has positioned online communities and AAS ‘vets’ (established forum members with a long history of AAS use) as a primary source of harm reduction information. Medical treatment providers should be cognisant of the presentation of harms associated with self-phlebotomy in AAS injecting groups and engage with individuals in a non-judgemental and empathic manner, which is mindful of the emphasis the AAS community places on freedom of choice and autonomy over one’s own body and healthcare. Individuals who inject PIED hold strong beliefs that they should have the freedom to make informed choices with regard to their own health and bodies. Interventions should conceptualise people who inject PIEDS as rational individuals exercising free will and avoid “*prescriptive moralism*”, an expectation of conformance to social health norms (Keane, 2003 cited in Vitellone, 2017). Individuals who inject PIED uphold their human right to choose a particular course of action over their own bodies – “*I made the choice to ‘stay on’ 6 years ago when I was 33. It’s the right choice for me*”.

While this study’s findings with regard to safe injecting are congruent with findings from previous studies that forum members disseminate pragmatic harm reduction information amongst their peers (Boyer et al., 2007; Friedman et al., 2007; Holt and Treloar, 2008), promotion of self-management of adverse events may put some

individuals who inject PIED at risk. Interventionists must be cognisant of the individualistic and self-efficacious nature of self-directed PIED use.

Reticence to engage with medical professionals amongst people who inject PIED has been documented in the literature (Zanhow et al., 2017) and also seen in this study. In this regard, medical treatment providers should be cognisant of engaging with individuals in a non-judgemental and empathic manner, and be mindful of the emphasis the PIED community gives to autonomy over one's own body and healthcare.

The current statistics show that approximately one third of people who use AAS become dependent (Pope et al, 2017). AAS dependence symptomology was indicted in the narratives of some forum discussants in this study. There is a dearth of treatment facilities and programmes specific to AAS dependence and development of service provision in this area is warranted.

Online interventions as conceptualised by Papangelis et al (2016) may be effective in engaging and collaborating with forum discussants in the design of effective harm reduction strategies, informed by scientific research and evidence based indigenous and novel interventions embedded in lay epidemiology.

#### *Future research agenda*

The findings are illustrative of the need to research further the nature and content of internet drug forums in order to explore the variations in PIED injecting practices.

Future research should focus on the newly discovered phenomena identified by this

study. This research should focus on further investigation of injecting practices, to include safe injecting practices and harms experienced, as well as the sourcing of formulas to perform '*kitchen chemistry*' (Van Hout, 2014b) and manufacture dermal filler kits at home, particularly as this relates to evidence informed and targeted interventions to reduce harm.

The use of tanning injectable melanotan amongst bodybuilding subsets was an area of interest identified in the literature review for this study; however, data on this type of melanotan use was limited. Investigation of melanotan specific sites may result in more findings. The emotional relationship with injecting and the syringe in PIED use may serve as a framework for future investigation into the meaning and context of injecting within this culture and online.

Use of the online setting is a relatively new methodology for research. Learnings from this study which may be useful for future online research include the discovery that a combination of keyword searches and the downloading of 'most recent' threads resulted in an overload of results and an unmanageable dataset. While keyword searches are useful when collecting data on a prior theory or known phenomenon, most recent threads provide the most up to date and current knowledge on the topic under investigation. It may be useful for researchers to place date restrictions on their searches from the outset. Findings from the online setting, using a smaller dataset to this study and therefore additional time resources, could potentially be illuminated with a series of case studies or face to face interviews.

## ***8.6 Limitations***

This study has some limitations. It was not possible to identify demographic profiles of forum discussants due to the sporadic nature of details given such as gender and age. Discussion forums originated in the U.S.A. and in the U.K; however, the geographical location of forum discussants could not be ascertained. This may be important when considering availability of needle exchange services and the legality of certain PIEDs. The study was also limited to publicly available forums. Data collected in relation to the injecting practices of individuals who inject Synthol was limited, which was due to the stigmatisation which exists towards this particular type of PIED injection in the forums sampled. It would have been useful to have accessed more information on Melanotan injection, however there were limited threads collected, due to the overwhelming focus on AAS and other physique sculpting PIED within the forums sampled. In hindsight, there were too many search terms used as orienting concepts (Layder, 1998) which resulted in a very large dataset (1, 113 files for coding) and an excess of data in relation to certain areas of research, which slowed down the process of investigation. The self-report nature of textual data collected from discussion forums is also a limitation, though verification was strengthened through cross checking of similarities across the experience reports of individuals who inject PIED. While every effort was made to exclude posts which referred to oral or other routes of administration of PIEDs, it is possible that some posts referring to overall health outcomes included oral use.

Nevertheless, this study provides a unique snapshot of contemporary injecting PIED culture as articulated in the online space. It reports on several previously underdocumented practices and contributes insight into perceptions, beliefs and values relational to injecting within online forums specific to PIED use. This study makes a

contribution to theory through the consideration of the impact of societal power structures alongside the ‘lifeworld’ of forum discussants, or the subjective realm at every stage of data collection and analysis. Three theoretical concepts were developed: selfhood in injecting PIED use, communal folk pharmacology in online discussion forums and the relationship with the syringe in PIED injecting, which may form a framework for future research in this field.

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An Ethnopharmacological Study of The  
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Drugs (PIED)  
Volume II of II

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## Chapter 10: Appendices

### Appendix A: Quantitative studies CASP chart

| Title                                                            | Year | Place | Author/s       | Design          | Data collection | Setting | Sample size | Response rate | Outcome measures                                                                                        | Main findings                                                                                                                                                                                                                                             | Contribution                                                                             | Strengths                                                                                              | Weaknesses                                                                                                                                                            |
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| 1<br>Gym and tonic:<br>A profile of 100<br>male steroid<br>users | 1997 | UK    | Evans, N.<br>A | cross-sectional | survey          | gym     | 100         | n/a           | Demographics, type of AAS used, duration of use, dosages used, use of other substances, adverse effects | AAS dosages ranged from 250 to 3200 mg per week. Combinations of drugs were used. Cycles ranged from 4 to 12 weeks. 86% reported polydrug use regimens in addition to AAS use. Acne, striae, and gynaecomastia were amongst the adverse effects reported. | One of the first studies to look at AAS use in gyms, profile users and drug use patterns | Study addressed a clearly focused issue. Methods of selection clearly described. Representative sample | Selection bias through use of a self selected sample. Survey left in gyms for participants to voluntarily complete. Cross-sectional design may limit generalizability |



| Title                                                                                                                                                          | Year | Place | Author/s                                               | Design          | Data collection       | Setting              | Sample size               | Response rate | Outcome measures                                                                                                                                                       | Main findings                                                                                                                                                                                                                                                       | Contribution                                                                                                                                                            | Strengths                                                                                                              | Weaknesses                                                                                                        |
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| 2 A preliminary investigation into the relationship between anabolic-androgenic steroid use and the symptoms of reverse anorexia in both current and ex-users. | 2003 | UK    | Cole, J.C., Smith, R., Halford, J.C and Wagstaff, G. F | cross-sectional | survey                | gym, needle exchange | 137                       | n/a           | Bodyweight, dieting and nutrition, substance use, the modified eating disorder inventory (EDI), the severity of dependence scale (SDS) for both exercising and AAS use | AAS users sought to create a muscular body more than those who did not use AAS. Those with current and past history AAS use scored higher on the reverse anorexia EDI than non AAS users. AAS use- but not bodybuilding alone- was associated with reverse anorexia | Few studies have focused on whether reverse anorexia or muscle dysmorphia symptoms cease after AAS use is discontinued. This study contributes evidence in this regard. | Study addressed a clearly focused issue. Samples taken from four separate gyms randomly reducing selection bias.       | Small sample. Cross-sectional design may reduce generalizability. Self report measures may introduce recall bias. |
| 3 New challenges for agency based syringe exchange schemes: analysis of 11 years of data (1991 to 2001) in Merseyside and Cheshire, UK                         | 2003 | UK    | McVeigh, J., Beynon, C and Bellis, M. A                | longitudinal    | SEP monitoring system | needle exchange      | 206,789 syringe exchanges | n/a           | n/a                                                                                                                                                                    | Numbers of AAS users accessing needle exchange has significantly risen (sixfold) in the 11 years of monitoring.                                                                                                                                                     | This paper contributes evidence for increasing levels of AAS use in the Merseyside area.                                                                                | Study addressed a clearly focused issue. Longitudinal design over eleven years. Method of selection clearly described. | Limited to AAS users accessing needle exchange services. Regional study findings are non generalizable locally.   |

| Title                                                                                            | Year | Place | Author/s                                                                | Design          | Data collection | Setting          | Sample size | Response rate | Outcome measures                                                                                                              | Main findings                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Contribution                                                                                                                                               | Strengths                                                                                                                                            | Weaknesses                                                                                                                                                                                                                |
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| 4 Anabolic steroid users' attitudes towards physicians                                           | 2004 | USA   | Pope, Jr. H.G, Kanayama, G., Ionescu-Pioggia, M and Hudson, J.I         | cross-sectional | interview       | research offices | 80          | n/a           | demographic information, athletic history and history of licit and illicit drug use, Structured Clinical Interview for DSM-IV | While participants rated physician knowledge as high on general health, cigarette smoking, alcohol, and conventional illicit drugs, knowledge on AAS was rated low and no more reliable than friends, the internet or AAS dealers. 40% of AAS users trusted as much as any physician, and 56% had not disclosed their AAS use to a physician. A mean of 3.1 agents was found in typical PIED regimens. Cycles ranged from 5 to 10 weeks, and often included supraphysiological dosages 5 to 29 times greater than therapeutic dose. 33% of respondents met criteria for AAS | This study contributes evidence for mistrust in physicians amongst AAS users which may hinder intervention                                                 | Study addressed a clearly focused issue. Appropriate methods to answer the research question. Participants were not aware of the focus of the study. | Small sample size. Self selection bias may have been introduced. Self report measures used.                                                                                                                               |
| 5 Anabolic steroid use in weightlifters and bodybuilders: an internet survey of drug utilization | 2005 | USA   | Perry, P.J., Lund, B.C., Deninger, M.J., Kutscher, E.C and Schneider, J | cross-sectional | survey          | online           | 207         | n/a           | demographics, AAS use, side effects, information sources, AAS dependence according to DSM-IV criteria                         | 1 dosages 5 to 29 times greater than therapeutic dose. 33% of respondents met criteria for AAS                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Potentially complicated drug regimens of AAS users are underdocumented. This study identified drug use patterns of AAS users to further knowledge of same. | Study addressed a clearly focused issue. Results are applicable to the local population. Geographically diverse sample due to internet setting.      | Internet study can introduce selection bias due to self selection and nonrepresentative nature of the Internet. Moderate sample size from survey. Survey advertised on bodybuilding sites which may have introduced bias. |

| Title                                                      | Year | Place | Author/s                                         | Design          | Data collection | Setting | Sample size | Response rate | Outcome measures                                                                                                                  | Main findings dependence                                                                                                              | Contribution                                                                                                 | Strengths                                                                                                                                 | Weaknesses                                                                                          |
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| 6 UV light tanning as a type of substance-related disorder | 2005 | USA   | Warthan, M. W., Uchida, T and Wagner, R. F., Jr. | cross-sectional | survey          | beach   | 145         | n/a           | Positive findings from modified versions of the CAGE (Cut down, Annoyed, Guilty, Eye-opener) Survey, and modified DSM-IV criteria | 26% met the modified CAGE criteria, and 53% met the modified DSM IV criteria for a substance-related disorder with regard to tanning. | One of the first studies to investigate tanning as an addictive behaviour using modified diagnostic criteria | Study addressed a clearly focused issue. Appropriate methods to answer the research question. Results applicable to the local population. | cross-sectional design may not be generalizable. Only refers to outdoor tanning. Small sample size. |

| Title                                                                                           | Year | Place | Author/s                               | Design          | Data collection | Setting | Sample size | Response rate | Outcome measures                                                   | Main findings                                                                                                                                                                                                                 | Contribution                                                                                                  | Strengths                                                                                                                                                                             | Weaknesses                                                                                                                                                                                                                                               |
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| 7 Steroid and prescription medicine abuse in the health and fitness community: A regional study | 2006 | Wales | Baker, J.S., Graham, M.R and Davies, B | cross-sectional | survey          | gym     | 210         | 69.50%        | Demographic and social characteristics, onset of use, polydrug use | This study has estimated one of the highest prevalence rates of AAS use in the published literature. 70% (102) reported using AAS use, 65.8% (96) were currently using. 7% (10) were female. Use of growth hormone was at 24% | One of the pioneering studies indicating use of PIEDs amongst recreational athletes in gyms and health clubs. | Study addressed a clearly focused issue. Appropriate method used to answer the research question. Results applicable to the local population. Methods of selection clearly described. | Cross-sectional design may not be generalizable. Sample selected from gyms that were seen to be "hardcore" through the availability of heavy weightlifting equipment and with a predominantly male clientele. Subject to selection bias for this reason. |

| Title                                                                                                                                 | Year | Place  | Author/s                                                                      | Design       | Data collection          | Setting          | Sample size | Response rate | Outcome measures                                                                                | Main findings                                                                                                                                                                                                                                                                             | Contribution                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Strengths                                                                                                                                                 | Weaknesses                                        |
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| Psychiatric side effects induced by supraphysiological doses of combinations of anabolic steroids correlate to the severity of abuse. | 2006 | Greece | Pagonis, T.A., Angelopoulos, N.V., Koukoulis, G.N and Hadjichristodoulou, C.S | cohort study | Psychometric instruments | research offices | 320         | n/a           | The Symptoms Check List-90 (SCL-90) and the Hostility and Direction of Hostility Survey (HDHQ). | The study showed a significant increase in all psychometric subscales recorded in active users of AAS and no statistically significant difference in groups administered placebo drugs, and groups of non users. Heavy abuse patterns were most associated with psychiatric side effects. | Previous clinical studies investigating AAS have administered volunteers with unrealistically low dosages of AAS compared to real life drug regimens. They have also failed to account for the typical polypharming of AAS users due to ethical concerns. This study observed AAS users who were self administering real life AAS regimens. It found a wide range of psychiatric symptoms caused by AAS use to be dose responsive and to increase in severity the higher the dose of AAS. | Study addressed a clearly focused issue. Psychometric measures were validated prior to study. Precise results that can be applied to the local population | Self selected sample may introduce sampling bias. |

| Title                                                 | Year | Place | Author/s                      | Design          | Data collection | Setting | Sample size | Response rate | Outcome measures                                               | Main findings                                                                                                                                                                                                                                                                                                                                                                             | Contribution                                                                                                                                               | Strengths                                                                                                                                       | Weaknesses                                                                                                                                        |
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| 9 Anabolic androgenic steroids: a survey of 500 users | 2006 | USA   | Parkinson, A.B and Evans, N.A | cross-sectional | survey          | online  | 500         | n/a           | dosages, regimes demographics , polydrug use, and side effects | 78.4% were recreational bodybuilders<br>59.6% reported using at least 1000 mg of testosterone weekly. 99.2% of AAS users self-inject AAS formulations, and up to 13% reported high risk injection practices e.g. reusing needles, sharing needles, and sharing vials. 25% admitted to concomitant use of growth hormone and insulin and 99.2% reported adverse side effects from AAS use. | Potentially complicated drug regimens of AAS users are underdocumented. This study identified drug use patterns of AAS users to further knowledge of same. | Study addressed a clearly focused issue. Results are applicable to the local population. Geographically diverse sample due to internet setting. | Internet study can introduce selection bias due to self selection and nonrepresentative nature of the Internet. Moderate sample size from survey. |

| Title                                  | Year | Place | Author/s                                                                                                   | Design          | Data collection | Setting          | Sample size | Response rate | Outcome measures                                                                                                                                                                                                                                                                                                          | Main findings                                                                                                                                                                                                                                                                                                                                     | Contribution                                                                                  | Strengths                                                                                                                                                                                                         | Weaknesses                                                                                                                                                                                                                                       |
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| 10 Tanning in body dysmorphic disorder | 2006 | USA   | Phillips, K.A., Conroy, M., Dufresne, R.G, Menard, W., Didie, E.R., Hunter-Yates, A., Fay, C and Pagano, M | cross-sectional | interviews      | research offices | 200         | n/a           | The Yale-Brown Obsessive Compulsive Scale Modified for Body Dysmorphic Disorder (BDD-YBOCS), LIFE-RIFT (Range of Impaired Functioning Tool), Medical Outcomes Study 36-Item Short-Form Health Survey (SF-36), Structured Clinical Interview for DSM-IV—Non-Patient Version (SCID-I/NP), Clinical Global Impressions Scale | Among tanners, 84% reported their skin as a matter of concern. All tanners had impaired functioning due to body dysmorphic disorder (BDD), 26% had attempted suicide, with poor overall quality of life. 52% of tanners had sought treatment for their skin which had no impact on their BDD. Compulsive skin picking was more likely in tanners. | This study contributes evidence for excessive tanning as a body dysmorphic disorder behaviour | Study addresses a clearly focused issue. appropriate design to answer the research question. The first study to systematically investigate tanning as a BDD behaviours. Broader sample than previous BDD studies. | Did not document type or frequency of tanning or determine specific body areas for tanning. The effect of tanning on appearance preoccupations was not assessed. Did not assess negative effects of tanning or the compulsive nature of tanning. |

| Title                                                                                                                | Year | Place   | Author/s                                                                                    | Design          | Data collection | Setting         | Sample size | Response rate | Outcome measures                                                                                   | Main findings                                                                                                                                                                                                                                                                                                                                     | Contribution                                                                                                         | Strengths                                                                                                                                                            | Weaknesses                                                                                     |
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| 1<br>1<br>Anabolic ergogenic substance users in fitness-sports: A distinct group supported by the health care system | 2006 | Germany | Striegel, H., Perikles, S., Frisch, S., Roecker, K., Dietz, K., Dickhuth, H.H and Ulrich, R | cross-sectional | survey          | fitness centres | 1802        | 34.50%        | biometric parameters, social indicators, physical fitness, use of stimulants, illicit drugs, PIEDs | 13.5% disclosed lifetime use of PIEDs. Use of PIEDs was positively associated with cocaine use, training years, training frequency, negatively associated with level of education, and alcohol intake. PIED use was significantly associated with illicit drug use particularly cocaine. Sourcing included the health care system and physicians. | One of the first studies to indicate the transgression of PIED use from subcultural groups to mainstream populations | Study addressed a clearly focused issue. appropriate design to answer the research question. Large representative sample. Results applicable to the local population | Self report measures. unsatisfactory response rate, non response may introduce selection bias. |



| Title                                                                                                                                                       | Year | Place | Author/s                                          | Design          | Data collection | Setting | Sample size | Response rate | Outcome measures                                                                                                                                                                 | Main findings                                                                                                                                                                                                                                                                                                                                | Contribution                                                                                                                                                          | Strengths                                                                                                                                                                                                                                                                                                                                                           | Weaknesses                                                                                        |
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| 1<br>2<br>A league of their own: demographics, motivations and patterns of use of 1,955 male adult non-medical anabolic steroid users in the United States. | 2007 | USA   | Cohen, J., Collins, R., Darkes, J and Gwartney, D | cross-sectional | survey          | online  | 2663        | 73%           | demographics, AAS use patterns, buying behaviour, positive effects and adverse effects of use, physical and psychiatric health history, drug use history, and dietary practices. | The majority of respondents did not start using AAS before adulthood. AAS use was not motivated by athletic. Typical user profile was white, educated to a high standard, employed, approximately 30 years of age, above average income, did not play organized sports, and whose use was motivated by the creation of a well built physique | Much of the existing research on AAS had focused on competitive sporting athletes. This study was one of the first to focus on recreational weight training athletes. | Large sample of user participants from across the US more representative than studies using small selective samples. In-depth survey despite large sample. Results displayed in figures and tables. This study was one of the first to profile the AAS user as a non-sporting professional, with drug use motivated by aesthetics rather than sporting performance. | Online sampling may be subject to selection bias. Self report measures may introduce recall bias. |

| Title                                                                      | Year | Place | Author/s                                                                       | Design                             | Data collection | Setting                  | Sample size | Response rate | Outcome measures | Main findings                                                                                                                                                                                                                                                                                                                                                                                            | Contribution                                                                                                                             | Strengths                                                                                                                                                        | Weaknesses                                                                                                                                     |
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| 1<br>3<br>Anabolic Steroid Abuse among Teenage Girls: An Illusory Problem? | 2007 | USA   | Kanayama, G.,<br>Boynes, M.,<br>Hudson, J.I.,<br>Field, A.E.,<br>Pope, Jr. H.G | review of cross-sectional research | surveys         | national and high school | n/a         | n/a           | n/a              | This review of survey data in relation to use of AAS in teenage girls found survey findings to vary greatly, with lifetime prevalence of AAS use estimated between 0.1% and 7.3%. Upon examining surveys with high prevalence, phrasing of certain questions may have led to confusion over which type of steroids the survey referred to, leading to false positives and over estimation of prevalence. | This review of survey data raises methodological concerns with regard to surveys estimating prevalence of AAS use amongst teenage girls. | Study addressed a clearly focused issue. Review of four large national surveys and several smaller surveys. Appropriate design to answer the research questions. | Teenage girls may not be representative of the typical female AAS user. Cross sectional design of surveys reviewed may limit generalizability. |

| Title                                                                                                                                                          | Year | Place     | Author/s                                                                                                                                                   | Design          | Data collection                                                                                   | Setting         | Sample size | Response rate | Outcome measures                                                                    | Main findings                                                                                                                                                                                                                | Contribution                                                                                                                                                                                        | Strengths                                                                                                                                                                                                                                           | Weaknesses                                                                                                                                                                                 |
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| 1<br>4<br>Left ventricular early myocardial dysfunction after chronic misuse of anabolic androgenic steroids: a Doppler myocardial and strain imaging analysis | 2007 | Italy     | D'Andrea, A., Caso, P., Salerno, G., Scarafile, R., De Corato, G., Mita, C., Di Salvo, G., Severino, S., Cuomo, S., Liccardo, B., Esposito, N., Calabro, R | Case control    | Standard Doppler echocardiography, Doppler myocardial imaging (DMI) and strain rate imaging (SRI) | lab             | 45          | n/a           | n/a                                                                                 | Power athletes with longterm AAS use history, several years after cessation of use, showed subclinical impairment of both systolic and diastolic myocardial function, which was highly dose dependant.                       | This study contributes evidence for cardiac dysfunction in AAS users, even several years after cessation of use.                                                                                    | Addressed a clearly focused issue. Appropriate method used to investigate AAS associated myocardial dysfunction in power athletes. Confirmed the validity of DMI and SRI as instruments to investigate cardiac damage in current and past AAS users | Generalizability of findings limited to power athletes. Cross sectional design cannot track participants to investigate later development of cardiac issues. Use of AAS was self reported. |
| 1<br>5<br>Injecting risk behaviour and related harm among men who use performance- and image-enhancing drugs                                                   | 2008 | Australia | Larance, B., Degenhardt, L., Copeland, J and Dillon, P                                                                                                     | cross-sectional | interview                                                                                         | needle exchange | 60          |               | demographics, patterns of use, injecting risk, health and information/help-seeking. | Rates of needle sharing were low (5%), re-use of needles, injecting from a shared container, injecting other drugs of abuse, as well as injecting insulin injecting into small muscle groups were reported. Participants who | PIED injection is understudied due to difficulties in gaining access to PIED users willing to disclose details of their use. This study examines injecting risk behaviours and harms in PIED users. | Study addresses focused issue. Appropriate design to ascertain prevalence and types of risk behaviours amongst PIED users.                                                                                                                          | Small sample size. Generalisability limited as findings are limited to PIED users who access needle exchange services. This could introduce selection bias.                                |

| Title | Year | Place | Author/s | Design | Data collection | Setting | Sample size | Response rate | Outcome measures | Main findings                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Contribution | Strengths | Weaknesses |
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|       |      |       |          |        |                 |         |             |               |                  | <p>reported being Hepatitis C positive had lifetime heroin use and history of illicit drug injection. HIV positive participants were gay/bisexual males. Injuries and diseases reported included fevers, scarring and abscesses. 38% of participants were characterised as 'risky' injectors and were more likely to have early age of onset, use longer PIED cycles, and report incidences of aggression than 'low risk' injectors. Participants sought PIED information from internet sites (62%) and friends (55%).</p> |              |           |            |

| Title  | Year | Place  | Author/s                                                                                   | Design          | Data collection | Setting         | Sample size | Response rate | Outcome measures                                                 | Main findings                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Contribution                                                                            | Strengths                                                                                                                | Weaknesses            |
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| 1<br>6 | 2008 | Jordan | Tahtamouni, L.H., Mustafa, N.H., Alfaouri, A.A., Hassan, I.M., Abdalla, M.Y and Yasin, S.R | cross-sectional | survey          | college and gym | 657         | 100 %         | demographics, prevalence of AAS use and attitude towards AAS use | 4.2% of college students were active AAS users and 26% of athletes. Mean age of AAS users was 19.9 in the college student group and 28.1 in the group of athletes. Almost one-third of students commenced AAS use prior to being 15 yrs. old. More than half of the athletes commenced AAS use between 15 and 18 years. Sourcing was reported as being through friends and coaches. Motivation for use included athletic performance enhancement and improvement of appearance. | One of the first studies to investigate prevalence of AAS outside of Western countries. | Study addressed a clearly focused issue. appropriate design to answer the research question. Satisfactory response rate. | Self report measures. |

|    | <b>Title</b>                                                                            | <b>Year</b> | <b>Place</b> | <b>Author/s</b>                                            | <b>Design</b>   | <b>Data collection</b> | <b>Setting</b> | <b>Sample size</b> | <b>Response rate</b> | <b>Outcome measures</b>                                                                                                               | <b>Main findings</b>                                                                                                                                                                                                                                                                                         | <b>Contribution</b>                                                                                                               | <b>Strengths</b>                                                                                                                                                                                                                    | <b>Weaknesses</b>                                                                                                                                                              |
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| 17 | Oils of local application inside of the muscle: epidemiology of the use in bodybuilding | 2009        | Brazil       | Azevedo, M. P.A, Ferreira, A.C.D and Ferreira, U.M.G       | cross-sectional | survey                 | gym            | 533                | n/a                  | n/a                                                                                                                                   | 11% of bodybuilders surveyed were using some form of oil injection to boost the appearance of certain muscle groups. Typical users were in their twenties, male and with low income. Adverse effects suffered by participants included pain, fever, boils, tachycardia                                       | Very little epidemiological studies exist on oil injection in bodybuilders. Adds to the limited literature base on oil injection, | Study addressed a clearly focused issue. Appropriate method used to answer the research question. Adequate sample size. Methods of selection clearly described.                                                                     | Cross-sectional design may limit generalizability. Regional sample, results may not be applicable to the local population. Self report measures may be subject to recall bias. |
| 18 | Human Growth Hormone Abuse in Male Weightlifters                                        | 2010        | USA          | Brennan, B.P., Kanayama, G., Hudson, J.I and Harrison, G.P | case control    | survey                 | gym            | 248                | 93%                  | Demographics, the structured clinical interview for DSM-IV, psychological rating scales, fat-free mass index (FFMI), drug use history | This study is part of a larger scale case control study of American weight lifters which began in 2005. 27 (12%) used GH or insulin-like growth factor-1 (IGF-1). All of these 27 men also used AAS and 22 (81%) met criteria for AAS dependence. Fifteen (56%) also disclosed current or past dependence on | This study contributes evidence to the limited epidemiological data on GH users in the published literature                       | Study addressed a clearly focused issue. Study design appropriate for assessing GH use in AAS using male weightlifters. Methods were designed to reduce selection bias, as participants were not informed of the focus of the study | Self report measures which may introduce recall bias                                                                                                                           |

| <b>Title</b> | <b>Year</b> | <b>Place</b> | <b>Author/s</b> | <b>Design</b> | <b>Data collection</b> | <b>Setting</b> | <b>Sample size</b> | <b>Response rate</b> | <b>Outcome measures</b> | <b>Main findings</b>                                                                                                                                                    | <b>Contribution</b> | <b>Strengths</b> | <b>Weaknesses</b> |
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|              |             |              |                 |               |                        |                |                    |                      |                         | illicit drugs. There was a significant increase in GH prevalence when compared to a similar study which the authors conducted in 2003, indicating a rise in popularity. |                     |                  |                   |

| Title                                                                                  | Year | Place | Author/s                                         | Design          | Data collection | Setting | Sample size | Response rate | Outcome measures                                                                                                                                           | Main findings                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Contribution                                                                                                 | Strengths                                                                                                                                                       | Weaknesses                                                                                                                                                                                           |
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| 19 Body image disturbance in 1000 male appearance and performance enhancing drug users | 2010 | USA   | Hildebrandt, T, Alfano, L and Langenbacher, J.W. | cross-sectional | survey          | online  | 1493        | 67%           | Muscle Dysmorphic Disorder Inventory (MDDI), Situational Inventory of Body Image Dysphoria (SIBID-SF), Multidimensional Body-Self Relations Survey (MBSRQ) | 94% used AAS, with testosterone the most popularly used AAS (90.3%) 85.3% reported use of fat burning agents. 27.9% reported use of illicit thermogenics such as clenbuterol. 3.1% reported use of insulin growth factor (IGF-1) with 6.1% using human growth hormone (GH). Median number of cycles undertaken was 2. Median AAS weekly dosage was 1000mg-1250mg. Model interpretation found that body image disturbance was heterogeneous and dependant on differing body ideals (leanness, size) within users. Bodybuilders had the most body image disturbance, with powerlifters less affected. | Few studies have focused on the heterogeneous nature of body image disturbance within subgroups of AAS users | Study addressed a clearly focused issue. Appropriate design to answer the research question. Methods of selection clearly described. Satisfactory response rate | Online sample selection may introduce bias. Unable to tell whether sample is representative due to the nature of the internet as a research setting. Self report measures may introduce recall bias. |



| Title                                                           | Year | Place | Author/s                                                | Design          | Data collection | Setting | Sample size | Response rate | Outcome measures                                                                                                                                                                           | Main findings                                                                                                                                                                                                                                                                                                                                                                                 | Contribution                                                                                                                                                                    | Strengths                                                                                                                                                           | Weaknesses                                                                                                                                  |
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| 20<br>Women and anabolic steroids: an analysis of a dozen users | 2010 | USA   | Ip, E.J., Barnett, M.J., Tenerowicz, M.J and Perry, P.J | cross-sectional | survey          | online  | 1277        |               | demographics, use of AAS and other performance-enhancing agents, alcohol and illicit drug use, substance dependence disorder, DSM-IV criteria, and history of sexual and/or physical abuse | 12 of 1277 respondents were female AAS users (230 women were non users). They reported polysubstance using with an average of 8.8 performance enhancing agents. Female AAS users were more likely to have met criteria for substance-dependence disorder than female non users and male AAS users (58.3%) 50% diagnosed with a psychiatric illness & 41.7% reported a history of sexual abuse | This study contributes evidence for female use of AAS which is underresearched due to low prevalence. Study shows high incidence of mental disturbance amongst female AAS users | Study addressed a clearly focused issue in an underresearched area. Appropriate method used to answer the research question. Method of selection clearly described. | Small sample size of female AAS users. Online recruitment and cross-sectional design may introduce sampling bias and limit generalizability |

| Title  | Year       | Place | Author/s | Design                                                                 | Data collection | Setting | Sample size  | Response rate | Outcome measures | Main findings                                      | Contribution                                                                                                                                                                                                                                                                            | Strengths                                                                                                                   | Weaknesses                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                               |
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| 2<br>1 | 1991–2005. | 2010  | Finland  | Mattila, V.M., Parkkari, J., Laakso, L., Pihlajamaki, H and Rimpela, A | cross-sectional | survey  | the military | 10 829        | 96%              | demographics , socioeconomic variables, use of AAS | 0.9% of sample reported AAS use. 0.3% reported that they would use AAS if they had access to them. AAS use was associated with weight training more than three times a week low educational status and alcohol use. Sports other than weight training were not associated with AAS use. | Exact prevalence of AAS use is unknown. This study aimed to estimate the prevalence of AAS use amongst young Finnish males. | Study addressed a clearly focused issue. Study design appropriate for answering the research question. Method of selection clearly described. Large sample. | Those exempted from duty in the military service due to health reasons and those who chose to enter the civilian service were not surveyed. There is a possibility conscripts felt pressure not to disclose AAS use. As the original purpose of the survey was not to explore AAS use, type, dosages and cycle details were not investigated. |

| Title                                                                       | Year | Place  | Author/s                                                          | Design          | Data collection | Setting                | Sample size | Response rate | Outcome measures                                                                                        | Main findings                                                                                                                                                                                                                                                                                        | Contribution                                                                                                                                                          | Strengths                                                                                                                                     | Weaknesses                                                                                                                                                   |
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| 2<br>2<br>Substance abusers' motives for using anabolic androgenic steroids | 2010 | Sweden | Petersson, A., Bengtsson, J., Voltaire-Carlsson, A and Thiblin, I | cross-sectional | survey          | substance abuse centre | 175         | n/a           | age of onset of AAS use, total amount of time spent using AAS, number of AAS cycles, motivators for use | 11% reported using AAS. Motives for use included aesthetics, strength, and performance enhancement. Also reported as motivators for use were concealing illicit drug use, to improve self confidence, to boost courage or to assist in committing crimes. Side effects experienced included negative | Previous studies have suggested a link between use of AAS and illicit drugs. This study examines motivators for AAS use in people attending a substance abuse centre. | Study addressed a clearly focused issue. Study design appropriate for answering the research question. Method of selection clearly described. | Moderate sample size. Generalisability limited as findings are limited to AAS users who access substance abuse centres. This could introduce selection bias. |

| Title                                                                                                                                | Year | Place   | Author/s                           | Design          | Data collection | Setting      | Sample size | Response rate | Outcome measures                                   | Main findings                                                                                                                                                                                                                                                                                                       | Contribution                                                                                        | Strengths                                                                                                                 | Weaknesses           |
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| 2<br>3<br>Sport, and use of anabolic androgenic steroids among Icelandic high school students: a critical test of three perspectives | 2010 | Iceland | Thorlindsson, T and Halldorsson, V | cross-sectional | survey          | high schools | 11,031      | n/a           | use of AAS, engagement in sports, illicit drug use | Prevalence was found to be 0.9%. Use of AAS was not significantly associated with engagement in competitive sports, but is positively associated with recreational fitness training. A strong link between AAS use and illicit drug use was found as well as a moderate association between AAS and tobacco smoking | This study contributes evidence for use of AAS outside of sporting cohorts in a high school sample. | Study addressed a clearly focused issue. appropriate design to answer the research question. Large representative sample. | Self report measures |

| Title                                                                                                    | Year | Place     | Author/s             | Design          | Data collection | Setting           | Sample size | Response rate | Outcome measures                                                                                     | Main findings                                                                                                                                                                                                                                                                                                                                                                                   | Contribution                                                                                                                                                                                                                           | Strengths                                                                                                                                                                                 | Weaknesses                                                                                                                                                                                                                                                                                                                                                                     |
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| 2<br>4<br>The epidemiology of anabolic-androgenic steroid use among Australian secondary school students | 2011 | Australia | Dunn, M and White, V | cross-sectional | survey          | secondary schools | 22,830      | 76%           | Lifetime and recent use of steroids as well as use of other substances including tobacco and alcohol | Low level AAS use was found amongst students: 2.4% - with use more common among 12–15-year olds than 16–17-year olds. More likely to use AAS were males, those that spoke a language other than English at home, absences from school, self stated low level scholastic ability . AAS users reported using other substances also which suggests use of AAS as part of polydrug experimentation. | High prevalence of AAS use has been documented in previous studies examining secondary school students in other countries. This study addressed the gap in research documenting prevalence of AAS use in Australian secondary schools. | Study addressed a clearly focused issue. Large sample size. Appropriate study design to answer the research question. Satisfactory response rate. Methods of selection clearly described. | Sample may not be representative of the typical AAS user commencing AAS use in their mid twenties (Pope et al, 2014). This may lead to underestimations of prevalence. Not all students were present for survey, and absentee students are more likely to use AAS according to the results of this survey. Use of school age sample is more likely to produce false positives. |

| Title                                                                                                                               | Year | Place | Author/s                                                | Design          | Data collection | Setting | Sample size | Response rate | Outcome measures                                                                                                                                                                           | Main findings                                                                                                                                                                                                                                                                                                                                                                                                                   | Contribution                                                                                                                                                                 | Strengths                                                                                     | Weaknesses                                                                                                                         |
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| 2<br>5 The Anabolic 500 survey: characteristics of male users versus nonusers of anabolic-androgenic steroids for strength training | 2011 | USA   | Ip, E.J., Barnett, M.J., Tenerowicz, M.J and Perry, P.J | cross-sectional | survey          | online  | 1277        | n/a           | demographics, use of AAS and other performance-enhancing agents, alcohol and illicit drug use, substance dependence disorder, DSM-IV criteria, and history of sexual and/or physical abuse | 506 of 1277 respondents reported using AAS. 70.4% of the AAS users strength trained recreationally and used an average of 11.1 agents in a performance enhancing drug regimen. 23% of the AAS users met DSM criteria for substance dependence disorder, 10.1% met criteria for an anxiety, 11.3 % used cocaine within the past 12 months 6.1% reported a history of sexual abuse, all higher percentages than in non-AAS users. | This study contributed evidence for associations with AAS use and substance abuse disorder, anxiety disorder and polysubstance use by contrasting results with non AAS users | Study addressed a clearly focused issue. Method of selection clearly described. Large sample. | Cross-sectional design may limit generalizability. Online recruitment may have introduced sampling bias and be non-representative. |

| Title                                                                                                               | Year | Place  | Author/s                                                                                     | Design          | Data collection | Setting         | Sample size | Response rate | Outcome measures                                                                                                                                             | Main findings                                                                                                                                                                                                                                                                                                                                                | Contribution                                                                                                                                            | Strengths                                                                                                                                                             | Weaknesses                                                                                                                                                                                                  |
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| 26 Anabolic androgenic steroids in the general population: user characteristics and associations with substance use | 2012 | Sweden | Hakansson, A., Mickelsson, K., Wallin, C and Berglund, M                                     | cross-sectional | survey          | national survey | 22095       | 38%           | Demographics, income, substance use, education, physical exercise, general health                                                                            | 1.7 % of males, and 0.3% of females reported lifetime use of AAS. Illicit drug use, use of prescription drugs, physical training and lower education were associated with AAS use. Use of other drugs (illicit and prescription) separated those who had used AAS from those who had been offered to use but chose not to. No associations with alcohol use. | Little is known about AAS use in the general population in Sweden. This data taken from a national survey sought to address this gap in the literature. | Study addressed a clearly focused issue. Large representative sample. Methods of selection clearly described.                                                         | Unsatisfactory response rate (38%), selection bias introduced through oversampling with risk groups for substance use, no control for criminal behaviour which has been found to be associated with AAS use |
| 27 Evaluating a measure of tanning abuse and dependence                                                             | 2012 | USA    | Hillhouse, J. J., Baker, M., Turrisi, R., Shield, A., Stapleton, J., Jain, S and Longacre, I | longitudinal    | survey          | college campus  | 360         | 90%           | The Structured Interview for Tanning Abuse and Dependence (SITAD), Indoor Tanning (IT) Behavioural Patterns, IT Behaviour, Opiate like reactions to tanning, | 32 out of 296 participants (10.8%) met SITAD criteria for tanning dependence. Tanning dependant participants used indoor tanning facilities ten times more frequently to other participants. Dependent tanners scored                                                                                                                                        | First study to use the SITAD to assess tanning dependence.                                                                                              | Study addressed a clearly focused issue. Appropriate study design to answer the research question. Methods of selection clearly described. Satisfactory response rate | Sample taken from college students, may not be representative.                                                                                                                                              |

| Title                                                                                                                         | Year | Place   | Author/s                                    | Design          | Data collection | Setting         | Sample size | Response rate | Outcome measures                                                                                                                                                         | Main findings                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Contribution                                                                                                                                                             | Strengths                                                                                                                                                                                                                          | Weaknesses                                                                                                                                                     |
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| Are people who inject performance and image-enhancing drugs an increasing population of Needle and Syringe Program attendees? | 2012 | Denmark | Iversen, J., Topp, L., Wand, H and Maher, L | cross-sectional | survey          | needle exchange | 2395        | 41%           | Abuse and Dependence The SITAD<br><br>demographics , PIED use, lifetime imprisonment , HIV/HCV screening, language spoken at home, needle sourcing, injecting behaviours | higher on the opiate-like reactions to tanning than other participants.<br><br>Prevalence of PIED injection was low at 1-2 % of needle exchange attendees over a period of ten years 2000-2010. However, this increased to 4.6% in 2011. People who recently injected PIEDs were more likely to be heterosexual males, younger than 25 years, source their needles from needle exchanges and to report no sharing of needles. No PIEDS injectors tested HIV positive with few testing HCV positive. | These survey results contribute evidence for an increase in PIED use in Australia which had been anecdotally described by needle exchange providers prior to the survey. | Study addressed a clearly focused issue. Appropriate design to answer the research question. Large sample. Participants were asked to provide a blood sample for testing to determine PIED use and presence of HIV/HCV antibodies. | Limited to PIED users who accessed needle exchange services. Self report measures may introduce recall bias. Cross-sectional design may limit generalizability |



| Title                                                                      | Year | Place  | Author/s                                     | Design          | Data collection                            | Setting                           | Sample size | Response rate | Outcome measures                                                                                                               | Main findings                                                                                                                                                                                                                                                                                                                                                                                                                | Contribution                                                                                                                                              | Strengths                                                                                                                                                                  | Weaknesses                                                                                                                         |
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| 2<br>9<br>Anabolic androgenic steroids in police cases in Sweden 1999–2009 | 2012 | Sweden | Lood, Y., Eklund, A., Garle, M and Ahlner, J | cross-sectional | analysis of forensic toxicological results | Department of Forensic Toxicology | 12, 141     | n/a           | AAS use, age and gender of the users, type of AAS used and the concentration levels determined, use of illicit and licit drugs | 12,141 urine samples (6362 police cases and 5779 inmates) were analysed in this study. 33.5% of police cases and 11.5% of inmates tested positive for AAS. 99.2% of AAS users were men with an average age of 26.2 Nandrolone was the most popularly used AAS followed by testosterone and methandienone. 60% of the cases from the police tested positive for illicit drugs, indicating polysubstance use amongst AAS users | There is limited data on correlates of AAS use outside of elite athleticism. This study aims to investigate types of AAS use amongst arrestees in Sweden. | Study addressed a clearly focused issue. Study design appropriate for answering the research question. Method of selection clearly described. Large sample of urine tests. | Cases were only tested for AAS if a police officer suspected they were using through observation of their physique and behaviours. |

| Title            | Year | Place        | Author/s                   | Design          | Data collection                 | Setting | Sample size | Response rate | Outcome measures                                                                                                                                                 | Main findings                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Contribution                                                                                                                    | Strengths                                                                                                                                                                                                    | Weaknesses                                                                                                                                                                            |
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| 3<br>0<br>3<br>1 | 2013 | UK & Ireland | Chandler, M and McVeigh, J | cross-sectional | survey and follow up interviews | online  | 109         | 93%           | Age of first use, types of SIEDs used, length of cycles, use of alcohol and psychoactive drugs, sharing and reusing of needles, BBV, adverse effects experienced | First onset of use for the majority of participants was 18-29, with one third beginning their first cycle before the age of 24. 79.8% (n=94) reporting ever using injectable AAS. Extensive polypharming with PIEDs such as GH and peptides was noted. A small number reported longer cycles than the recommended eight weeks, such as blast and cruise, a cycle of continuous use. 78.7% reported having ever used illicit drugs. Needles were sourced in bulk from needle exchange or online. Few incidences of adverse effect. | Prevalence of self-directed PIED use in the UK is unknown. This study contributes data on PIED use in the scientific literature | Study addressed a clearly focused issue. Study design appropriate for investigating characteristics of PIED use. Follow up telephone interview which allowed for richer data collection than a survey alone. | Small sample. Potential for selection bias as online survey link was advertised on PIEDs websites as well as weighttraining websites. Self report measures may introduce recall bias. |

| Title                                                                                                                                                      | Year | Place | Author/s                                                                                                | Design          | Data collection | Setting         | Sample size | Response rate | Outcome measures                                                                                                                  | Main findings                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Contribution                                     | Strengths                                                                                                                                                                                                                | Weaknesses                                                                                       |
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| Prevalence of, and risk factors for, HIV, hepatitis B and C infections among men who inject image and performance enhancing drugs: a cross-sectional study | 2013 | UK    | Hope, V.D., McVeigh, J., Marongiu A, Evans-Brown, M., Smith, J., Kimergård, A., Parry, J.V and Ncube, F | cross-sectional | survey          | needle exchange | 400         | 98.75%        | anti-HIV, anti-HBc and anti-HCV positivity, equipment sharing, condom use, age, drug use, sexual practice and health services use | less than five years. Anabolic steroids were injected by 86%. 32% injected growth hormone. 88% injected intramuscularly and 39% subcutaneously. Oral use of PIEDs was reported by two-thirds. Recent polypharming with illicit drugs was common (46% cocaine, 12% amphetamine), 5% had ever injected a psychoactive drug and 9% had shared injecting equipment. Risky sexual practice was also reported. 1.5% had HIV, 9% had antibodies to the hepatitis B core antigen (anti-HBc) and 5% to hepatitis C (anti-HCV). | First study to find HIV antibodies in PIED users | The largest study investigating bloodborne virus in PIED users. Study addressed a clearly focused issue. Appropriate research design to answer the research question. Representative sample. Satisfactory response rate. | Limited to PIED users who accessed needle exchange services, may have introduced selection bias. |

| Title                                                                                                                                                                                                                                                                                   | Year | Place  | Author/s                                                        | Design        | Data collection | Setting           | Sample size | Response rate | Outcome measures                                                                                                              | Main findings                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Contribution                                                                                                                                                                                                                                                                                                         | Strengths                                                                                                                                                                   | Weaknesses                                                                                                                                                                                                                                                                                                                                |
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| 3<br>2<br>Monitoring the Future national results on drug use: 2012 Overview, Key Findings on Adolescent Drug Use. A retrospective 30-year follow-up study of former Swedish-elite male athletes in power sports with a past anabolic androgenic steroids use: a focus on mental health, | 2013 | USA    | Johnston, L.D., O'Malley, P.M., Bachman, J.G., Schulenberg, J.E | longitudinal  | survey          | secondary schools | 45,400      | n/a           | Usage levels, perceived risk, disapproval, perceived availability                                                             | In 2012, annual prevalence rates for male use of AAS were 0.8%, 1.3%, and 1.7% in grades 8, 10, and 12, compared with 0.3%, 0.4%, and 0.7% for females, a slight drop from previous years. AAS were perceived as quite risky with 60% of respondents rating them high risk. Disapproval was quite high amongst respondents. Availability has declined. At least 20% of participants (power sports athletes) disclosed past AAS use. AAAS users were more likely to have sought professional help for mental health issues and use illicit drugs than non-users. | These survey results contribute evidence for low level AAS use amongst U.S secondary school students. There is limited knowledge on the long term effects of AAS use. This study investigates power sports athletes 30 years after engagement in sporting activity and AAS use to examine any mental health effects. | Study addressed a clearly focused issue. Appropriate design to answer the research question. Longitudinal design with a large national sample across 395 schools.           | Secondary school setting may not be representative of the typical AAS user and may introduce false positives. Self report measures may introduce recall bias. Time elapsed between seeking professional help for mental health issues and AAS use is unknown. Findings limited to men. Cross sectional design may limit generalisability. |
| 3<br>3<br>Lindqvist, A.S., Moberg, T., Eriksson, B.O., Ehrnborg, C., Rosén, T., Fahlke, C                                                                                                                                                                                               | 2013 | Sweden |                                                                 | retrospective | survey          | power sports      | 683         | 68.6<br>0%    | demographics, AAS use, engagement in sporting activity past and present, mental health issues, past and present substance use |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                      | Study addressed a clearly focused issue. Study design appropriate for answering the research question. Method of selection clearly described. Large representative samples. |                                                                                                                                                                                                                                                                                                                                           |

|        | <b>Title</b>                                                                                                           | <b>Year</b> | <b>Place</b>    | <b>Author/s</b>                                                                                             | <b>Design</b> | <b>Data collection</b>                                    | <b>Setting</b> | <b>Sample size</b> | <b>Response rate</b> | <b>Outcome measures</b> | <b>Main findings</b>                                                                                                                                                                                                                                                                                       | <b>Contribution</b>                                                                                                                                                                                                                 | <b>Strengths</b>                                                                                                                                                                                         | <b>Weaknesses</b>                                                                                                      |
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| 3<br>4 | Anabolic androgenic steroid use is associated with ventricular dysfunction on cardiac MRI in strength trained athletes | 2013        | The Netherlands | Luijckx, T., Velthuis, B.K., Backx, F, G, J., Buckens, C., Prakken, N., Rienks, R., Mali, W and Cramer, M.J | case control  | Cardiacmagnetic resonance                                 | laboratory     | 156                | n/a                  | n/a                     | Strength athletes using AAS show significantly different cardiac dimensions and function when compared to strength athletes who don't use, and non-strength athletes.                                                                                                                                      | There is disagreement in the literature on possible cardiac adaptation to strength training and the role of AAS in this. This study seeks to investigate the effects of AAS use and strength training on the cardiovascular system. | Study addressed a clearly focused issue. Study design appropriate for answering the research question. Case and controls recruited in an acceptable way. Results are applicable to the local population. | Cross-sectional design cannot determine long term cardiac changes in participants. Participants self-reported AAS use. |
| 3<br>5 | Predictors of Anabolic-Androgenic Steroid Usage                                                                        | 2013        | USA             | Noone, J and Blanchette, C.M                                                                                | longitudinal  | the 1994 National Longitudinal Study of Adolescent Health | high schools   | 3028               | n/a                  | n/a                     | Mean age of participants was 15. Notable risk factors included: coming from a two parent household, drinking and driving, intention to participate in competitive wrestling, and having difficulties with peers at school (Protective factors included: being underweight and a good maternal relationship | One of the only studies to assess risk factors of AAS use using longitudinal data. Drink driving was the only variable found to be significantly associated with AAS use                                                            | Study addressed a clearly focused issue. Appropriate method for addressing the research question. Longitudinal design. Large sample. Method of selection clearly described.                              | n/a                                                                                                                    |

| Title                                                                                                                                                    | Year | Place   | Author/s                                                                                                                                                 | Design       | Data collection                                                         | Setting                   | Sample size | Response rate | Outcome measures                                                                                                                                                                                                        | Main findings                                                                                                                                                                                                                                                                                                          | Contribution                                                           | Strengths                                                                                                                                 | Weaknesses                                                                                                                                                                                |
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| 3<br>6<br>Long-Term Anabolic Androgenic Steroid Use Is Associated with Increased Atrial Electromechanical Delay in Male Bodybuilders                     | 2014 | Turkey  | Akçakoyun, M., Alizade, E., Gündo, R., Bulut, M., Mustafa Tabakc, M., Açar, G., Avci, A., Zeki S., Fidan, S., Demir, S., Kargın, R and Yunus Emiroglu, M | case control | Survey, physical examination, laboratory tests, echocardiographic tests | lab                       | 33          | n/a           | medical history, drug use history, urine testing, height, weight, body mass index (BMI) (kg/m <sup>2</sup> ), body surface area (BSA) (m <sup>2</sup> ), heart rate, and blood pressure, echocardiographic measurements | Inter-AEMD and Intra-AEMD - which are associated with arrhythmias, were significantly increased in the AAS using participants compared with nonusers, although no arrhythmias were observed<br>All participants were male with average age 27. Motivators for PIED use included to look good and increase muscle mass. | Study contributes evidence for arrhythmic cardiac events in AAS users. | Study addressed a clearly focused issue. Appropriate method used to answer the research question. Methods of selection clearly described. | Small sample size. Unable to follow up on participants future cardiac events. May be subject to selection bias.                                                                           |
| 3<br>7<br>Examining the Profile and Perspectives of Individuals Attending Harm Reduction Services who are Users of Performance and Image enhancing Drugs | 2014 | Ireland | Merchants Quay Ireland, Homeless & Drugs Service                                                                                                         | Mixed method | Survey                                                                  | Homeless and drug service | 89          | n/a           | Demographics, motivators for use, PIED history, type of PIED use, patterns of use, training and exercise programme, injecting practice, bloodborne virus (BBV) prevalence                                               | Polypharming with Clenbuterol and other ancillary PIEDs, as well as illicit drugs was reported by participants. 85% reported training at least four times per week. Majority of injectors has                                                                                                                          | One of the first studies to investigate PIED use in an Irish context   | Study addressed a clearly focused issue. Appropriate method used to answer the research question. Methods of selection clearly described. | Generalisability of findings is limited to those who accessed drug services and may not be representative of the typical PIED user. Self report measures may have introduced recall bias. |

| Title                                                                        | Year | Place | Author/s                                                | Design          | Data collection | Setting | Sample size | Response rate | Outcome measures                                                                                                                                                                           | Main findings                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Contribution                                                                                                         | Strengths                                                                                                                                                     | Weaknesses                                                             |
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| 3<br>8<br>Characteristics and Behaviors of Older Male Anabolic Steroid Users | 2014 | USA   | Ip, E.J., Barnett, M.J., Tenerowicz, M.J and Perry, P.J | cross-sectional | survey          | online  | 1277        |               | demographics, use of AAS and other performance-enhancing agents, alcohol and illicit drug use, substance dependence disorder, DSM-IV criteria, and history of sexual and/or physical abuse | learned to inject from peers and injected intramuscularly. No reports of positive HIV status. 4.6% reported positive status for Hep C. 67 of 1277 respondents were AAS users over 40 years old. 92.5% of AAS users over 40 years old were Caucasian 97% were heterosexual and 79.1% strength trained recreationally. On average over 40s AAS users took 11.5 performance enhancing agents. 47.8% were reported binge drinking with 21% disclosing heavy alcohol use. 27.4% met criteria for substance dependence disorder and 12% reported an anxiety disorder diagnosis | This study contributed evidence for polysubstance use, binge drinking and mental disorder amongst AAS users over 40. | Study addressed a clearly focused issue. Appropriate design to answer the research question. Satisfactory sample size. Method of selection clearly described. | Online setting and cross-sectional design may introduce sampling bias. |

| Title                                                              | Year | Place   | Author/s                                                                    | Design          | Data collection | Setting         | Sample size | Response rate | Outcome measures                                                                                                                                                                                                                                                                                                            | Main findings                                                                                                                                                                                                                                                                                                | Contribution                                                                                                              | Strengths                                                                                                                                | Weaknesses                                                                                                 |
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| 39<br>Melanotan Injecting Survey Results                           | 2014 | Ireland | Irish Needle Exchange Forum                                                 | cross-sectional | survey          | needle exchange | 17          | n/a           | gender, region of needle exchange service accessed, negative effects experienced, motives for use, awareness of sourcing routes, gender, age, education, family income, marital status, training regime, substance used, duration of use, sourcing, motivation for use, consumption guidance, and possible adverse effects. | Of 17 respondents, 4 were male and 13 were female. The majority of respondents accessed a traveller specific service. Effects disclosed were pigmentation of skin, nausea, and skin flushing. Motivation for use included to avoid sunbeds, and because using Melanotan was cheaper than using just sunbeds. | First survey conducted in Ireland investigating use of Melanotan.                                                         | Appropriate design to answer the research question.                                                                                      | Small sample. Five questions in survey. Sampling bias introduced limited to needle exchange service users. |
| 40<br>Anabolic-androgenic steroid use among Brazilian bodybuilders | 2014 | Brazil  | Nogueira, F.R., Brito Ade, F., Oliveira, C.V., Vieira, T.I and Gouveia, R.L | cross-sectional | survey          | gym             | 510         | 89.77%        | gender, age, education, family income, marital status, training regime, substance used, duration of use, sourcing, motivation for use, consumption guidance, and possible adverse effects.                                                                                                                                  | 20.6% used AAS; 98.1% of these were male, with little education (46.7%), with a training history longer than 4 years (49.5%). AAS use was associated with dietary supplement use. Most popularly used AAS were Deca-Durabolin, Winstrol, and Sustanon.                                                       | This paper contributes evidence for prevalence of AAS use and socioeconomic profile of users in the city of Jo'ao Pessoa. | Study addressed a clearly focused issue. Appropriate method for addressing the research question. Method of selection clearly described. | Convenience sample. The survey utilized was not previously validated.                                      |



|        | <b>Title</b>                                                                                                    | <b>Year</b> | <b>Place</b> | <b>Author/s</b>                                                                | <b>Design</b>   | <b>Data collection</b> | <b>Setting</b> | <b>Sample size</b> | <b>Response rate</b> | <b>Outcome measures</b>                                    | <b>Main findings</b>                                                                                                                                                                               | <b>Contribution</b>                                                                                                                                                 | <b>Strengths</b>                                                                                                                                                                        | <b>Weaknesses</b>                                                                                                                                     |
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| 4<br>1 | Association between AAS use, muscle dysmorphia and illicit drug use among gym frequenters                       | 2014        | Brazil       | Pipet, S., Halpern, R., Woody, G.E and Szobot, C                               | cross-sectional | survey                 | gym            | 278                | n/a                  | AAS use, illicit drug use, demographics, muscle dysmorphia | 9.7% of sample had AAS use. AAS use was associated with negative body image with illicit drug use such as marijuana and cocaine use                                                                | This study contributes evidence for the occurrence of non-health conscious behaviours in PIED users, who have been said to be motivated by health in their PIED use | Study addresses a clearly focused issue. appropriate design to answer the research question.                                                                                            | Self report measures. Results may not be applicable to the local population.                                                                          |
| 4<br>2 | The lifetime prevalence of anabolic-androgenic steroid use and dependence in Americans: current best estimates. | 2014        | USA          | Pope, Jnr. H.G., Kanayama, G., Athey, A., Ryan, E., Hudson, J.I and Baggish, A | meta-analysis   | Literature search      | various        | n/a                | n/a                  | AAS use, age of onset, demographics, AAS dependence        | Extropolated from data pooled from nine and ten studies, AAS use typically begins after the age of 20. 2.9–4.0 million U.S citizens have used AAS. Approximately 1 million may have AAS dependence | This study is unique in pooling data from several surveys to determine various characteristics of AAS use                                                           | Study addressed a clearly focused issue. appropriate design to answer the research question. Consistent findings across all studies pooled. Results applicable to the local population. | Vulnerable to selection bias in the studies pooled. Youth-survey datasets are likely to include false-positive responses leading to over estimations. |

| Title                                                                                                              | Year | Place  | Author/s                                                              | Design                                     | Data collection   | Setting     | Sample size | Response rate | Outcome measures                                                          | Main findings                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Contribution                                                                                                                                                                                    | Strengths                                                                                                                                                                                                                                            | Weaknesses                                                                                                                                                                                                                 |
|--------------------------------------------------------------------------------------------------------------------|------|--------|-----------------------------------------------------------------------|--------------------------------------------|-------------------|-------------|-------------|---------------|---------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4<br>3<br>The global epidemiology of anabolic–androgenic steroid use: A meta-analysis and meta-regression analysis | 2014 | Norway | Sagoe, D., Molde, H., Andreassen, C. S., Torsheim, T., & Pallesen, S. | meta-analysis and meta-regression analysis | Literature search | various     | n/a         | n/a           | n/a                                                                       | Global prevalence rate for AAS use 3.3%<br>Males 6.4% and females 1.6%<br>AAS use was associated with athletic samples, studies which used interviews and surveys as methods, and male samples.<br>High prevalence of AAS use was indicated in non-Western countries as well as Western countries.<br>Prevalence of AAS use was 3.8% (males = 4.9%, females = 3.1%). 18.5% knew someone that had used AAS 6.0% had been offered AAS before but could not name the AAS type. AAS use and intent to use was associated with being male, a teenager, an athlete, and participation in ball games | This study is the first meta-analysis of the global lifetime prevalence rate of AAS use                                                                                                         | Study addressed a clearly focused issue. Appropriate design to answer the research question. Method of selection clearly described. Large number of studies used. Study presents the best estimates for AAS prevalence available due to its methods. | Potential for overestimations in studies used with high school samples. Lifetime prevalence is always higher than current prevalence. Self report measures in many studies used. Lack of studies in non-Western countries. |
| 4<br>4<br>Attitudes towards use of anabolic–androgenic steroids among Ghanaian high school students                | 2015 | Norway | Sagoe, D., Torsheim, T., Molde, H., Andreassen, C.S and Pallesen, S   | cross-sectional                            | survey            | High school | 2683        | 96.8%         | Demographics, participation in sports, AAS use, attitudes towards AAS use | This study contributes evidence for high prevalence of AAS use in non-Western countries                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Study addressed a clearly focused issue. Appropriate design to answer the research question. Satisfactory sample size. Method of selection clearly described. Large sample. High response rate. | Use of high school sample may produce false positives which can lead to overestimations. The five schools used were all located in central Ghana, limiting generalisability of findings. Self-report measures.                                       |                                                                                                                                                                                                                            |

|        | <b>Title</b>                                                                                                     | <b>Year</b> | <b>Place</b> | <b>Author/s</b>                                                                  | <b>Design</b>                     | <b>Data collection</b> | <b>Setting</b> | <b>Sample size</b> | <b>Response rate</b> | <b>Outcome measures</b>                                                                                         | <b>Main findings</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>Contribution</b>                                                                                                                                            | <b>Strengths</b>                                                                                                                                                                                                                                     | <b>Weaknesses</b>                                                                                                                                           |
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| 4<br>5 | Anabolic-Androgenic Steroid Use in the Nordic Countries: A Meta-Analysis and Meta-Regression Analysis            | 2015        | Norway       | Sagoe, D., Torsheim, T., Molde, H., Schou, C., Andreassen, C.S., and Pallesen, S | Meta-analysis and meta-regression | Literature search      | various        | n/a                | n/a                  | n/a                                                                                                             | Overall lifetime prevalence was 2.1% with males having 2.9% lifetime prevalence rate, Females 0.2% Sweden had the highest lifetime prevalence rate at 4.4%, followed by Norway: 2.4%, Finland: 0.8%, Iceland: 0.7%, and Denmark: 0.5%. PIEDs injectors were predominantly male (99%). only one reported ever sharing any injecting equipment. Participants rarely ever injected intravenously (6%); were tested for HIV and HCV in the last year (44% and 32% respectively), and had low rates of HCV (0%). They were much more likely to be gay or bisexual (42%). Gay/bisexual participants were | First study to conduct a meta analysis of lifetime prevalence of AAS use in Nordic countries                                                                   | Study addressed a clearly focused issue. Appropriate design to answer the research question. Method of selection clearly described. Large number of studies used. Study presents the best estimates for AAS prevalence available due to its methods. | Findings are subject to the limitations of the studies used, including self report measures. Life time prevalence is always higher than current prevalence. |
| 4<br>6 | Performance and image enhancing drug injectors' access to needle syringe programs: Responding to a public policy | 2015        | Sydney       | Van Beek, I., & Chronister, K. J                                                 | Convenience sample                | survey                 | 2 NPS          | 103                | n/a                  | demographics, history of incarceration, injecting risk behaviour, HIV and HCV testing, NSP access, health needs | This study contributes evidence for the presence of HIV antibodies in people who inject PIED. Four males in this study were HIV positive. However, the study concludes that transmission was likely to be through sexual intercourse, and that PIED injectors are still low risk for BBV compared to other injectors                                                                                                                                                                                                                                                                               | This study acts as a case study of how evidence can ensure that public health resources are directed towards those people who inject drugs most at risk of BBV | Anonymous, self-report survey. Convenience sample, non-representative. Potential social desirability bias in the health setting, Survey did not collect information on mode of transmission in those who reported being HIV positive.                |                                                                                                                                                             |

| Title                                                                        | Year | Place | Author/s                 | Design          | Data collection                                    | Setting | Sample size | Response rate | Outcome measures                   | Main findings                                                                                                                                                                                                                                                                                             | Contribution                                                                                    | Strengths                                                                                                      | Weaknesses                                                                                                                                                                                                           |
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| 4<br>7<br>Anabolic steroids in the UK: an increasing issue for public health | 2016 | U.K   | McVeigh, J., & Begley, E | Cross sectional | Standardised data collection, occasions of service | 18 NPS  | 2446        | n/a           | Demographics; occasions of service | older (35 vs 31 years) and more likely to report being HIV positive (9% vs 0%, $p < 0.001$ ).<br><br>Numbers of AAS users accessing NPS increased in the from 553 in 1995 to 2246 in 2016 - 54.9% of NPS clients With the inclusion of pharmacy NPSs, this rose to 5336 individual anabolic steroid users | This study contributes evidence for a significantly growing number of AAS injectors in the U.K. | Study addressed a clearly focused issue. Method of selection clearly described. 3 NPS used in data collection. | The study is set within a United Kingdom context and specifics related to legislation, service provision, and limits generalisability. Limited to those who access needle exchange services regarding their AAS use. |

| Title                                                                                                                          | Year | Place | Author/s                                                    | Design          | Data collection | Setting | Sample size | Response rate | Outcome measures                                                                                                                                                                                                                                                                                                                                                            | Main findings                                                                                                                                                                                                                                                                                                                               | Contribution                                                                                                      | Strengths                                                                                          | Weaknesses                                                                   |
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| The Prevalence and Characteristics of Performance-Enhancing Drug Use Among Bodybuilding Athletes in the South of Iran, Bushehr | 2016 | Iran  | Haerinejad, M.J., Ostovar, A., Farzaneh, M.R., Keshavarz, M | Cross sectional | survey          | 11 gyms | 453         |               | Demographics, exercise patterns, periodic check of health condition, alcohol use, history of violence, PIED use, familiarity with PIED side effects, use of dietary supplements, motivations for PIED use, acquisition method for PIEDs, age of first use, level of awareness about PIED type of drugs used, period of use, consultation with health services, side effects | 234 (51.7%) had used PIEDs, average of 3.80 ± 4.52 agents' use, for the average of 3.24 ± 3.99 years. Most common anabolic steroids (used by 185 athletes (79.4% of athletes). Also common use of stimulants and alcohol. Motivation for use was increasing muscle mass. Sexual dysfunction and skin related side effects were most common. | This study contributes evidence for high prevalence of PIED use among bodybuilding athletes in the south of Iran. | Study addressed a clearly focused issue. Methods of selection clearly described. Large sample size | Self-report measures used. Cross sectional design may limit generalizability |

| Title                                                                                                                                                                 | Year | Place | Author/s                                                                                 | Design          | Data collection                                                                                                                                                                                              | Setting        | Sample size | Response rate | Outcome measures                                                                                                                                                                                                                                                   | Main findings                                                                                                                                                                                                                                                                                                                                                                     | Contribution                                                    | Strengths                                                                                                                           | Weaknesses                                                                   |
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| 4<br>8<br>Body image and eating disorders are common in professional and amateur athletes using performance and image-enhancing drugs (PIED). A cross-sectional study | 2016 | Italy | Piacentino, D., Longo, L., Pavan, A., Ferracuti, S., Brugnoli, R., Girardi, P., Sani, G. | Cross sectional | Structured interviews (SCID I/SCID II) and the Body Image Concern Inventory (BICI) and the Sick, Control, One, Fat, Food Eating Disorder Screening Test (SCOFF). Mann-Whitney U test and Fisher's exact test | Sports centres | 84          | n/a           | Demographics, physical activity levels, consumption of cigarettes and coffee, and psychotropic medications diagnoses of psychiatric disorders, especially Substance Use Disorders, Eating Disorders, Body Dysmorphic Disorder (BDD), and General Anxiety Disorders | 18 (21.4%) used PIEDs, most commonly AAS. PIEDs using athletes had higher physical activity levels, consumed more coffee, cigarettes, and psychotropic medications per day, presented with more diagnoses of psychiatric disorders, especially Substance Use Disorders, Eating Disorders, Body Dysmorphic Disorder (BDD), and General Anxiety Disorders, had a higher risk of BDD | This study contributes evidence for BDD in people who use PIEDs | Study addressed a clearly focused issue. Appropriate design to answer the research question. Method of selection clearly described. | AAS use was self-reported. Cross sectional design may limit generalizability |

| Title                                                                                                           | Year | Place     | Author/s                                                     | Design          | Data collection | Setting | Sample size | Response rate | Outcome measures                                                                                                                                                                                                     | Main findings                                                                                                                                                                                                                                                                                                                                                                                                                                         | Contribution                                                                                                                | Strengths                                                                                                                       | Weaknesses                                                                                                                                                                                                                                                           |
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| 4<br>9<br>“No pain, no gainz”?<br>Performance and image-enhancing drugs, health effects and information seeking | 2016 | Australia | Rowe, R.,<br>Berger, I.,<br>Yaseen, B.,<br>&<br>Copeland, J. | Cross sectional | survey          | NPS     | 644         | 94%           | Social, cultural, economical<br>Supplements, Injecting sites<br>Cycle length<br>Break length<br>Adverse health effects<br>Engagement with doctor<br>Blood tests<br>Sources of drug<br>Motivators and<br>constrainers | Rage and anger was most commonly reported as a side effect (27%, 95% CI: 23.4–30.6) with sexual or genital problems (26.4%, 95% CI: 22.9–30.0) the next most common. Taking regular, longer breaks between AAS cycles was recommended to reduce side effects. 63.1% had informed their GP of use. Perceptions of doctors as reliable in participants decreased according to larger amounts of PIEDs taken. Reliance on peer education was very common | This study contributes evidence for the adverse health outcomes and information seeking behaviour of people who inject PIED | Addressed a clearly focused issue An large sample of men who inject PIEDs and access the Australian NSP was used for this study | Self-administered survey participants may have underreported experiences that they did not associate with PIEDs<br>Females were not included in sample<br>Findings cannot be generalised as practices of people who access NPS may be different to those that do not |

| Title                                                                                                                                                                        | Year | Place | Author/s                                                                    | Design          | Data collection                                | Setting                    | Sample size | Response rate | Outcome measures                                                                                                                                                                                                    | Main findings                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Contribution                                                                                                     | Strengths                                                                                                                  | Weaknesses                                                                                                              |
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| Risk of HIV and Hepatitis B and C Over Time Among Men Who Inject Image and Performance Enhancing Drugs in England and Wales: Results From Cross-Sectional Surveys, 1992–2013 | 2016 | U.K   | Hope, V.D., Harris, R., McVeigh, J., Cullen, K.J., Smith, J., & Parry, J.V. | Cross sectional | Survey, oral fluid test, dried blood spot test | NPS and addiction services | 1296        | n/a           | 5 time periods, region, age, injecting duration, UK born, ever received a used needle/syringe, ever used a NSP, HBV vaccination uptake, number of sexual partners, condom use sexuality, ever tested for HCV or HIV | Prevalence of HIV similar to that of people who inject opioids and stimulants. Increases between 1992 and 2009, were median age from 25 to 29 years and years injecting from 2 to 4. 53 men who had sex with men 0.93% were HIV positive. 4.4% ever had hepatitis B (HBV), and 3.9% hepatitis C. HIV increased in 2004—and remained elevated. HIV and HBV were associated with men who have sex with men and HCV was associated with unsafe injecting practices. Low level condom use and some needle/syringe sharing occurred. | This study contributes evidence for the risk of BBV in people who inject PIED which few studies have focused on. | Largest sample to date of people who use PIEDs studied in relation to BBV and is the first study to examine risk over time | Representativeness limited due to injectable drug using sample. Self-report measures. Responses contained missing data. |



| Title                                                                                                                                          | Year | Place                 | Author/s                                                                                                                  | Design          | Data collection                                    | Setting | Sample size                  | Response rate | Outcome measures                                                                                                     | Main findings                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Contribution                                                                                                         | Strengths                                                                                          | Weaknesses                                                                                                                                                                                                                                                                                                                                                                                                                                              |
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| 5<br>0 Trends in<br>PIEDs use<br>among male<br>clients of<br>needle-syringe<br>programs in<br>Queensland,<br>Australia;<br>2007–2015           | 2017 | Queensland, Australia | Jackaa, B.,<br>Peacocka, C.,<br>Degenhardta,<br>L., Brunoc, R.,<br>Clarea, P.,<br>Kempd, R.,<br>Deve, A.,<br>Larancea, B. | Cross-sectional | Standardised data collection, occasions of service | 26 NPS  | 106,072 occasions of service | n/a           | Demographic; equipment dispensed, interventions provided                                                             | PIED related occasions of service increased from 2008-2013 across all 26 NPS. However, they remain a minor injecting group compared to methamphetamine and other illicit drug injectors in this region. Most common interventions were safe equipment disposal, followed by BBV education and safe injecting information. Reticence to engage with medical professionals was indicated. Sexual dysfunction was the most likely symptomology to increase health service engagement. People who use AAS response to health problems was reactive, as they arise, rather than proactive | This study contributes evidence for increasing rates of engagement with needle exchange services in Queensland, Aus. | This study reports on the most systematic and comprehensive data collection from NPS in Australia. | Anonymity of clients may result in duplicate findings as clients may be represented more than once. May underestimate the use of PIEDs as clients can obtain equipment for multiple uses or for other people on a single visit. Self-nominating opportunistic sample. Small sample relational to AAS use. Recreational drug use was also reported in all cases in addition to AAS. Non representative sample. Questions did not capture forms of health |
| 5<br>1 Adverse<br>Effects, Health<br>Service<br>Engagement,<br>and Service<br>Satisfaction<br>Among<br>Anabolic<br>Androgenic<br>Steroid Users | 2017 | USA                   | Zahnow, R.,<br>McVeigh, J.,<br>Ferris, J., &<br>Winstock, A.                                                              | cross-sectional | survey                                             | n/a     | 195                          | n/a           | a combination of patterns of AAS and PIEDs use and experience of adverse health issues and health-seeking behaviours | This study contributes evidence for low level health service engagement in people who use AAS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Use of a large, international and unique sample to investigate health service engagement amongst people who use AAS  |                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

| Title                                                                                        | Year | Place                                          | Author/s                                                                         | Design       | Data collection                                            | Setting | Sample size | Response rate | Outcome measures                                                                                                                                                                                                               | Main findings                                                                                                                                        | Contribution                                                                                                                                                                                                                                           | Strengths                                                          | Weaknesses                                                                                                                                                         |
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| 5<br>2 Adverse effects of performance-enhancing drugs on the kidney in the male bodybuilders | 2017 | B<br>u<br>s<br>h<br>a<br>r<br>I<br>r<br>a<br>n | Ostovar, A.,<br>Haerinejada,<br>M.J.,<br>Farzanehb, M.<br>R., &<br>Keshavarzc, M | case control | survey &<br>blood<br>sample &<br>renal<br>function<br>test | lab     | 203         | n/a           | exercise<br>pattern and<br>duration,<br>alcohol use,<br>PIED use,<br>and the use of<br>dietary<br>supplements<br>level of serum<br>creatinine in<br>the blood,<br>BUN (Blood<br>Urea<br>Nitrogen), the<br>FSH and LH<br>levels | This study's<br>findings are that<br>use of AAS<br>among the<br>bodybuilding<br>athletes may<br>increase the risk<br>of acute kidney<br>injury (AKI) | This study is one of<br>few to contribute<br>evidence for the<br>effects of AAS use<br>on renal function.<br>Although previous<br>studies have found<br>limited evidence for<br>renal failure in<br>people who use<br>AAS, this study<br>found a link. | Addressed a<br>clearly focused<br>issue. Large<br>sample size used | Use of simple<br>screening tests<br>like serum<br>creatinine and<br>BUN to test<br>renal functions.<br>Tests used<br>could only<br>detect AAS and<br>no other PIED |

| Title                                                                                                                                                          | Year | Place     | Author/s                                                                                 | Design          | Data collection | Setting       | Sample size | Response rate | Outcome measures                                                                                                                                                      | Main findings                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Contribution                                                                                                                                                                          | Strengths                                                    | Weaknesses                                                                                                |
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| 5<br>3 Risk and blood-borne virus testing among men who inject image and performance enhancing drugs                                                           | 2017 | Australia | Rowe, R., Berger, L., Yaseen, B., & Copeland, J.                                         | cross sectional | Survey          | NPS           | 605         | n/a           | Injecting practices, HBV, HCV and HIV testing, condom use, benefits and drawbacks of PIEDs use, and information seeking practices.                                    | Participants in this study were generally aged in their mid to late twenties, had only recently started injecting and self-identified with one or more culturally and linguistically diverse backgrounds. All unsafe injecting practice came from culturally and linguistically diverse participants, who has never been tested for BBVs. Motivation to use PIED was grounded in losing weight (16%) reaching fitness goals (41%). The internet was a key part of garnering information and sourcing products (33.7%) 10.5% experienced side effects. Exercise addiction was scored high, appearance anxiety was | This study contributes evidence for subgroups of people who inject PIEDs in Australia who may be more vulnerable to contracting and transmitting BBV                                  | . Addressed a clearly focused issue. Large sample size used  | Anonymous, self-administered cross-sectional survey limits the complexity of information gathered         |
| 5<br>5 The use of supplements and performance and image enhancing drugs in fitness settings: A exploratory cross-sectional investigation in the United Kingdom | 2017 | UK        | Mooney, R., Simonato, P., Ruparelia, R., Urrestarazu, A., Martinotti, G., and Corazza, O | Cross sectional | survey          | Fitness clubs | 377         | n/a           | Exercise addiction (Exercise Addiction Inventory; EAI), anxiety levels (Appearance Anxiety Inventory; AAI) and their self-esteem (Rosenberg's Self-Esteem Scale; RSE) | Exercise addiction (Exercise Addiction Inventory; EAI), anxiety levels (Appearance Anxiety Inventory; AAI) and their self-esteem (Rosenberg's Self-Esteem Scale; RSE)                                                                                                                                                                                                                                                                                                                                                                                                                                            | This study contributed evidence for the presence of exercise addiction, appearance anxiety and low self-esteem in people who use PIED to lose weight and achieve their fitness goals. | Addressed a clearly focused issue and a rarely studied area. | Limited sample size, limited to the fitness setting, survey may have been too long, self-report measures. |

| <b>Title</b> | <b>Year</b> | <b>Place</b> | <b>Author/s</b> | <b>Design</b> | <b>Data collection</b> | <b>Setting</b> | <b>Sample size</b> | <b>Response rate</b> | <b>Outcome measures</b> | <b>Main findings</b>                              | <b>Contribution</b> | <b>Strengths</b> | <b>Weaknesses</b> |
|--------------|-------------|--------------|-----------------|---------------|------------------------|----------------|--------------------|----------------------|-------------------------|---------------------------------------------------|---------------------|------------------|-------------------|
|              |             |              |                 |               |                        |                |                    |                      |                         | scored intermediately, low self-esteem was found. |                     |                  |                   |

## Appendix B: Qualitative studies CASP chart

| Title                                                                                        | Year | Place     | Author/s                                      | Design       | Data collection                                             | Setting                                  | Sample size | Response rate | Main findings                                                                                                                                                               | Contribution                                                                                                            | Strengths                                                                                                                                                                                                                                                                                                                  | Weaknesses                                                                                                                                                                                                       |
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| 1<br>Social capital: implications from an investigation of illegal anabolic steroid networks | 2007 | Australia | Maycock, B.R., & Howat, P                     | Longitudinal | Observation and in depth interviews                         | Gym, nightclub, café, participants homes | 147         | n/a           | AAS dealing networks were found to be grounded in social capital where subcultural group norms and interpersonal trust facilitate AAS dealers to operate without detection. | Unique study examining the role of social capital in AAS dealing and using networks.                                    | Clear statement of the aims of the research. Methodology appropriate for the research aim. Longitudinal design ten of the interviewees over a three year period. Eight gyms purposefully sampled. Variety of settings to include gyms, nightclubs, cafes and participants homes. Rich data from open ended interviewing. ] | Snowballing sampling method may introduce selection bias. Purposeful sampling of AAS using gyms may have introduced selection bias. Close relationship between interviewers and participants may introduce bias. |
| 2<br>Getting huge, getting ripped: a qualitative exploration of recreational steroid use     | 2008 | USA       | Petrocelli, M., Oberweis, T and Petrocelli, J | longitudinal | semi-structured interviews and snowball sampling techniques | hardcore gym                             | 37          | n/a           | Motivation for AAS use was grounded in the creation of a physique impossible to build through diet and exercise alone. Typical cycling was two to three times               | Few studies examine the motives and attitudes of AAS user, this study gives an in-depth exploration of user experiences | Clear statement of the aims of the research. Methodology appropriate for the research aim. Longitudinal design tracks participants over four years. Rich data from open ended interviewing. Clear statement of                                                                                                             | Limited to one type of hardcore gym, which may have introduced selection bias. Potential bias introduced through longitudinal design, and development of relationship between interviewers and                   |

| Title                                                                   | Year | Place | Author/s                                | Design   | Data collection | Setting | Sample size | Response rate | Main findings                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Contribution                                                                                                                                            | Strengths findings.                                                                                                                                                                                                                                                                                                                                       | Weaknesses participants training together at the gym.                                                                                                                                                                 |
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| 3 Performance-Enhancing Drugs on the Web: A Growing Public-Health Issue | 2010 | USA   | Brennan, B.P, Kanayama, G and Pope, H.G | internet | google search   | online  | n/a         | n/a           | <p>annually. Injecting was preferred to oral administration due to better aesthetic outcome. AAS were typically sourced through local networks and gyms, or online. Very few adverse health consequences were reported by users.</p> <p>This study surveyed thousands of PIED sites, largely AAS. The researchers noted a pro-drug use position taken by the majority of websites found. Selling of PIEDs was widespread. This study identified two lesser known practices within PIED culture, synthol injection and cattle implants.</p> | <p>This study highlighted a need for further research into the underground practices of many PIED users, which may be largely unknown to clinicians</p> | <p>This study used broader searches than the only previously existing study to use a similar methodology (Cordaro, Lombardo &amp; Cosentino, 2011). Clear statement of the aims of the research. Qualitative method appropriate to investigate the nature of the detailed information available on these sites. Clear statement of findings. Valuable</p> | <p>Whereas a previous study (Cordaro, Lombardo &amp; Cosentino, 2011) had identified by url the websites they had found selling AAS, the larger scope of this study means the websites found were not identified.</p> |

| Title                                                                                                                            | Year | Place | Author/s                      | Design             | Data collection    | Setting          | Sample size | Response rate | Main findings                                                                                                                                                                                                                                                                                                                                                                                                                                     | Contribution                                                                                                                                                                                                                              | Strengths                                                                                                                                                                                                                                                                                                                                          | Weaknesses                                                                                                   |
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| Confidence by injection: Male users of anabolic steroids speak of increases in perceived confidence through anabolic steroid use | 2010 | USA   | Vassallo, M.J and Olrich, T.W | Selective sampling | In depth interview | research offices | 39          | n/a           | Use of AAS was grounded in increased confidence through positive impact on physical appearance, and on self confidence accrued through athletic achievement. Users also described a psychological euphoria through AAS use. All participants agreed that AAS dependence was valid and grounded in psychological effects. Cessation of use was characterised by change of context, marriage, maturity and discontinuation of sporting involvement. | Controversy around the phenomenon of AAS dependence has meant user experiences of symptomology relative to this concept is underresearched. This study offers an insight into the perceptions of users of the addictive properties of AAS | contribution to the literature on PIED culture particularly lesser known practices such as synthol injection<br><br>Clear statement of the aims of the research. Methodology suitable for examining user attitudes and experiences of aspects of AAS dependence. Rich data collected through open ended interviewing. Clear statement of findings. | Potential bias introduced through purposeful sampling and relationship between interviewers and participants |

| Title                                                                                                                | Year | Place | Author/s                                    | Design   | Data collection | Setting | Sample size | Response rate | Main findings                                                                                                                                                                                                                                                                                                                                     | Contribution                                                                                                                                                                                                                | Strengths                                                                                                                                                                                                                                                                                                  | Weaknesses                                                                   |
|----------------------------------------------------------------------------------------------------------------------|------|-------|---------------------------------------------|----------|-----------------|---------|-------------|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|
| 5 Selling androgenic anabolic steroids by the pound: identification and analysis of popular websites on the Internet | 2011 | Italy | Cordaro, F.G., Lombardo, S and Cosentino, M | internet | Google search   | online  | n/a         | n/a           | 30 AAS vendor websites were identified using through Google search. A minimum of two products were selected from each website for purchase and examination. Dietary supplements were found to contain fake compounds and DHEA. Adverse effects rarely well described with benefits listed. Supraphysiological dosages were generally recommended. | This study was one of the first to characterize AAS and AAS-related products for sale online, and to analyse their presentation. It highlights the need for future research to investigate the extensive online PIED market | Clear statement of the aims of the research. Qualitative method appropriate to investigate the nature of the detailed information available on these sites. Clear statement of findings. Identification of thirty AAS vendor sites by url. Valuable contribution to the literature on online PIED markets. | Limited range of search terms used, which may have introduced selection bias |



| Title                                      | Year | Place | Author/s                                                                    | Design   | Data collection | Setting | Sample size | Response rate | Main findings                                                                                                                                                                                                                                                                                                                                                                                                                                            | Contribution                                                      | Strengths                                                                                                                                                                                                  | Weaknesses                                                                                          |
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| 6 Nonprescription Steroids on the Internet | 2012 | USA   | Clement, C.L., Marlowe, D.B., Patapis, N.S., Festinger, D.S and Forman, R.F | internet | Google search   | online  | n/a         | n/a           | Searches for specific product names (e.g.- Dianabol) between March 2006 and June 2006 found that half of the Web sites declared the products as safe, and approximately one third sold the products without a prescription. Misinformation about steroids and their harms was often presented. Less than 5% of sites studied presented accurate information about steroids or provided self help information for those wishing to discontinue their use. | Little research has been published on the online selling of PIEDs | Important study highlighting the pro-drug use stance of many PIED vendor websites and the ease of which PIEDs are available for sale, potentially to minors, online. Results of study presented in tables. | Drugs advertised were not ordered and tested. Multiple websites may be owned by the same companies. |

| Title                                                                                                                                   | Year | Place   | Author/s       | Design   | Data collection        | Setting | Sample size                      | Response rate | Main findings                                                                                                                                                                                                                                                                                                           | Contribution                                                                                                                                                                               | Strengths                                                                                                                                                                                                      | Weaknesses                                                                                                                                                                                                                                       |
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| 7<br>“Definitely Not for Women”: An Online Community’s Reflections on Women’s Use of Performance Enhancing Drugs in Recreational Sports | 2012 | Denmark | Jespersen, M.R | internet | discussion forum posts | online  | 59 threads on 1 discussion forum | n/a           | Use of performance enhancing drugs amongst women is grounded in a short cut to their ideal body, unachievable through diet and exercise alone. From analysis of forum postings, the members of the bodyhouse forum generally support well informed, educated PIED use and advise against use by women and young people. | This study offers an insight into the female use of performance enhancing drugs, utilising information available in discussion forums specific to recreational weighttraining and PIED use | Clear statement of the aims of the research. Qualitative method of analysis of internet postings appropriate to collect rich descriptive and indepth data on female use of PIEDS. Clear statement of findings. | Restricted to members of one discussion forum. Findings cannot be representative as they are limited to a small number of people at a certain time. Demographical information is difficult to ascertain from internet discussion forum postings. |

| Title                                                                                | Year | Place     | Author/s                    | Design   | Data collection    | Setting | Sample size            | Response rate | Main findings                                                                                                                                                                                                                                    | Contribution                                                                                                    | Strengths                                                                                                                                                                                                                                                                                                                                                                                                             | Weaknesses                                                                                                                     |
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| 8 Body conceptions and virtual ethnopharmacology in an online bodybuilding community | 2012 | Australia | Smith, A.C.T and Stewart, B | internet | online ethnography | online  | 34 threads, 2894 posts | n/a           | Motivation for AAS use was grounded in heroic feats of strength and physical power and pursuit of a masculine ideal. Hyper masculinity of AAS use was contradicted by emotional side effects. Polypharming and stacking regimes were normalised. | Unique online study mapping discussion forum postings gives an insight into a subcultural network of AAS users. | Clear statement of the aims of the research. Longitudinal design tracked forum posts over three years. Rich data collection due to access to conversations between users which play out over time and are very detailed. Online setting an easy observational and safe place for researchers. Practices discussed by users may not have been revealed through face to face interviewing. Clear statement of findings. | Online identities may not be representative of reality. Collection of user demographics is not possible using this methodology |

| Title                                                                                                                              | Year | Place   | Author/s                                   | Design            | Data collection                   | Setting          | Sample size    | Response rate | Main findings                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Contribution                                                                                                                                                                                                                                                     | Strengths                                                                                                                                                                                                                                                    | Weaknesses                                                                                                                                                                                 |
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| 9 “Will steroids kill me if I use them once?” A qualitative analysis of inquiries submitted to the Danish anti-doping authorities, | 2012 | Denmark | Vest Christian sen, A and Bojsen-Møller, J | longitudinal      | analysis of enquiries to helpline | research offices | 1398 inquiries | n/a           | Four different types of enquirers were identified 1) those with no knowledge of AAS 2) those seeking help with side effects 3) those with some knowledge of AAS and 4) those which posed harm reduction dilemmas for the service. Enquiries included advice sought on cycling, worries about positive dope tests, description of adverse effects to include psychological harm (low mood) and cardiac symptoms. Use of Melanotan was grounded in the achievement of a healthy looking, attractive tan and avoidance of a naturally pale and freckly appearance. Topical tanners were not used due to streaking and interference with exotic dancing | Anti Doping Denmark (ADD) campaign to stop use of PIEDs in fitness centres is the largest and most comprehensive in the world. This study gives an insight into the types of enquiries received to their helpline, which in turn helps categorise AAS user types | Clear statement of the aims of the research. Methodology appropriate for the investigation of helpline enquiries to Anti Doping Denmark. Longitudinal design over eighteen months analysing a large sample (1398) of enquiries. Clear statement of findings. | Anti Doping Denmark operate an anti-drug policy which although didn't deter some AAS users from detailing their use, may have deterred others. Limited to those who accessed the helpline. |
| 10 An in-depth case examination of an exotic dancer's experience of Melanotan                                                      | 2013 | Ireland | Van Hout, M.C & Brennan, R                 | single case study | In depth interview                | research offices | 1              | n/a           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | User attitudes and motivations for Melanotan use are underresearched. This single case presentation contributes an indepth exploration of one Melanotan                                                                                                          | Clear statement of the aims of the research. Methodology suitable for an indepth account of a Melanotan user's experience, motivation and attitude to use. Clear statement of findings.                                                                      | Findings limited to one Melanotan user and cannot be generalised.                                                                                                                          |

| Title                                                                                               | Year | Place | Author/s                            | Design             | Data collection                      | Setting         | Sample size | Response rate | Main findings                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Contribution                                                                                                                                                                                                                                                                                 | Strengths                                                                                                                                                                                                              | Weaknesses                                                                                                                                                             |
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| 1<br>1<br>Anabolic–androgenic steroids and heroin use: A qualitative study exploring the connection | 2014 | UK    | Cornford, C.S., Kean, J and Nash, A | Selective sampling | focus groups and in depth interviews | needle exchange | 41          | 73%           | <p>           routines using ice. Side effects noted were nausea, which the case self managed with Xanax to promote sleeping through sick feeling. Sourced Melanotan through bodybuilder friend or online. Case had awareness of dangers of unregulated products but was unconcerned.         </p> <p>           Results showed that participants used AAS to conceal the weight loss associated with their heroin use to avoid stigmatism and detection. The intimidating nature of musculature achieved through AAS use was also described as functional in drug dealing networks         </p> | <p>           user's experiences.         </p> <p>           Previous studies have noted a link between heroin use and AAS (Petersson et al, 2010; McCabe et al, 2007). This study offers a unique an indepth exploration of one aspect of this connection through user reports         </p> | <p>           Clear statement of the aims of the research. Qualitative method appropriate to investigate the nature of current and past heroin users motives for use of AAS. Clear statement of findings.         </p> | <p>           Use of needle exchange service users may have introduced selection bias and is limited to AAS and heroin users who accessed these services.         </p> |

| Title                                                                 | Year | Place   | Author/s      | Design   | Data collection                       | Setting | Sample size                       | Response rate | Main findings                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Contribution                                                                                                         | Strengths                                                                                                                                                                                                                                                                                                                                                   | Weaknesses                                                                                                                                                                                                    |
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| 1<br>2<br>An internet study of users experiences of synthetic tanning | 2014 | Ireland | Van Hout, M.C | internet | analysis of discussion forum postings | online  | The first 10 pages of 467 threads | n/a           | Users sought to conceal their Melanotan use and pass off their skin tan as natural. .Despite awareness of risks associated with use of unregulated tanning injectables, user's experiences are driven by and grounded in positive outcomes. Products are sold online as 'lifestyle choices', 'research chemicals' and labelled 'not for human use' to circumvent legislation. Adverse health consequences include pigmentation changes, nausea, darkening of fingernail beds, and facial flushing. Management of side effects was characterised by polypharming with substances such as marijuana and retinal | First online study mapping discussion forum postings gives an insight into a subcultural network of Melanotan users. | Clear statement of the aims of the research. Rich data collection due to access to conversations between users which play out over time and are very detailed. Online setting an easy observational and safe place for researchers. Practices discussed by users may not have been revealed through face to face interviewing. Clear statement of findings. | Online identities may not be representative of reality. Collection of user demographics is not possible using this methodology. Limited to one site. Excludes bodybuilding collective who also use Melanotan. |

| Title                                                                                                                   | Year | Place | Author/s                  | Design          | Data collection     | Setting         | Sample size | Response rate | Main findings                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Contribution                                                                                                                                                           | Strengths                                                                                                                                                                                       | Weaknesses                                                                                                                                                                                                                                                    |
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| 1<br>3<br>Variability and dilemmas in harm reduction for anabolic steroid users in the UK: a multi-area interview study | 2014 | UK    | Kimergard, A & McVeigh, J | cross-sectional | In depth interviews | needle exchange | 33          | n/a           | <p>All service providers reported an increase of PIED users sourcing needles. PIED user sourcing of needles is dynamic and can include peer-led distribution networks in addition to needle exchange services available at clinics. Disagreements arose where service providers were unsure of their boundaries when offering harm reduction advice to service users. Regular medical examinations were offered to service users.</p> <p>Significant tensions and dilemmas in policy implementation due to differing perspectives between service providers and service users</p> | <p>Few studies have examined the impact of harm reduction services on the injecting risk behaviours of PIED users. This study contributes evidence in this regard.</p> | <p>Clear statement of the aims of the research. Methodology suitable for an in-depth account of service providers and clientele experiences of harm reduction. Clear statement of findings.</p> | <p>Service providers may have leaned towards speaking in a positive manner about the benefits of harm reduction services, while underplaying the negative aspects. Generalisability of findings are limited to those who accessed harm reduction services</p> |

| <b>Title</b> | <b>Year</b> | <b>Place</b> | <b>Author/s</b> | <b>Design</b> | <b>Data collection</b> | <b>Setting</b> | <b>Sample size</b> | <b>Response rate</b> | <b>Main findings relating to practices, risks and effective interventions.</b> | <b>Contribution</b> | <b>Strengths</b> | <b>Weaknesses</b> |
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| Title                                                                                                                                                                     | Year | Place | Author/s                  | Design          | Data collection     | Setting         | Sample size | Response rate | Main findings                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Contribution                                                                                 | Strengths                                                                                                                                                                                                          | Weaknesses                                                                               |
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| 1<br>4<br>Environments, risk and health harms: a qualitative investigation into the illicit use of anabolic steroids among people using harm reduction services in the UK | 2014 | UK    | Kimergard, A & McVeigh, J | cross-sectional | In depth interviews | needle exchange | 24          | n/a           | Motivation for use was grounded in improving body image. Some users showed a lack of awareness of the harms associated with online sourcing of PIEDs. Other used adapted self designed risk negotiation strategies to navigate potential risk. Group norms and lay epidemiology supported ideas of moderated drug use and harm reduction measures like visiting needle exchange services but also promoted some high risk practices to increase effects of AAS. | This study contributes evidence for perceptions of risk and risk navigation by users of AAS. | Clear statement of the aims of the research. Methodology suitable for an in-depth account of AAS user's drug use patterns and perceptions of risk. Clear statement of findings. A broad cross section of AAS users | Generalisability of findings is limited to those who attend at needle exchange services. |

|        | <b>Title</b>                                                                                               | <b>Year</b> | <b>Place</b> | <b>Author/s</b>           | <b>Design</b>    | <b>Data collection</b> | <b>Setting</b>                 | <b>Sample size</b> | <b>Response rate</b> | <b>Main findings</b>                                                                                                                                                                                                                                                                                                                                                                                                            | <b>Contribution</b>                                                                   | <b>Strengths</b>                                                                                                                                                                                                | <b>Weaknesses</b>                                     |
|--------|------------------------------------------------------------------------------------------------------------|-------------|--------------|---------------------------|------------------|------------------------|--------------------------------|--------------------|----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|
| 1<br>5 | An exploratory study of image and performance enhancement drug use in a male British South Asian community | 2015        | UK           | Van Hout, M.C., & Kean, J | Selective sample | In depth interviews    | Harm reduction outreach centre | 20                 | n/a                  | Motive for use was recreational bodybuilding. All participants reported having their interest in PIEDs awoken through social media and peer messages. Older participants practiced moderated use whereas younger participants tended to be more reckless. Sourcing of AAS and growth hormones occurred from originating countries (Pakistan, India) with peer dealing also. Sellers acted as AAS gurus for inexperienced users. | This study contributes evidence on an under researched ethnic group of PIED injectors | Clear statement of the aims of the research. Methodology suitable for an in-depth account of PIED injection in a small group. Rich data collected through open ended interviewing. Clear statement of findings. | Potential bias introduced through selective sampling. |

| Title                                                                                                                                                              | Year | Place | Author/s                                                                       | Design           | Data collection                           | Setting                       | Sample size | Response rate | Main findings                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Contribution                                                                                                                                                                                                                                                                                               | Strengths                                                                                                                      | Weaknesses                                          |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|-------|--------------------------------------------------------------------------------|------------------|-------------------------------------------|-------------------------------|-------------|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|
| The supply of steroids and other performance and image enhancing drugs (PIEDs) in one English city: Fakes, counterfeits, supplier trust, common beliefs and access | 2015 | U.K.  | Coomber, R., Pavlidis, A., Santos, G.H., Wilde, M., Schmidt, W., & Redshaw, C. | Rapid assessment | In depth interviews and forensic sampling | service agency and local gyms | 32          | n/a           | Three or four main commercial suppliers to Plymouth were identified, they supplied to gym owners/body builders who then supplied to others. Only three of ten samples of PIED were genuine under forensic analysis, however, the authors posit that this was potentially due to inadequate testing equipment on behalf of the manufacturer, Eight out of twenty five participants who used PIED sold to friends (peer selling). Participants did not trust the online | This study contributes evidence from a local network of PIED suppliers. In doing do it finds that not all PIED products being sold are counterfeit and posits that maybe this is an inaccurate picture of the PIED market. Relationships and social capital were important in the 'social supply' of PIED. | The mixed methods approach provides insight into PIED markets including the social and interpersonal nature of local networks. | Not representative, restricted to one point in time |

| <b>Title</b> | <b>Year</b> | <b>Place</b> | <b>Author/s</b> | <b>Design</b> | <b>Data collection</b> | <b>Setting</b> | <b>Sample size</b> | <b>Response rate</b> | <b>Main findings</b> | <b>Contribution market.</b> | <b>Strengths</b> | <b>Weaknesses</b> |
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| Title                                                                                                                                      | Year | Place  | Author/s      | Design           | Data collection                                                                                  | Setting | Sample size                                 | Response rate | Main findings | Contribution                                                                                                                                                                                                                                                                                                                                                                                                                                             | Strengths                                                                                                                                                 | Weaknesses                                                                                       |                                                                                                                                                                                                 |
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| Exploring the social lives of image and performance enhancing drugs: An online ethnography of the Zyzx fandom of recreational bodybuilders | 2017 | online | Underwood, M. | Selective sample | Observation of discussion forum posts and in depth interactions via Facebook messenger and email | online  | 1 online discussion forum – the Zyzx fandom |               | n/a           | This study finds that use of PIEDs is changing hands from competitive bodybuilders to an increasing number of people who see PIEDs as having social benefits relational to gender and power. Using a sample from famous bodybuilder Zyzx fan forum, results show people who use PIED believe prohibition is failing and causing harm to users. PIED use is also conceptualised as liberating men from social and gender constraints regarding appearance | This contributes a unique insight into an online discussion forum of Zyzx fans, comprised of recreational bodybuilders, and their beliefs around PIED use | Utilises an online ethnographical approach which combines participant observation and interviews | Demographics cannot be presented due to sporadic details of gender and age etc. given online, duplicity of screen pseudonyms. Geographical location of forum discussants cannot be ascertained. |

| <b>Title</b> | <b>Year</b> | <b>Place</b> | <b>Author/s</b> | <b>Design</b> | <b>Data collection</b> | <b>Setting</b> | <b>Sample size</b> | <b>Response rate</b> | <b>Main findings</b> | <b>Contribution enhancement.</b> | <b>Strengths</b> | <b>Weaknesses</b> |
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| Title                                                                         | Year | Place          | Author/s                       | Design           | Data collection                                               | Setting                       | Sample size                                 | Response rate | Main findings | Contribution                                                                                                                                                                                                               | Strengths                                                                                                    | Weaknesses                                                                                                                                                                                                                                               |                                                                                                                                                                  |
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| 18<br>'Gain with no pain': Anabolic-androgenic steroids trafficking in the UK | 2016 | Online and U.K | Antonopoulos, G.A., & Hall, A. | Selective sample | Observation of discussion forum posts and in depth interviews | Online and in the gym setting | Several discussion forums and 20 interviews |               | n/a           | The steroid trade is decentralized . People willing to travel to countries where steroids are sold in bulk legitimately, or people able to buy merchandise online, sell steroids to gym and bodybuilding local networks. . | This study contributes an account of the social organization of the steroids trafficking business in the UK. | Utilises two data collection strategies. Clear statement of the aims of the research. Methodology suitable for an in-depth account of steroid trafficking and dealing. Rich data collected through open ended interviewing. Clear statement of findings. | Demographics cannot be collected from the online setting due to sporadic nature of details given. Interview data cannot be generalised due to selective sampling |

| Title                                                                                                                  | Year | Place   | Author/s                                           | Design           | Data collection                           | Setting | Sample size | Response rate | Main findings | Contribution                                                                                                                                                                                                                  | Strengths                                                                              | Weaknesses                                                                                                                         |                                                                                      |
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| 19<br>Outline of a typology of men's use of anabolic androgenic steroids in fitness and strength training environments | 2016 | Denmark | Christiansen, A.V., Vinther, A.S., & Liokaftos, D. | Selective sample | In depth interviews and literature review | n/a     | 37          |               | n/a           | The authors organise people who use AAS into a typology consisting of four ideal types: the Expert type, the Well-being type, the YOLO type and the Athlete type in the context of users' approach to risk and effectiveness. | This study contributes a framework for understanding the dynamic phenomenon of AAS use | Novel characterisation of approaches to AAS use, rich data collected through open ended interviewing. Clear statement of findings. | The ideal typology cannot encapsulate every dynamic and existing approach to AAS use |



| Title                                                                                                                                                         | Year | Place | Author/s                         | Design             | Data collection                                                         | Setting               | Sample size     | Response rate | Main findings | Contribution                                                                                                                                                                                                                                                               | Strengths                                                                                         | Weaknesses                                                                                                             |                                                       |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------|------|-------|----------------------------------|--------------------|-------------------------------------------------------------------------|-----------------------|-----------------|---------------|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|
| Social suppliers: Exploring the cultural contours of the performance and image enhancing drug (PIED) market among bodybuilders in the Netherlands and Belgium | 2016 | U.K.  | Van de Vena, K., & Mulrooney, K. | Selective sampling | In depth interviews and analysis of 64 PIED dealing criminal case files | Bodybuilding networks | 47 (interviews) |               | n/a           | PIED dealing groups are often embedded in distinct social and subcultural contexts. cultural scripts inform a lot of people who deal PIEDs movements and behaviours. networks among bodybuilders in the Netherlands and Belgium consist of friends and friends of friends. | This study contributes evidence for the social and cultural embeddedness of PIED dealing networks | Clearly focused issue. Clear statement of findings. Mixed methodology to investigate this topic in an in-depth manner. | Potential bias introduced through selective sampling. |

| Title                                                                                            | Year | Place  | Author/s                  | Design             | Data collection                 | Setting | Sample size         | Response rate | Main findings | Contribution                                                                                                                                                                                                                                                                                        | Strengths                                                    | Weaknesses                                                                                                                                                                                                 |                                                                                                                                       |
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| 2<br>1<br>Netnography of Female Use of the Synthetic Growth Hormone CJC-1295: Pulses and Potions | 2016 | online | Van Hout, M.C & Hearne, E | Selective sampling | Observation of discussion posts | online  | 9 discussion forums |               | n/a           | Forum discussants demonstrated a high level of lay expertise in relation to PIED. Motivation to use CJC 1295 included weight loss, muscle enhancement, youthful skin, improved sleep, and injury healing. Concerns centred on consequences of use regarding putting on too much muscle, weight gain | This study gives a unique insight into female use of CJC1295 | Clear statement of the aims of the research. Online methodology allows access to rich data. 9 discussion forums used. Validity was strengthened through use of the EPP method. Clear statement of findings | Demographics of forum discussants cannot be presented due to sporadic nature of details given, and potential duplicity of pseudonyms. |

| Title                                                                                     | Year | Place  | Author/s                         | Design             | Data collection                 | Setting | Sample size        | Response rate | Main findings | Contribution                                                                                                                  | Strengths                                                                                             | Weaknesses                                                                                                                  |                                                                                                                                                                  |
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| 2<br>2<br>Bodybuilder's accounts of synthol use: the construction of lay expertise online | 2016 | online | Hall, M., Grogan, S., & Gough, B | Selective sampling | Observation of discussion posts | online  | 1 discussion forum |               | n/a           | This study contributes evidence for how lay expertise is constructed and disseminated online in relation to synthol injection | This study gives a unique insight into synthol use and into the dissemination of lay expertise online | Clear statement of the aims of the research<br>Online methodology allows access to rich data<br>Clear statement of findings | Demographics of forum discussants cannot be presented due to sporadic nature of details given, and potential duplicity of pseudonyms.<br>Restricted to one forum |

| Title                                                                                                                                               | Year | Place  | Author/s                                                    | Design             | Data collection                 | Setting | Sample size         | Response rate | Main findings | Contribution                                                                                                                                                                         | Strengths                                                                                                                                   | Weaknesses                                                                                                                   |                                                                                                                                       |
|-----------------------------------------------------------------------------------------------------------------------------------------------------|------|--------|-------------------------------------------------------------|--------------------|---------------------------------|---------|---------------------|---------------|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| Information sought, information shared: exploring performance and image enhancing drug user-facilitated harm reduction information in online forums | 2017 | online | Tighe, B.,<br>Dunn, M.,<br>McKay, F.H., &<br>Piatkowski, T. | Selective sampling | Observation of discussion posts | online  | 3 discussion forums |               | n/a           | Forum discussants utilise the discussion forum space to swap information and lend support. Anecdotal advice is given but recommendations are also given for seeking medical advices. | This study contributes evidence for the function of the discussion forum as an information point and support system for people who use PIED | Clear statement of the aims of the research<br>Online methodology allows access to rich data.<br>Clear statement of findings | Demographics of forum discussants cannot be presented due to sporadic nature of details given, and potential duplicity of pseudonyms. |

## Appendix C: Clinical trials CASP chart

|   | <b>Title</b>                                                                                                     | <b>Place</b> | <b>Year</b> | <b>Author/s</b>                                                          | <b>Methods</b>                                                                                                                                                  | <b>Results</b>                                                                              | <b>Contribution</b>                                                                                                                     | <b>Strengths</b>                                                                                                                             | <b>Weaknesses</b>                                                  |
|---|------------------------------------------------------------------------------------------------------------------|--------------|-------------|--------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|
| 1 | Online marketing of synthetic peptide hormones: poor manufacturing, user safety, and challenges to public health | UK           | 2014        | Kimergård, A., McVeigh, J., Knutsson, S., Breindahl, T., & Stensballe, A | Analysis of a vial purchase online and labelled human growth hormone using a reference standard and liquid chromatographic-tandem mass spectrometry (LC-MS/MS). | Despite being labelled and sold as GHRP-2 the vials contents were found to be Melanotan II. | This study highlighted the potential for contamination, mislabelling and misrepresentation of compounds in the unregulated IPED market. | Addressed a clearly focused issue. All important clinical outcomes considered. Precise results. Findings applicable to the local population. | Findings are limited to one vial purchased from one online vendor. |

| Title                                                                                                                     | Place     | Year | Author/s                                                                                                   | Methods                                                                                                                                                                                                                                                                                                                                                                 | Results                                                                                                                                                                                                                                                                                                                                                                                                                  | Contribution                                                                                                                                                                                                                                                                             | Strengths                                                                                                                                                               | Weaknesses                                                                                                 |
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| 2 The effects of growth hormone on body composition and physical performance in recreational athletes: a randomized trial | Australia | 2010 | Meinhardt, U., Nelson, A.E., Hansen, J.L., Birzniece, V., Clifford, D., Leung, K.C., Graham, K and Ho, K.K | Randomized, placebo-controlled, blinded study of 96 recreational athletes (63 male, 33, female) over 8 weeks of treatment followed by a 6-week washout period. Male volunteers were randomly administered growth hormone (2mg/d) testosterone (250mg/d) or a placebo, and female volunteers were randomly assigned to receive either placebo or growth hormone (2 mg/d) | Growth hormone had reducing effects on fat mass, and through increasing extracellular water increased lean body mass. When combined with testosterone, increases in body cell mass in men were observed. Growth hormone also improved sprint capacity in men and women but did not significantly improve athletic performance otherwise. Six weeks after cessation of the drug sprint capacity increases had diminished. | Growth hormone is commonly abused by athletes in combination with AAS. Its performance enhancing effects are as yet unevidenced. This study aimed to determine the effects of growth hormone in isolation and in combination with testosterone on the body and its athletic performance. | Addressed a clearly focused issue. Double blind, randomized control trial. Computer generated randomization with hidden allocation. Applicable to the local population. | Trial used lower dosages of growth hormone than may be typically used in reality by recreational athletes. |

| Title                                                                                                                         | Place | Year | Author/s                                                                                               | Methods                                                                                                                                                                      | Results                                                                                                                                                                                                                                    | Contribution                                                                                                                                                                                                                             | Strengths                                                                                                                                                                                                                                 | Weaknesses                                                                                                                                                                                                                                        |
|-------------------------------------------------------------------------------------------------------------------------------|-------|------|--------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3 Identification and characterization by LC-UVMS/2014 MS of Melanotan II skin-tanning products sold illegally on the Internet | UK    | 2014 | Breindahl, T., Evans-Brown, M., Hinderesson, P., McVeigh, J., Bellis, M., Stensballe, A., Kimergård, a | Samples of Melanotan products were purchased from three online shops. Newly developed methods of liquid chromatography were used to identify the contents of vials purchased | Melanotan II was identified in all vials purchased. Varying levels of unidentified impurities were also found. Melanotan vials were sold as containing 10mg of Melanotan but vials were understrength, containing between 4.32 and 8.84mg. | New analytical methods to clearly identify Melanotan II, determine contents of vials and measure levels of impurities were developed and validated. This study also provides evidence that Melanotan is available on the illicit market. | Addressed a clearly focused issue. First quantitative report on analysis of Melanotan products sourced online. Precise results. All important outcomes considered. Methods of testing well described. Applicable to the local population. | Products were sourced from three websites. Results cannot be generalised to all Melanotan products for sale from these vendors nor to any other vendors online. Levels of impurities in vials were measured but impurities were not characterised |

| Title                                                                                     | Place   | Year | Author/s                                                                | Methods                                                                                                                                                                                                                                                               | Results                                                                                   | Contribution                                                                                                                                                                                 | Strengths                                                                                                                                                                                                                                                                                                 | Weaknesses                                                                                                                                                                                                                                                                    |
|-------------------------------------------------------------------------------------------|---------|------|-------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4 Availability and quality of illegitimate somatropin products obtained from the Internet | Hungary | 2017 | Vida, R.G., Fittler, A., Abraham, E., Sandor, V., Kilar, F., & Botz, L. | Samples of somatropin, a type of human growth hormone (GH) product were purchased from three online shops. Methods of capillary electrophoresis with UV detection and electrospray ionization mass spectrometry were used to identify the contents of vials purchased | Majority of internet sites sold somatropin without a prescription, and were understrength | This study contributes evidence that GH products are available on the illicit market and also provides information on the contents of vials, namely that they are likely to be understrength | Addressed a clearly focused issue. This study mapped out the online sellers' market method and also used analysis of medication quality alongside this. Precise results. All important outcomes to practice and policy considered. Methods of testing well described. Applicable to the local population. | Products were sourced from three websites. Results cannot be generalised to all somatropin products for sale from these vendors nor to any other vendors online. A lack of comprehensive analysis including purity test and peptide mapping and no microbiological evaluation |



**Appendix D: Clinical case presentations CASP chart**

| Title                                                          | Year | Place | Author/s                                | No. of patients | Summary of findings                                                                                                                                                                                                                                                                                 | Strengths                                                                                                                                                                                                    | Weaknesses                                                                                                |
|----------------------------------------------------------------|------|-------|-----------------------------------------|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|
| 1 Hodgkin's lymphoma in a cyclist treated with growth hormone. | 1996 | Italy | Magnavita, N., Teofili, L and Leone, G. | 1               | A 31yr old male presented with right inguinal lymphadenopathy, later diagnosed as Hodgkin's lymphoma. He reported longterm use of AAS caffeine and amphetamines, in addition to four large doses of human growth hormone during his participation in competitive cycling four years prior to onset. | This single case presentation contributes evidence for Hodgkin's Lymphoma in a human growth hormone user and also reports on dosages administered, drug history and motivation for use (competitive cycling) | No information on sourcing of PIEDs, no evidence that the substance administered was human growth hormone |

| Title                                                                                       | Year | Place   | Author/s                                                           | No. of patients | Summary of findings                                                                                                                                                                                                                                                                                                    | Strengths                                                                                                                                                                                                                                        | Weaknesses                                                                                                     |
|---------------------------------------------------------------------------------------------|------|---------|--------------------------------------------------------------------|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|
| 2 Subcutaneous oleomas induced by self-injection of sesame seed oil for muscle augmentation | 2000 | Germany | Darsow, U., Bruckbauer, H., Worret, W. I., Hofmann, H and Ring, J. | 1               | Male, 48, AAS user, presented with nodules in the pectoral area where he had injected sesame seed oil purchased in a pharmacist to augment the appearance of his pectoral muscles. Excision revealed an oil filled cyst surrounded by granuloma. The case reported that oil injection was common amongst bodybuilders. | This single case presentation contributes evidence for adverse effects associated with oil injection in bodybuilding culture, of which there is a lack of research. PIED drug history taken from patient, sourcing of sesame seed oil described. | Single case study which cannot be generalised. No information regarding sourcing of needles for oil injection. |

| Title                                                      | Year | Place  | Author/s                                                                               | No. of patients | Summary of findings                                                                                                                                                                                                                                              | Strengths                                                                                                                                                                                                                           | Weaknesses                                                                                                                                                             |
|------------------------------------------------------------|------|--------|----------------------------------------------------------------------------------------|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3 Bodybuilder oleoma.                                      | 2003 | Berlin | Georgieva, J., Assaf, C., Steinhoff, M., Treudler, R., Orfanos, C. E and Geilen, C. C. | 1               | A 44-year-old male, bodybuilder, presented painful nodules on his arms and pectorals. Disclosed injecting use of sesame oil to augment muscle up to 120ml per week. Diagnosis was oleoma in the form of chronic foreign body reaction to sesame oil injection    | This single case presentation contributes evidence for oil injection in bodybuilding subculture, and the occurrence of adverse effects such as oleoma. Oil dosage information collected.                                            | No information collected on sourcing of injectable oil. No evidence that the oil injected was sesame oil. Incomplete PIED use history.                                 |
| 4 Multifactorial hypoglycaemic coma in female bodybuilder. | 2005 | Poland | Sein Anand, J., Chodorowski, Z and Wisniewski, M.                                      | 1               | A 31 yr. old female bodybuilder presented with deep coma and hypoglycaemia. In preparation for a bodybuilding competition she had been following a high protein, low carbohydrate diet, and also taking a low dose of somatotropin (human growth hormone) daily. | This single case presentation contributes evidence of female bodybuilder's use of human growth hormone, and also the occurrence of coma and hypoglycaemia in a human growth hormone user. Reports motivation for use (bodybuilding) | No information on sourcing of human growth hormone, or evidence that the substance administered was human growth hormone. No drug history or exact dosage information. |

| Title                                                   | Year | Place | Author/s                     | No. of patients | Summary of findings                                                                                                                                                                                                                                                                                                                                                                                | Strengths                                                                                                                                                                       | Weaknesses                                                                                                       |
|---------------------------------------------------------|------|-------|------------------------------|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
| 5 Anabolic steroid related abscess—A risk worth taking? | 2006 | UK    | Marquis, C.P and Maffulli, N | 1               | A 36-year-old male body builder presented with very tender bilateral deltoid abscesses with patient disclosing intramuscular steroid use, in a 10-day cycle, which included 100 mg Viramone (testosterone propionate);300 mg Enathate (testosterone Enathate); and 300 mg Deca—Durabolin (Nandrolone).The patient did not admit to either needle or vial sharing, and intended to continue AAS use | This single case presentation contributes evidence for abscess in an AAS user. It also reports on dosages used, some injecting behaviour and intentions to continue use of AAS. | No information on sourcing of PIEDs, no evidence that the substance administered was AAS. No drug history taken. |

| Title                                                                                                   | Year | Place | Author/s                                                | No. of patients | Summary of findings                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Strengths                                                                                                                                                                                                                     | Weaknesses                                                                                                                                            |
|---------------------------------------------------------------------------------------------------------|------|-------|---------------------------------------------------------|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| 6 Near-fatal spontaneous hepatic rupture associated with anabolic androgenic steroid use: a case report | 2007 | UK    | Patil, J.J., O'Donohoe, B., Loyden, C.F and Shanahan, D | 1               | A 43 yr. old male bodybuilder presented with collapse after two days of stomach pain. Investigation found that he had been taking AAS for 25 years, but had ceased 4 years prior to onset of symptoms. Dosages were perceived as low compared to other bodybuilders. Medical history included Crohns disease and recurrent deep vein thrombosis. He then had a cardiovascular collapse requiring resuscitation with blood and IV fluids. Three litres of blood was taken from his abdomen. A ruptured haematoma of the liver was found to be the cause of the haemorrhage. He made a slow recovery over a 20 day period. | This single case presentation contributes evidence for ruptured haematoma of the liver in a long term user of AAS, four years after cessation of use. Some dosage information was taken with motivation for use (bodybuilder) | No information on sourcing of AAS or evidence that product administered was AAS. No drug history taken with additional PIEDS or illicit drugs if any. |

| Title              | Year | Place | Author/s               | No. of patients | Summary of findings                                                                                                                                                                                                                                                                             | Strengths                                                                                                                                                                                                                                                                                                         | Weaknesses                                                                                                                                           |
|--------------------|------|-------|------------------------|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7 Strong diabetes. | 2007 | UK    | Young, J and Anwar, A. | 1               | A 36 yr. old male professional bodybuilder presented to emergency services with right upper quadrant pain. He disclosed a 15 year history of AAS and growth hormone use. Investigations found a 16 cm hepatomegaly with bilaterally mildly enlarged kidneys and he was diagnosed with diabetes. | This single case presentation contributes evidence for frank diabetes in a longterm AAS and growth hormone user. Due to the insulin resistance associated with growth hormone excess the development of diabetes was likely to be attributed to the administration of growth hormone. Drug history reported (AAS) | No information on dosages of AAS or GH administered. No information on sourcing of either drug. No evidence that product administered was AAS or GH. |

| Title                                                                             | Year | Place | Author/s                 | No. of patients | Summary of findings                                                                                                                                                                                                                                                                                                                                          | Strengths                                                                                                                                       | Weaknesses                                |
|-----------------------------------------------------------------------------------|------|-------|--------------------------|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|
| 8 Anabolic and Cardiomyopathy in a Bodybuilder: Case Report and Literature Review | 2009 | USA   | Ahlgrim, C and Guglin, M | 1               | A 41 male patient with past history of AAS and IGF use presented to an emergency room with abdominal pain and nausea, and was later diagnosed with heart failure. The case continued to engage in heavy weightlifting despite a diagnosis of heart problems. This is likely to have exacerbated his condition and contributed to his eventual heart failure. | This clinical case report offers further evidence for a link between AAS abuse and heart failure. Complete drug history was taken from patient. | Single case study limits generalizability |

| Title                                                         | Year | Place | Author/s                              | No. of patients | Summary of findings                                                                                                                                                                                                                                                                                                                                   | Strengths                                                                                                                  | Weaknesses                                                                                                                                                                                         |
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| 9 Alpha-Melanocyte-stimulating hormone-induced eruptive nevi. | 2009 | USA   | Cardones, A., Rand, J and Richnik, M. | 1               | A 40-year-old male patient with a history of melanoma and multiple dysplastic nevi presented disclosing Melanotan use. He had several newly developed pigmented nevi, many of which had atypical features. The preexisting nevi grew in size and deepened in colour. After he stopped using Melanotan, the nevi lightened and didn't grow any larger. | This single case report adds to the evidence base linking eruptive naevi and darkening of existing naevi to Melanotan use. | Single case study limits generalizability. Incomplete drug history reported. No information on whether solarium use. No information on Melanotan sourcing, or evidence that product was Melanotan. |



| Title                                                       | Year | Place | Author/s                               | No. of patients | Summary of findings                                                                                                                                                                 | Strengths                                                                                                                                | Weaknesses                                                                                                                           |
|-------------------------------------------------------------|------|-------|----------------------------------------|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|
| 10 Eruptive melanocytic naevi following Melanotan injection | 2009 | UK    | Cousen, P., Colver, G and Helbling, I. | 1               | 19-year-old female. Presented with 60 new eruptive naevi after four injections of Melanotan II. Described darkening of pre-existing larger moles. Heavy sunbed use was reported.    | This single case report adds to the evidence base linking eruptive naevi and darkening of existing naevi to Melanotan use.               | No information on additional PIED or illicit drug use. No information on Melanotan sourcing, or evidence that product was Melanotan. |
| 11 Malignant melanoma in a user of Melanotan I.             | 2009 | USA   | Ellis, R., Kirkham, N and Seukeran, D  | 1               | A 23 year old male with four weeks Melanotan I use presented with enlarged and darkened pigmented lesion. Heavy sunbed use was reported. Biopsy showed the lesion to be a melanoma. | This single case presentation contributes evidence for changes in nevi in Melanotan users. Use of solariums was accounted for in report. | No information on additional PIED or illicit drug use. No information on Melanotan sourcing, or evidence that product was Melanotan. |

| Title                                                                                                      | Year | Place  | Author/s                                | No. of patients | Summary of findings                                                                                                                                                                                           | Strengths                                                                                                               | Weaknesses                                                                                                                          |
|------------------------------------------------------------------------------------------------------------|------|--------|-----------------------------------------|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| 12 Rhabdomyolysis of the Deltoid Muscle in a Bodybuilder Using Anabolic-Androgenic Steroids: A Case Report | 2009 | Israel | Farkash, U., Shabshin, N and Pritsch, M | 1               | A 39-year-old male presented with pain and unable to move his right shoulder after injecting Stanozolol, an AAS into his right deltoid muscle that day. Medical examination confirmed massive rhabdomyolysis. | This single case presentation contributes evidence for AAS associated rhabdomyolysis. AAS dosage information collected. | No information collected on sourcing of AAS. Incomplete PIED drug use history taken. No evidence that the product injected was AAS. |

| Title                                                        | Year | Place | Author/s                                                     | No. of patients | Summary of findings                                                                                                                                                                                                                                                                    | Strengths                                                                                                                                                        | Weaknesses                                                                                                                                                                                                                                                                                                                    |
|--------------------------------------------------------------|------|-------|--------------------------------------------------------------|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 13 Change in moles linked to use of unlicensed 'sun tan jab' | 2009 | UK    | Langan, E. A., Ramlogan, D., Jamieson, L. A and Rhodes, L. E | 2               | Case 1: A 42 year old female had two moles on her sole which had enlarged and darkened. They were benign.<br>Case 2: A 30 year old female reported recent darkening of several moles on her back. Both had been injecting Melanotan I and II sourced online. Both reported sunbed use. | This case series contributes evidence for changes in nevi in two Melanotan users. It also reports sourcing route (online) and reports use of artificial UV light | It is unclear whether both patients had injected both Melanotan I and II concurrently, and if not, which patient had injected Melanotan I or II. No information on dosages or length of cycles of Melanotan administered. No information on other PIEDs or illicit drugs used if any. No evidence that product was Melanotan. |

| Title                                                                                     | Year | Place | Author/s                                                     | No. of patients | Summary of findings                                                                                                                                                                                                                                                            | Strengths                                                                                                                                            | Weaknesses                                    |
|-------------------------------------------------------------------------------------------|------|-------|--------------------------------------------------------------|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|
| 14 Foreign body granulomatous reactions to cosmetic fillers: a clinical study of 15 cases | 2009 | Spain | Sanchis-Bielsa, J.M., Began, J.V., Poveda, R and Salvador, I | 15              | Collation of data from 15 patients - 1 male, 14 females - presenting with swelling on average 7 years post injection of cosmetic fillers, which ranged in composition ( silicone (n=9) , hyaluronic acid (n = 2), collagen (n = 2), methacrylate (n = 1)polyalkylimide (n = 1) | This case series presentation contributes evidence for the occurrence of pain and swelling in users of dermal fillers several years after injection. | No information on sourcing of cosmetic filler |

| Title                                                                                                                                             | Year | Place  | Author/s                                | No. of patients | Summary of findings                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Strengths                                                                                                                                                                                                                                     | Weaknesses                           |
|---------------------------------------------------------------------------------------------------------------------------------------------------|------|--------|-----------------------------------------|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|
| 15 Sudden unexpected death in a female fitness athlete, with a possible connection to the use of anabolic androgenic steroids (AAS) and ephedrine | 2009 | Sweden | Thiblin, I., Mobini-Far, H and Frisk, M | 1               | A 29 yr. old female was found deceased at her home. She had a past history of alcohol abuse & disorderly conduct, but none recently. No evidence of illicit drug abuse or psychiatric illness. She was known to police for trading in PIEDs and also prostitution. Nine separate PIEDs were documented as part of her drug regimen in a diary found at her home. Clenbuterol, ephedrine, tadalafil, metandienon, mestanolon, and stanozolol were all found at her home also. Cause of death was most likely to be sudden cardiac arrhythmia caused by an underlying inflammatory process in the heart and the effects of AAS and ephedrine. | This single case presentation of the death of a female fitness athlete contributes evidence for fatal cardiac arrhythmia in an AAS user. Evidence that the substances ingested were AAS and other PIEDs is documented. Drug history reported. | No information on sourcing of PIEDs. |

|    | <b>Title</b>                                                                                      | <b>Year</b> | <b>Place</b> | <b>Author/s</b>            | <b>No. of patients</b> | <b>Summary of findings</b>                                                                                                                                                                                                                                                                                                                                                                                  | <b>Strengths</b>                                                                                               | <b>Weaknesses</b>                                                                                                                              |
|----|---------------------------------------------------------------------------------------------------|-------------|--------------|----------------------------|------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| 16 | Foreign body granulomatous reaction of the temporal region following dermal filler administration | 2010        | UK           | Avery, C., and Clifford, N | 1                      | A 46-year-old female presented with an increasing mass in her right temple which upon excision proved to be dermal filler foreign body reaction                                                                                                                                                                                                                                                             | This clinical case report offers further evidence for inflammatory reaction caused by dermal filler injection  | Sourcing of dermal filler injection was not described.                                                                                         |
| 17 | Anabolic steroid use, dilated cardiomyopathy and compartment syndrome                             | 2010        | UK           | Joynes, E                  | 1                      | A young male reported to the emergency services with heart failure and was diagnosed with dilated cardiomyopathy attributable to recreational steroid use. At 3 month follow up he had no symptoms and his condition had reversed. Two weeks after admission an above knee amputation had to be performed after compartment syndrome set in after minor trauma to the leg, which occurred during admission. | This single case presentation contributes evidence for heart failure, and compartment syndrome in an AAS user. | No information on sourcing. No evidence that the substance used was AAS. No information on polypharming with other PIED or illicit substances. |

| Title                                                                                 | Year | Place   | Author/s                        | No. of patients | Summary of findings                                                                                                                                                                                                                                                                                                                                                                                                                      | Strengths                                                                                                                         | Weaknesses                                                                                                                                                                                                                                                          |
|---------------------------------------------------------------------------------------|------|---------|---------------------------------|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 18 Melanotan - a Skin-tanning Product with Potentially Harmful Effects. A Case Series | 2010 | Denmark | Kjærsgaard, C.T and Dalhoff , K | 3               | Case 1: A 23 year old female developed a haematoma after injecting Melanotan.<br>Case 2: An 18 year old female with a history of alcohol abuse and hyperventilation had hyperventilation and palpitations of the heart after taking Melanotan. Nausea and abdominal pain also described.<br>Case 3: A 22 year old male presented with difficulty in breathing, dizziness and a tingling sensation in both arms after injecting Melanotan | This case series contributes evidence for a range of adverse effects in three Melanotan users. Reports drug history (alcohol use) | No information on additional PIED use if any. No information on whether products were Melanotan I or II. No information on dosages or length of cycles administered. No information on source of Melanotan product, no evidence that product injected was Melanotan |

| Title                                                                   | Year | Place   | Author/s                                 | No. of patients | Summary of findings                                                                                                                                                                        | Strengths                                                                                                                                 | Weaknesses                                                                                                                                                                                                                                                                                 |
|-------------------------------------------------------------------------|------|---------|------------------------------------------|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 19 Melatonin used for tanning induces and augments lentigines and naevi | 2010 | Denmark | Thestrup-Pedersen, K., & Søndergaard, K. | 1               | A 25 year old male presented with brown markings all over his body particularly penis, having injected approx. 150 injections of Melanotan. Two naevi were excised but found to be benign. | This single case presentation contributes evidence for changes in skin pigmentation in a Melanotan user and reports dosages administered. | No information given on whether product administered was Melanotan I or II. No other PIED use history or illicit drug use history given. No information on source of Melanotan given. No evidence that product injected was Melanotan. No information regarding use of artificial UV light |



| Title                                                                                       | Year | Place   | Author/s                                               | No. of patients | Summary of findings                                                                                                                                                                                                                                                                                                                                               | Strengths                                                                                                                                                                                                                  | Weaknesses                                                                                                                                                                                    |
|---------------------------------------------------------------------------------------------|------|---------|--------------------------------------------------------|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 20 Pseudoleuco-derma after injections of afemelanotide in a patient with atopic dermatitis. | 2011 | Germany | Von Bartenwerffer, W., Siebenhaar, G., & Hunzelmann, N | 1               | A 30yr old male presented with patchy pigmentation of skin on his torso. Disclosed use of afemelanotide (Melanotan I) after several visits, a total dosage of 50mg administered over two months. Additional side effects he experienced included headache, nausea and fatigue. Eight weeks after cessation of Melanotan use the patchy pigmentation had resolved. | This single case presentation contributes evidence for patchy pigmentation, headache, nausea and fatigue in a Melanotan user, and also reports dosages administered and whether product was disclosed to be Melanotan I/II | No other PIED use history or illicit drug history given. No information on source of Melanotan I. No evidence that product injected was Melanotan I. No information regarding use of sunbeds. |

| Title                                                      | Year | Place | Author/s                       | No. of patients | Summary of findings                                                                                                                                                                                                           | Strengths                                                                                                             | Weaknesses                                                                                                                                |
|------------------------------------------------------------|------|-------|--------------------------------|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| 21 Melanotan II: An unusual cause of drug-induced priapism | 2012 | USA   | Devlin, J.J and Pomerleau, A.C | 1               | A 60 year-old male with refractory priapism and a sympathomimetic toxidrome after self-injecting an unknown dose of Melanotan II, sourced on the internet. Developed tachycardia, diaphoresis, hypertension, and back-arching | This single case presentation contributes evidence for priapism and systemic toxidrome associated with Melanotan use. | Dosage of Melanotan administered was unknown. No information on other drug use. No evidence that the product self-injected was Melanotan. |

| Title                                                | Year | Place | Author/s                                                                       | No. of patients | Summary of findings                                                                                                                                                                                                                                                                                                                                          | Strengths                                                                                                       | Weaknesses                                                                                                                           |
|------------------------------------------------------|------|-------|--------------------------------------------------------------------------------|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|
| 22 Eruptive dysplastic nevi following Melanotan use. | 2012 | Spain | Hueso-Gabriel, L., Mahiques-Santos, L., Terrádez Mas, L., & Santonja López, N. | 1               | A 25-year-old male presented with sudden eruption of multiple melanocytic nevi and changes in pre-existing nevi. use of Melanotan II was reported. Histopathology revealed dysplastic melanocytic nevi, which carry a high risk of developing into melanoma, with severe dysplasia. One carcinoma was also removed. Use of artificial UV light was confirmed | This single case presentation contributes evidence of melanoma in a Melanotan user. Use of solariums confirmed. | No information on additional PIED or illicit drug use. No information on Melanotan sourcing, or evidence that product was Melanotan. |

| Title                                                                                                                     | Year | Place     | Author/s      | No. of patients | Summary of findings                                                                                                                                                                                                                                                                                                                                                                                             | Strengths                                                                                                                                                                                 | Weaknesses                                                                                                   |
|---------------------------------------------------------------------------------------------------------------------------|------|-----------|---------------|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|
| 23 Changes of melanocytic lesions induced by Melanotan injections and sunbed use in a teenage patient with FAMMM syndrome | 2012 | Australia | Sivyer, G. W. | 1               | A 16 year old female presented multiple dark melanocytic naevi and an enlarging nevus in her left groin following self administration of Melanotan II. Product was sourced online. Use of artificial UV light disclosed. Three months later the patient was reviewed. She had ceased using Melanotan II but still used artificial UV light frequently. Her skin and moles appeared much lighter on examination. | This single case presentation contributes evidence for changes in nevi in a Melanotan user. It also reports whether product was disclosed to be Melanotan I/II and reports sourcing route | No other PIED use history or illicit drug history given. No evidence that product injected was Melanotan II. |

| Title                                                                        | Year | Place | Author/s                                   | No. of patients | Summary of findings                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Strengths                                                                                                                                                                                                        | Weaknesses                                     |
|------------------------------------------------------------------------------|------|-------|--------------------------------------------|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|
| 24 Melanotan II injection resulting in systemic toxicity and rhabdomyolysis. | 2012 | USA   | Nelson, M. E., Bryant, S. M and Aks, S. E. | 1               | A 39 year old male injected 6 mg (six times the recommended starting dose) of Melanotan II purchased online in an attempt to tan during winter. Symptoms two hour post injection included diffuse body aches, sweating, anxiety, mydriasis, diaphoresis, tachycardia, and diffuse muscle tremors. Diagnosis of systemic toxicity with sympathomimetic excess, rhabdomyolysis, and renal dysfunction. Product administered was sourced online and was tested and found to be Melanotan II. Opiates were found in patient's system and patient disclosed taking an unnamed "pain pill". | This single case presentation contributes evidence for systemic toxicity in a Melanotan user. Also reports whether product was disclosed to be Melanotan I/II, dosages administered, and sourcing route (online) | No information on additional PIEDs used if any |

| Title                                                                                                                             | Year | Place | Author/s                                                                                         | No. of patients | Summary of findings                                                                                                                                                                                                                                                                                                                                                                                                                                  | Strengths                                                                                                                                       | Weaknesses                                                                                                                                                                                                                       |
|-----------------------------------------------------------------------------------------------------------------------------------|------|-------|--------------------------------------------------------------------------------------------------|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 25 Anabolic androgenic steroids abuse and cardiac death in athletes: Morphological and toxicological findings in four fatal cases | 2012 | Italy | Montisci, M., Mazloum, R.E., Cecchetto, G., Terranova, C., Ferrara, S.D., Thiene, G and Basso, C | 4               | Using a necroscopic methodology, three cases of sudden cardiac death and one case of congestive heart failure in previously healthy athletes who used AAS are reported in this observational case series. Data confirms the most common cardiac event in AAS abusers is left ventricular hypertrophy, associated with fibrosis and myocytolysis. There was no evidence of any consumption of illicit drugs that may have contributed to these events | This case series investigation of the deaths of previously healthy athletes contributes evidence for fatal cardiac events in four users of AAS. | Extensive polypharmacy amongst AAS users makes interpretation of pathologic findings difficult. Alternative causes of myocardial hypertrophy may have been present, e.g. exercise itself can cause left ventricular hypertrophy. |

| Title                                                                   | Year | Place | Author/s                                                                               | No. of patients | Summary of findings                                                                                                                                                                                                                                                                                                                                                                      | Strengths                                                                                                                   | Weaknesses                                                                                                                           |
|-------------------------------------------------------------------------|------|-------|----------------------------------------------------------------------------------------|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|
| 26 Cerebral Infarction in a Young Man Using High-dose Anabolic Steroids | 2012 | Japan | Shimada, Y., Yoritaka, A., Tanaka, Y., Miyamoto, N., Ueno, Y., Hattori, N and Takao, U | 1               | A 27 yr. old male who had paralysis of the right side of his body, partial blindness, motor speech disturbance, and double vision in the middle of weight lifting. Final diagnosis of cardioembolic stroke . He reported taking various AASs (methasterone and prostanazol) for the previous 6 months. He had no history of smoking or alcohol abuse. Routine blood studies were normal. | This single case presentation contributes evidence for cardioembolic stroke in an AAS user. Some drug history taken (none). | No information on dosages of AAS administered. No information on sourcing of AAS. No evidence that the product administered was AAS. |

| Title                                                              | Year | Place | Author/s                                                           | No. of patients | Summary of findings                                                                                                                                                                                                                                                                                                                                                                                                                                  | Strengths                                                                                                                                                                                     | Weaknesses                                                                                   |
|--------------------------------------------------------------------|------|-------|--------------------------------------------------------------------|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|
| 27 Melanotan and the posterior reversible encephalopathy syndrome. | 2013 | UK    | Kaski, D., Stafford, N., Mehta, A., Jenkins, I. H and Malhotra, P. | 1               | A 20-year-old woman had a single generalized tonic– clonic seizure while boarding an airplane to return from holidays. 6 days later on examination in the United Kingdom, she reported weakness of the right arm, reduced concentration, and difficulties with word-finding. . Two days after admission, she disclosed her Melanotan II use while on holiday. Symptoms resolved over a period of two weeks. Some illicit drug use history disclosed. | This single case presentation provides evidence for clonic seizure in a Melanotan user. It also reports drug history (illicit) and reports whether product was disclosed to be Melanotan I/II | No evidence that the product injected on holiday was Melanotan II, no information on source. |



| Title                                                       | Year | Place   | Author/s                                         | No. of patients | Summary of findings                                                                                                                                                                                                                                          | Strengths                                                                                                                                                                      | Weaknesses                                                                                                                                                                   |
|-------------------------------------------------------------|------|---------|--------------------------------------------------|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 28 Atypical melanocytic nevi following Melanotan injection. | 2013 | Ireland | Reid, C., Fitzgerald, T., Fabre, A., & Kirby, B. | 1               | A 33 year old female presented with changes in moles after having Melanotan injected on two occasions by a beautician. Use of artificial UV light was disclosed. In particular one naevi was enlarged and darkened. Upon excision it was found to be benign. | This single case presentation contributes evidence for changes in nevi in a Melanotan user. It also reports sourcing route (beautician) and reports use of artificial UV light | No information on whether the product injected was Melanotan I or II. No information on additional PIED or drug use if any. No evidence that product injected was Melanotan. |

| Title                                           | Year | Place   | Author/s                                                                | No. of patients | Summary of findings                                                                                                                                                                                                                                                                                                                                                                                              | Strengths                                                                                                                                                                                                                                       | Weaknesses                                                                                 |
|-------------------------------------------------|------|---------|-------------------------------------------------------------------------|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|
| 29 Melanotan-associated transverse melanonychia | 2013 | Belgium | Paurobally, D., El Hayderi, L., Richert, B., Andre, J., & Nikkels, A. F | 1               | A 54yr old female presented to the dermatology department for treatment of transverse pigmented streaks on her fingernails. She disclosed use of Melanotan I four months previously. She had sourced the product from a "cosmetic physician". She injected 0.4ml once a day for five days. The hyperpigmentation began about 1.5 months after the injections. Patient reported not taking any other medications. | This single case presentation contributes evidence for changes in pigmentation in the nails in a Melanotan user. Also reports sourcing route (cosmetic physician), dosages administered, and whether product was disclosed to be Melanotan I/II | No evidence that the product was Melanotan I. No information on use of artificial UV light |

|    | <b>Title</b>                                                                                                                        | <b>Year</b> | <b>Place</b> | <b>Author/s</b>                                                                                             | <b>No. of patients</b> | <b>Summary of findings</b>                                                                                                                                                                                  | <b>Strengths</b>                                                                     | <b>Weaknesses</b>                                                                                                |
|----|-------------------------------------------------------------------------------------------------------------------------------------|-------------|--------------|-------------------------------------------------------------------------------------------------------------|------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
| 30 | Delayed Adverse Effects related to hyaluronic acid dermal filler (restylane): Clinical Findings and Treatment of Oral Manifestation | 2014        | Brazil       | Curi, M.M., Koga, D.H., Zardetto, C., Cardoso, C.L and Araujo, S.R                                          | 1                      | 65 year old female. Presented with developed oral lesions. facial swelling, and nodules twelve years after hyaluronic acid dermal filler injections.                                                        | This single case report adds to the evidence base on delayed dermal filler reaction. | No information regarding sourcing of dermal filler injectable and who administered the injection to the patient. |
| 31 | Delayed Intraoral Foreign Body Reaction to Polymethylmethacrylate                                                                   | 2014        | Brazil       | De Almeida, S., Carvalho, F.S.R., Chaves, F.N., Turatti, E., Ribeiro, T.R., Pereira, K.M.A and Costa, F.W.G | 1                      | 57 year old female presented with facial swelling and non-movable nodules. Silicone dermal filler injection (polymethylmethacrylate) was reported by the patient to have been administered 9 years earlier. | This single case report adds to the evidence base on delayed dermal filler reaction. | No information regarding sourcing of dermal filler injectable and who administered the injection to the patient. |

| Title                                                                | Year | Place     | Author/s                          | No. of patients | Summary of findings                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Strengths                                                            | Weaknesses                                                                                                                                                                                                                                                                           |
|----------------------------------------------------------------------|------|-----------|-----------------------------------|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 32 Sudden or Unnatural Deaths Involving Anabolic Androgenic Steroids | 2014 | Australia | Darke, S., Torok, M and Dufrou, J | 24              | 24 AAS positive autopsy reports from the New South Wales Department of Forensic Medicine were analysed to determine causes of death, characteristics, toxicology, and pathology. All were male, and the mean age was 31.7 years. Cause of death was largely accidental drug toxicity (62.5%), suicide (16.7%) and homicide (12.5%). Nandrolone (58.3%), stanozolol (33.3%), and methandienone (20.8%) were detected in cases. Other drugs such as psychoactives were detected in the majority of cases (66.7%). Testicular atrophy, testicular fibrosis and spermatogenesis were noted in half of all cases. Left ventricular hypertrophy was seen in 30.4% of cases and narrowing of the arteries in 26.1%. | Clearly focused research question, with appropriate method utilised. | Findings limited to cases that were screened for AAS. Additional cases are likely to have gone undetected. New designer AAS were not accounted for in tests. Drug histories and length and severity of AAS use could not be determined in this clinical study of case presentations. |

| Title                                                                                                         | Year | Place   | Author/s                                                                                      | No. of patients | Summary of findings                                                                                                                                                                                                                                              | Strengths                                                                                                                                                                                                                                                                                                      | Weaknesses                                                                                                                                                                                                                                   |
|---------------------------------------------------------------------------------------------------------------|------|---------|-----------------------------------------------------------------------------------------------|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 33 Eruptive naevi and darkening of pre-existing naevi 24 h after a single mono-dose injection of Melanotan II | 2014 | Germany | Schulze, F., Erdmann, H., Hardkop, L.H., Anemüller, W., Rose C., Zillikens, D and Fischer T.W | 1               | A 24 year old male bodybuilder, presented with eruption of multiple new moles and darkening of pre-existing naevi 24 h after one single injection of Melanotan II. Regular use of artificial UV light. No signs of malignancy and naevi were found to be benign. | This single case presentation contributes evidence for eruption of new nevi and changes in existing nevi in a Melanotan user. It also reports motivation for use (bodybuilding), reports dosage administered reports use of artificial UV light and reports whether product was disclosed to be Melanotan I/II | Reports that Melanotan II was illegally acquired but no information on whether this was through online sources or peer selling. No evidence that product injected was Melanotan II. No other PIED use history or illicit drug history given. |

| Title                                                                                                                                        | Year | Place | Author/s                                           | No. of patients | Summary of findings                                                                                                                                                                                                              | Strengths                                                                                                                                     | Weaknesses                                                            |
|----------------------------------------------------------------------------------------------------------------------------------------------|------|-------|----------------------------------------------------|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|
| 34 Hurdles in the pursuit of youth. A case series investigating adverse reactions associated with dermal fillers: where is the onus of care? | 2014 | UK    | Sampson, A., Cymerman, J., Kumar, M and Messiha, A | 3               | Three patients presented with facial pain, swelling and granulomatous, and lesions, following injections of hyaluronic acid dermal fillers. Profound psychological impact was noted in patients during the process of treatment. | This case series presentation contributes evidence for the occurrence of pain, swelling and granulomatous lesions in users of dermal fillers. | No information on sourcing of product, dosages or injecting practice. |

| Title                                                                                      | Year | Place | Author/s                                                                 | No. of patients | Summary of findings                                                                                                                                                                                                                                                                                                                                        | Strengths                                                                                                                                                                         | Weaknesses                                  |
|--------------------------------------------------------------------------------------------|------|-------|--------------------------------------------------------------------------|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|
| 35 Granulomatous foreign body reaction to dermal cosmetic fillers with intraoral migration | 2014 | USA   | Shahrabi-Farahani, S., Lerman, M.A., Noonan, V., Kabani, S and Woo, S. B | 25              | Collation of data from 25 patients- female, aged 35- 78yrs, after dermal filler injection, either calcium-hydroxy-apatite (CHA) or poly-l-lactic acid (PLA). Two experienced cutaneous nodules at injection sites, whereas the remainder experienced nodules distant from injection site, signifying migration of the filler material. Five cases had pain | This case series presentation contributed evidence of nodules experienced by 25 patients after dermal filler injection and pain in 5 patients. Type of product used was reported. | No information on sourcing of dermal filler |

| Title                                                                              | Year | Place  | Author/s                            | No. of patients | Summary of findings                                                                                                                                                                                                                                                                                                                                                                                                                          | Strengths                                                                                                                                                                                                                                 | Weaknesses                                                                                                              |
|------------------------------------------------------------------------------------|------|--------|-------------------------------------|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| 36 Strong man with a weak heart: the ill effects of performance enhancing drug use | 2016 | Canada | Ge, Y., Liu, S., Liu, S.,& Singh, M | 1               | A 25-year-old bodybuilder with a history of liver cysts presented for emergency care with symptoms including nausea and shortness of breath. Diagnoses included viral myocarditis, giant cell myocarditis, toxin- or drug-induced cardiomyopathy, tachycardia-induced cardiomyopathy, and infiltrative cardiomyopathy. The presence of liver masses was also discovered. The patient eventually admitted to injection of testosterone and T3 | This single case study contributes evidence for cardiovascular harm in people who inject AAS, with information given on type of AAS injectable and additional fat burning PIED used. Information taken on previous drug use history(none) | No information on sourcing of AAS, product not presented for examination, no information on injecting practices, dosage |





## Appendix E: Literature reviews CASP chart

| Title                                                | Place | Year | Author/s     | Results                                                                                                                                                                                                                                                                                                                                                                                                     | Contribution                                                    | Strengths                                                                                                                        | Weaknesses                             |
|------------------------------------------------------|-------|------|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|
| 1 Growth Hormone & Exercise: Physiology, Use & Abuse | UK    | 2001 | Jenkins, P.J | This review summarizes the interactions between human growth hormone (GH) and exercise. While exercise impacts naturally occurring GH the efficacy of illicit GH use by bodybuilders and athletes is unproven. Due to its undetectable nature the abuse of GH is likely to increase. Adverse side effects suffered are indicated by acromegaly, a condition where the sufferer has excess production of GH. | Collates the literature on interaction between GH and exercise. | Clearly focused research question, clear overall results. All important outcomes considered. Applicable to the local population. | Literature search method not described |

| Title                                                                                            | Place | Year | Author/s    | Results                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Contribution                                                                                                                                                | Strengths                                                                                                                                                                                             | Weaknesses                                                                                          |
|--------------------------------------------------------------------------------------------------|-------|------|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|
| <p>2 Claims for the anabolic effects of growth hormone: a case of the Emperor's new clothes?</p> | UK    | 2003 | Rennie, M.J | <p>Several online sites promote the use of GH as a health, wellbeing or longevity supplement, or muscle enhancer for bodybuilders. This is largely due to a tenuous link made between the efficacy of GH treatment in adults and children with certain medical conditions. There is little evidence to support the claim that GH promotes muscle growth in healthy adults. This may be in part due to the fact that clinical trials have not tested realistic dosages associated with use in bodybuilding subculture. Side effects associated with high doses of GH administered to healthy adults include cardiac events, high blood pressure, and type</p> | <p>This review looks at studies which have tested the efficacy of GH on athletic performance and metabolism in healthy adults, which is underevidenced.</p> | <p>Clearly focused research question, clearly stated results. Selected the right types of papers for the research question. All important outcomes considered. Applicable to the local population</p> | <p>Literature search method not described. No evidence that quality of literature was assessed.</p> |

**Title**

**Place**

**Year**

**Author/s**

**Results**  
2 diabetes.

**Contribution**

**Strengths**

**Weaknesses**

| Title                                                                                               | Place | Year | Author/s                                                         | Results                                                                                                                                                                                                                                                                                                                                                                                                            | Contribution                                                                                              | Strengths                                                                          | Weaknesses                                                                                                                                                                                                                                                                       |
|-----------------------------------------------------------------------------------------------------|-------|------|------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3 Botulinum toxin type A injections: Adverse events reported to the US Food and Drug Administration | USA   | 2005 | Cote, T.R., Mohan, A.K, Polder, J.A., Walton, M.K and Braun, M.M | This review collates information from 1437 Food & Drug Administration (FDA) Accident and Emergency presentation reports, 1031 from cosmetic use of Botox and the remainder from therapeutic use. From the cosmetic use presentations, no deaths were reported. 36 serious harms were reported including headaches, focal facial paralysis, muscle weakness, dysphagia, flu-like syndromes, and allergic reactions. | This review was the first attempt to collate emergency reports to the FDA regarding botox administration. | Clear research question, clear overall results. Applicable to the local population | FDA data only includes a small number of all A&E presentations occurring due to botox administration. Incomplete reporting by clinicians may have impacted on accuracy of results, where neglecting to mention underlying disease or where incomplete drug histories were taken. |

| Title                                               | Place | Year | Author/s                 | Results                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Contribution                                                   | Strengths                                                                                                                               | Weaknesses                                                                     |
|-----------------------------------------------------|-------|------|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|
| 4 Growth hormone, IGF-I and insulin and their abuse | UK    | 2008 | Holt, R and Sonksen, P.H | <p>Human growth hormone (GH) is abused for its reported muscle building and fat burning properties, of which there is little evidence. Due to polypharming with AAS and other PIEDS, randomized controlled studies conducted to date have had limitations. Insulin like growth factor (IGF-1) is also used for anabolism. There is considerable potential harm associated with the self-injection of GH, IGF-1 and other PIEDS. Acromegaly, a condition where the sufferer produces an excess of GH, exemplifies some of the potential side effects of large doses of GH self administered.</p> | <p>Reviews literature on the little researched abuse of GH</p> | <p>Clearly focused research question, clear overall results. All important outcomes considered. Applicable to the local population.</p> | <p>Literature search method not described, quality of papers not described</p> |

| Title                                                                      | Place | Year | Author/s                                                                                                                                       | Results                                                                                                                                                                                                                                                                                                                         | Contribution                                                                                                                                                                                                                       | Strengths                                                                                                                                                                                                                                                                      | Weaknesses                                                                                                                                                  |
|----------------------------------------------------------------------------|-------|------|------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 5 Systematic Review: The Effects of Growth Hormone on Athletic Performance | USA   | 2008 | Liu, H., Bravata, D., Olkin, I, Friedlander, A, Liu, V., Roberts, B., Bendavid, E., Saynina, O, Salpeter, S.R., Garber, A.M., and Hoffman, A.R | Evidence from the scientific literature does not support the efficacy of human growth hormone on enhancing physical performance or strength. Limited evidence suggests that growth hormone increases lean body mass, and may in fact have a negative impact on exercise capacity and increase the likelihood of adverse events. | The efficacy and safety of human growth hormone in the enhancement of athletic performance is underevidenced. This review analyses the available evidence of the effects of growth hormone on athleticism in healthy young people. | Clearly focused research question, clearly stated results. Literature search method described. Selected the right types of papers for the research question. All important outcomes considered. Applicable to the local population                                             | Few studies reviewed assessed athletic performance. Growth hormone dosages and contexts in clinical studies may not reflect real life dosages and regimens. |
| 6 Anabolic-androgenic steroid dependence: an emerging disorder             | USA   | 2009 | Kanayama, G., Brower, K.J., Wood, R.I., Hudson, J.I and Pope, Jnr., H.G                                                                        | 30% of AAS users have dependence symptomology associated with chronic AAS use despite negative effects on functioning, and physical and psychological wellbeing. Some features of AAS dependence are similar to other drugs of                                                                                                  | There has been some disagreement in the literature on the nature and validity of AAS dependence as a syndrome. This review collates the literature on AAS dependence and concludes it is a valid diagnostic entity.                | Clearly focused issue with clearly stated results using table to illustrate the similarities and differences between AAS dependence and classical drug dependence according to human and animal studies. Methodology described as using a combination of literature search and | No evidence that quality of papers used were assessed                                                                                                       |

| Title | Place | Year | Author/s | Results                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Contribution | Strengths                                                                                                  | Weaknesses |
|-------|-------|------|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|------------------------------------------------------------------------------------------------------------|------------|
|       |       |      |          | <p>dependence e.g. hamsters have been seen to self-administer AAS even until death, and AAS withdrawal syndrome has been evidenced in human and animal studies. AAS dependence has some neurological similarities with opioid dependence. Differences between AAS dependence and classical drugs of abuse include no intoxication syndrome. Standard diagnostic tools for substance dependence need adaptation for AAS which have delayed onset of reward i.e. muscle development</p> |              | <p>reports known to the authors. All important outcomes considered. Applicable to the local population</p> |            |



| Title                                                                        | Place | Year | Author/s                                | Results                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Contribution                                                                                                                                        | Strengths                                                                                                                               | Weaknesses                                                                     |
|------------------------------------------------------------------------------|-------|------|-----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|
| 7 "Melanotropic Peptides: More Than Just 'Barbie Drugs' and 'Sun-Tan Jabs'?" | UK    | 2010 | Langan, E. A., Z. Nie, and L. E. Rhodes | <p>Awareness of the risks associated with exposure to UV light has led to development of a market for new unregulated tanning injectables Melanotan I and /or II, available online or through tanning salons and gyms. Dangers associated with these include injecting risks and impurities in online products. Some symptomology of Melanotan use which dermatologists may look out for in clients include changes in nevi and an unusually dark sun tan. The regulated a-MSH analogue afamelanotide is undergoing phase II and III clinical trials for treatment of photosensitivity disorders.</p> | <p>This review collates available information on tanning injectables, to inform practitioners on what to recognise in patients using Melanotan.</p> | <p>Clearly focused research question, clearly stated results. All important outcomes considered. Applicable to the local population</p> | <p>Literature search method not described, quality of papers not described</p> |

| Title                                     | Place     | Year | Author/s                               | Results                                                                                                                                                                                                                                                                                                                                                                                     | Contribution                                                                         | Strengths                                                                                                                                                                                                   | Weaknesses                                                                                            |
|-------------------------------------------|-----------|------|----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|
| 8 Growth hormone and physical performance | Australia | 2011 | Birzniece, V., Nelson, A.E and Ho, K.K | <p>This review summarises the literature on the efficacy of GH as a performance enhancing agent. Findings are that while GH reduces fat mass and increases lean body mass, this is mainly attributable to fluid retention. No strength increasing effects could be found, and no aerobic exercise capacity increases. However, some studies pointed to increases in anaerobic function.</p> | <p>There is limited research on the physical performance enhancing effects of GH</p> | <p>Addressed a clearly focused question. Selected the right types of paper for the research question. Overall results clear and presented using tables and figures. Applicable to the local population.</p> | <p>Literature search methods not described. No evidence that quality of papers used was assessed.</p> |

| Title                                                                | Place  | Year | Author/s                                                              | Results                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Contribution                                        | Strengths                                                                                    | Weaknesses                                                                                                                                                                        |
|----------------------------------------------------------------------|--------|------|-----------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|----------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 9 Cosmetic doping: The problems of intramuscular application of oils | Brazil | 2011 | Figueiredo, V. C., Silva, P. R. P., Trindade, R. S and Rose, E. D. H. | This article collates the available information on injection of oil to enlarge the appearance of muscle, known as Syntherol injection or ADE injection in Brazil, in the subculture of bodybuilding. Findings include history of use and collation of clinical case reports to document adverse effects such as inflammatory reaction, paraffinoma and vasculitis. Authors suggest the term cosmetic doping as oil injection is used to increase chances of success in bodybuilding competition. | Summaries the available literature on oil injection | Clear focused research question. Selected the right type of paper for the research question. | Literature search methods not described. No evidence that quality of papers used were assessed. Some practices described regionally in Brazil may not apply outside of this area. |

| Title                                                                                   | Place | Year | Author/s                                                                               | Results                                                                                                                                                                                                                                                                                    | Contribution                                                                                                                                                                                                            | Strengths                                                                                                                                                 | Weaknesses                                                                                    |
|-----------------------------------------------------------------------------------------|-------|------|----------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|
| 10 The diagnostic dilemma of pathological appearance and performance enhancing drug use | USA   | 2011 | Hildebrandt, T., Lai, J.K., Langenbacher, J.W, Schneider, M., Yehuda, R., Pfaff, D. W. | Review of published data to include human studies of AAS use. Three features of AAS use identified are (1) polypharmacy with IPEDs (2) body image disturbance; (3) strict training and diet regimes. These indicate pathological use of AAS and are associated with the most health risks. | Highlights gaps in the literature regarding the diagnoses of pathological IPED use                                                                                                                                      | Clearly focused research question, clear overall results. All important outcomes considered. Applicable to the local population.                          | Literature search methods not described No evidence that quality of papers used were assessed |
| 11 Illicit Use of Androgens and Other Hormones: Recent Advances                         | USA   | 2012 | Kanayama, G and Pope, Jnr. H.G                                                         | Image and performance enhancing androgens are widely used worldwide. Recent findings have evidenced extensive polypharmacy with multiple IPEDs and illicit drugs amongst IPED users. Evidence for long term psychiatric harm and physiological adverse effects                             | This review collates recent findings in relation to AAS harm. AAS dependence is understudied as a drug dependence syndrome and this review underscores the increasing public health concern associated with this issue. | Clearly focused issue. Literature search method described. Clearly stated results. All important outcomes considered. Applicable to the local population. | No evidence that quality of papers used were assessed.                                        |

| Title | Place | Year | Author/s | Results                                                             | Contribution | Strengths | Weaknesses |
|-------|-------|------|----------|---------------------------------------------------------------------|--------------|-----------|------------|
|       |       |      |          | continues to build, particularly in the case of cardiovascular harm |              |           |            |

| Title                                                                                                                                                 | Place   | Year | Author/s                                                 | Results                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Contribution                                                                                                                | Strengths                                                                                                                                                                                                                           | Weaknesses                                                             |
|-------------------------------------------------------------------------------------------------------------------------------------------------------|---------|------|----------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|
| 12 Muscle enhancement using intramuscular injections of oil in bodybuilding: review on epidemiology, complications, clinical evaluation and treatment | Denmark | 2012 | Schafer, C.N., Hvolris, T., Karlsmark, T and Plambeck, M | This review identified one review and seven case reports. All case reports describe oleomas caused by repeated intramuscular injections of oil. Site enhancement oils (SEO) can be bought online in vials often marked "posing oil". Contents range from a variety of oils, anabolic steroids and silicone mixed with a painkiller. Adverse effects include infection, swelling, abscess, sclerosing lipogranulomatosis which is a lifelong chronic condition of the muscle and in severe cases, signs and symptoms of an acute thromboembolic event. There is a lack of epidemiological studies on SEO | Injection of SEOs is underdescribed in the scientific literature. This review attempts to collate extant knowledge on same. | Clearly focused research question, clearly stated results. Selected the right types of papers for the research question. Literature search method described. All important outcomes considered. Applicable to the local population. | Limited literature base confined to seven case reports and one review. |

| Title | Place | Year | Author/s | Results                                                                                                                                                   | Contribution | Strengths | Weaknesses |
|-------|-------|------|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|-----------|------------|
|       |       |      |          | <p>use. Internet searches reveal that there are several underground practices undocumented in the scientific literature such as "homebrewing" of SEOs</p> |              |           |            |

| Title                                                                                    | Place   | Year | Author/s                                              | Results                                                                                                                                                                                                                                                                                                    | Contribution                                                                                                                                                                               | Strengths                                                                                                                                                                                                         | Weaknesses                                           |
|------------------------------------------------------------------------------------------|---------|------|-------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|
| 13 Inflammatory, immune-mediated adverse reactions related to soft tissue dermal fillers | Spain   | 2013 | Alijotas-Reig,J., FernándeZ-Figueras, M. T and Puig,L | Early and late onset foreign body reaction to dermal fillers is widespread. Exact prevalence is not known. Late onset reactions tend to be inflammatory. Most common reactions experienced are edema, granulomas, sarcoid-like disorders, and panniculitis. Systemic reactions are rarer and more serious. | Prevalence of dermal filler injection is not known but would appear to be significant from the high volume of case reports. Treatment of dermal filler reaction has not been studied well. | Addressed a clearly focused question. Selected the right types of paper for the research question. Overall results clear and presented using tables and figures. Applicable to the local population               | No evidence that quality of papers used was assessed |
| 14 Heuristics of Human Enhancement Risk: A little chemical help?                         | Ireland | 2013 | Brennan, R., Van Hout, M.C and Wells, J.S             | This review summaries the literature on PIED injectables including AAS, Melanotan, and site enhancement oils and liquids. Findings include the non-identification of PIED users with a drug user profile, motivators for use to include health and appearances and                                         | There is a lack of research on prevalence of PIED use, and demographics of PIED users                                                                                                      | Clear research question, PRISMA methodology described, used the appropriate papers to answer the research question, clear overall results. All important outcomes considered. Applicable to the local population. | No evidence that quality of papers used was assessed |



**Title**

**Place**

**Year**

**Author/s**

**Results**

pharmaceutical  
quick fix mentality

**Contribution**

**Strengths**

**Weaknesses**

| Title                                                                                                     | Place | Year | Author/s                                                                  | Results                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Contribution                                                                                                                              | Strengths                                                                                                                                                                                                                                                           | Weaknesses                                                              |
|-----------------------------------------------------------------------------------------------------------|-------|------|---------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|
| 15 Adverse Health Consequences of Performance- Enhancing Drugs: An Endocrine Society Scientific Statement | USA   | 2013 | Pope, Jnr. H.G., Wood, R., Rogol, A., Nyberg, F., Bowers, L and Bhasin, S | Existing literature base on IPEDs is of poor quality, due to reliance on retrospective surveys, case control studies and case reports. As IPED use did not emerge until the 80s and 90s, most IPED users are under 50, which also restricts our knowledge on long term harm. IPED use is typically covert and does not usually precede a medical emergency. Average age of onset is between 22-24 yrs. Between 2.9 and 4 million Americans have used AAS. IPED users often consume high dosages of IPEDs, in combination with other IPEDs and illicit drugs. IPED use has been linked to a wide range of physiological and | This scientific statement aims to collate the extant literature on the medical consequences of IPED use among recreational weightlifters. | Clearly focused research question, clearly stated results. Selected the right types of papers for the research question. Literature search method described. Quality of literature assessed. All important outcomes considered. Applicable to the local population. | Articles not written in English or translated to English were excluded. |

| <b>Title</b> | <b>Place</b> | <b>Year</b> | <b>Author/s</b> | <b>Results</b><br>psychiatric<br>disorder | <b>Contribution</b> | <b>Strengths</b> | <b>Weaknesses</b> |
|--------------|--------------|-------------|-----------------|-------------------------------------------|---------------------|------------------|-------------------|
|--------------|--------------|-------------|-----------------|-------------------------------------------|---------------------|------------------|-------------------|

| Title                                                                                                                                    | Place  | Year | Author/s                                                                                | Results                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Contribution                                                                                                                                                                                                                     | Strengths                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Weaknesses                                                                                                                                                                                                                                                                                                                                                                   |
|------------------------------------------------------------------------------------------------------------------------------------------|--------|------|-----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 16 The aetiology and trajectory of anabolic androgenic steroid use initiation: a systematic review and synthesis of qualitative research | Norway | 2014 | Sagoe, D., Andreassen, C.S and Pallesen, S                                              | <p>44 studies published between 1980 and 2014 and across 11 countries were included for review. Onset of first use was typically before the age of 30. Participation in sports, poor body image, and mental disorder predicted AAS use. AAS sourcing occurred through peer networks and the blackmarket. Motivation for use included improved athletic performance, aesthetics and strength and muscle gain.</p> <p>AAS use is associated with polypharming with a wide range of substances such as analgesics, opioids anti-oestrogens, recreational drugs such as cocaine and amphetamines, cardiovascular</p> | <p>This is the first attempt to collate the qualitative literature on psychosocial influences on initiation of AAS use</p> <p>First study to collate data from the qualitative literature on polypharmacy amongst AAS users.</p> | <p>Clearly focused research question, clearly stated results. Selected the right types of papers for the research question. Literature search method described. Quality of the literature assessed using inclusion and exclusion criteria. All important outcomes considered. Applicable to the local population. Clearly focused research question, clearly stated results. Selected the right types of papers for the research question. Literature search method described. Quality of the literature assessed using inclusion and exclusion criteria. All important outcomes</p> | <p>Excluded papers not written in English. Single case reports used in the review may not have been representative of the typical AAS user.</p> <p>Excluded articles not in English. Case reports included may have been rare events and differ from the experience of the average AAS user. Could not determine causal associations between AAS use and other drug use.</p> |
| 17 Polypharmacy among anabolic-androgenic steroid users: a descriptive metasynthesis                                                     | UK     | 2015 | Sagoe, D., McVeigh, J., Bjørnebekk, A., Essilfie, M.S., Andreassen, C.S and Pallesen, S |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                              |

| Title | Place | Year | Author/s | Results                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Contribution | Strengths                                             | Weaknesses |
|-------|-------|------|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|-------------------------------------------------------|------------|
|       |       |      |          | <p>drugs such as beta blockers, additional ergogenic substances such as fat burners and growth hormones, image enhancement drugs such as Melanotan, sexual enhancement drugs such as Viagra, depressants such as oxycodone, diuretics and nutritional supplements such as calcium and potassium. Motivations for use of additional substance concomitantly with AAS are grounded in management of side effects from AAS use, enhancing the effects of AAS use, and a variety of overlapping motivators such as enhanced wellbeing, sleep and appearance.</p> |              | <p>considered. Applicable to the local population</p> |            |

| Title                                                                                              | Place | Year | Author/s                                        | Results                                                                                                                                                                                                                                                                                                                                | Contribution                                                              | Strengths                                                                                                                                                                                                                          | Weaknesses                                                                                                                                                                                                                                                                                              |
|----------------------------------------------------------------------------------------------------|-------|------|-------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 18 Infectious disease, injection practices, and risky sexual behavior among anabolic steroid users | USA   | 2016 | Ip, E.J., Yadaoa, M.A., Shahb, B.M., & Lauc, B. | This review summarises prevalence of infectious diseases and high risk behaviours evidenced in the literature on AAS injecting. Findings are that HIV appears more common among homosexual male AAS users than heterosexual. While high risk injecting practices do occur in AAS injecting groups, it is less common than in other IDU | This review collates data on injecting practices and BBV in AAS injectors | Clearly focused research question, clearly stated results. Selected the right types of papers for the research question. Literature search method described. All important outcomes considered. Applicable to the local population | Excluded articles not in English. Case reports included may have been rare events and differ from the experience of the average AAS user. Could not determine causal associations between AAS use and other drug use. Quality of the literature was not assessed using inclusion and exclusion criteria |

| Title                                                                                   | Place       | Year | Author/s                                                | Results                                                                                                                                                                                                     | Contribution                                                                                                                                    | Strengths                                                                                                                                                                                      | Weaknesses                                                                                                                                                                                                                                           |
|-----------------------------------------------------------------------------------------|-------------|------|---------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 19 Risks of unregulated use of alpha-melanocyte-stimulating hormone analogues: a review | Netherlands | 2017 | Habbema, L., Berthe Halk, A., Neumann, M., & Bergman, W | This review provides an overview of the health consequences documented in people who inject Melanotan. Including melanoma in situ, eruptive nevi, changes in existing nevi, and injecting risks such as BBV | This review makes a contribution by summarising the clinical case literature and including to information from clinical trials on afemelanotide | Clearly focused research question, clearly stated results. Selected the right types of papers for the research question. All important outcomes considered. Applicable to the local population | Does not present an assessment of the quality of the literature reviewed or inclusion or exclusion criteria. A similar review was published in 2015 (Brennan, Wells & Van Hout, 2015) and this newer review does not include any more recent studies |

**Appendix F: Editorials and reports CASP charts**

| Title                                              | Place | Year | Author/s    | Type of report | Summary                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|----------------------------------------------------|-------|------|-------------|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 Inappropriate Advertising of Dietary Supplements | USA   | 2003 | Drazen, J.M | editorial      | Statement from the editors of the New England Journal of Medicine about advertisements regarding the sale of human growth hormone, or substances claiming to stimulate production of human growth hormone, as a wellbeing or anti-aging supplement. The editors state that there is a lack of research to support the efficacy of using human growth hormone in this manner, and also that adverse effects of this practice are largely unknown. |



| Title                                                                                           | Place | Year | Author/s                      | Type of report | Summary                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-------------------------------------------------------------------------------------------------|-------|------|-------------------------------|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2 New developments in the illegal provision of growth hormone for “anti-aging” and bodybuilding | USA   | 2008 | Olshansky, S.J and Perls, T.T | commentary     | This commentary focuses on the illicit GH market for anti-aging and bodybuilding purposes. Although GH has been scientifically proven to have benefit in children and adults with specific medical conditions, there is no evidence to suggest it will improve the health or longevity of normal individuals. A number of anti-aging clinics and pharmacies are now operating in the business of selling GH for unregulated purposes. It is impossible to track adverse health consequences in consumers of online GH products. Adverse effects documented in the scientific literature include soft tissue edema, carpal tunnel syndrome and insulin resistance. |

| Title                                                           | Place | Year | Author/s                 | Type of report | Summary                                                                                                                                                                                                                                                                                                  |
|-----------------------------------------------------------------|-------|------|--------------------------|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3 Counterfeit patient safety botulinum toxins—A serious risk to | UK    | 2008 | Pickett, A and Mewies, M | report         | This article reports on studies on counterfeit Dysport which has appeared in several countries. In most cases, potency of samples was mislabelled. Some samples were not tested due to poor quality of contents. Despite appearing similarly to legitimate Botox, vial contents were likely to be toxic. |

| Title                                                  | Place | Year | Author/s                                                 | Type of report | Summary                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------------------------------------------|-------|------|----------------------------------------------------------|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4 Use of Melanotan I and II in the general population. | UK    | 2009 | Evans-Brown, M., Dawson, R.T, Chandler, M and McVeigh, J | editorial      | <p>This editorial discussed Melanotan I &amp; II as one of many new popular PIEDs of which prevalence is unknown. In 2008 Needle exchange services in Liverpool reported increasing numbers of Melanotan users presenting for services. Melanotan is easily purchased online and has a large online community. Melanotan I (afemelanotide) is still currently undergoing trials for treatment of various skin conditions such as vitiligo. Bremelanotide is also still undergoing trials for treatment of haemorrhagic shock. Melanotan I &amp; II are injected subcutaneously. Contaminated and mislabelled Melanotan products being sold online are of public health concern. Known adverse effects include nausea and facial flushing.</p> |

| Title                                                                                              | Place | Year | Author/s                                                                 | Type of report | Summary                                                                                                                                                                                                                                                              |
|----------------------------------------------------------------------------------------------------|-------|------|--------------------------------------------------------------------------|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 5 Issues for DSM-V: Clarifying the Diagnostic Criteria For Anabolic- Androgenic Steroid Dependence | USA   | 2009 | Kanayama, G., Brower, K. J., Wood, R. I., Hudson, J. I and Pope Jnr. H.G | report         | This report presents a commentary on the similarities and differences between later stage AAS dependence and classical drug dependence. Based on these, the report recommends adjustment is made to the existing DSM-IV to accommodate AAS dependence as a disorder. |

| Title                                    | Place | Year | Author/s                                       | Type of report         | Summary                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|------------------------------------------|-------|------|------------------------------------------------|------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 6 Consideration of the Anabolic Steroids | UK    | 2010 | Advisory Council on the Misuse of Drugs (ACMD) | government publication | <p>This report made recommendations for further research to determine prevalence of use of AAS, and also to identify demographics of users. The ACMD found that prevalence of non-medical use of AAS is difficult to determine. A range of potential harms including harms posed by counterfeit and contaminated products were identified. This report makes recommendations regarding harm reduction, legislation and future research. The report focuses on young people's use of AAS. Continuation of legislative control of AAS under the Misuse of Drugs Act 1971 was recommended.</p> |

| Title                                                       | Place | Year | Author/s   | Type of report       | Summary                                                                                                                                                                                                                                                                                                                     |
|-------------------------------------------------------------|-------|------|------------|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7 Consider underlying body dysmorphia in users of Melanotan | UK    | 2010 | Affleck, A | Letter to the Editor | This letter discusses “tanorexia” as a disorder and the link between pathological tanning and body dysmorphic disorder (BDD). The author discusses a possible link between BDD and some users of Melanotan, underscoring use of Melanotan by bodybuilders who may be already experiencing muscle dysmorphia, a form of BDD. |
| 8 Cult of the Body Beautiful: At What Cost?                 | Spain | 2010 | Mataix, J  | Opinion piece        | A cultural emphasis on physical perfection has led to marketing of potentially harmful image enhancement drugs and practices. The desire for a year round tan, which is heralded as a hallmark of beauty, has led to opportunistic development of tanning injectables Melanotan I and II.                                   |

| Title                     | Place | Year | Author/s                         | Type of report | Summary                                                                                                                                                                                                                                                                          |
|---------------------------|-------|------|----------------------------------|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 9 Fake botox, real threat | USA   | 2010 | Coleman, K. D and Zilinskas, R.A | editorial      | Consumer demand for cosmetic injectables has fuelled a counterfeit botox market. Twenty counterfeit Botox vendors were identified and found to be located in China. Availability of fake botox , which is a potential biological weapons agent, may potentiate terrorist threats |

| Title                                                                                              | Place | Year | Author/s                         | Type of report | Summary                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|----------------------------------------------------------------------------------------------------|-------|------|----------------------------------|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 10 Security Threat from Producers of Counterfeit Botulinum Toxin, Phase 1: Scoping out the Problem | USA   | 2011 | Zilinskas, R. G and Coleman, K D | report         | <p>This report focuses on the counterfeit Botox (BoNT) market as a potential terrorist threat. In doing so it details legitimate manufacturers of botox across the globe, and also illegitimate producers of Botox, largely based in China. These businesses sell botox through internet sites, claiming to be high quality although it is highly unlikely that they meet the stringent safety protocols required for safe botox production. One such product name is "beauteous". These businesses regularly disappear from online and re appear under another name. Many of them are likely to be distributors rather than manufacturers, sourcing their products elsewhere. Many borrow product names from reputable manufacturers such as Allergan, and also deal in human growth hormone and other IPEDs. The vials sold may not contain botox at all, or understrength, overstrength or impure contents. In the case of overstrength botox this can be particularly dangerous.</p> |



| Title                                                                                    | Place | Year | Author/s   | Type of report       | Summary                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|------------------------------------------------------------------------------------------|-------|------|------------|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 11 Serious issues relating to counterfeit dermal fillers available from Internet sources | UK    | 2011 | Pickett, A | letter to the editor | This letter describes an apparently counterfeit dermal filler, for self administration, sourced online. Availability is extensive yet there is little available information on these types of products. The dermal filler product arrived in "sterile" pouches. The product appeared to be labelled as though it was manufactured by a company which had gone out of business. Chinese characters appeared on the labelling and the contents of one syringe had evaporated. |

| Title                                                                 | Place | Year | Author/s                                                    | Type of report | Summary                                                                                                                                                                                                                                                                                                                                    |
|-----------------------------------------------------------------------|-------|------|-------------------------------------------------------------|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 12 Human Enhancement Drugs: The Emerging Challenges to Public Health. | UK    | 2012 | Evans-Brown, M.J., McVeigh, J., Perkins, C. and Bellis, M.A | report         | This report reviews what is currently known on PIEDs. It discussed the culture which supports the popularity of these drugs to include societal obsession with appearances, the adverse health outcomes such as toxicity and contamination risk and issues with legislating for the online marketing of counterfeit and mislabelled PIEDs. |

| Title        | Place | Year  | Author/s           | Type of report | Summary                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------|-------|-------|--------------------|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 13 Melanotan | 2012  | Spain | Mahiques-Santos, L | Opinion piece  | Melanotan is an injectable peptide hormone with tanning, anorectic and libido enhancing effects. Developed to stimulate a photoprotective effect, a blackmarket has now emerged. It is popular in fitness centres and beauty salons and with people suffering from body dysmorphia. Products can be sourced online and have several potential harms including eruptive naevi, melanoma, hypertension, all of which are underresearched |

| Title                                                                                                                         | Place | Year | Author/s                                                   | Type of report       | Summary                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-------------------------------------------------------------------------------------------------------------------------------|-------|------|------------------------------------------------------------|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 14 Synthetic growth hormone releasers detected in seized drugs:<br>new trends in the use of drugs for performance enhancement | 2015  | UK   | Stensbelle, A., McVeigh, J., Breindahl, T and Kimergard, A | Letter to the Editor | New synthetic peptide hormones are emerging on the illicit drug market for muscle enhancement. These include growth hormone releasers CJC-1295, GHRP-2 and GHRP-6. Danish custom officers intercepted a package coming from China which contained ten clear glass vials with no identifying labels or accompanying information. Analysis of the vial contents revealed that they contained CJC-1295, which also contained mannitol, and GHRP-2 |

| Title                                                                           | Place | Year | Author/s                                     | Type of report | Summary                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|---------------------------------------------------------------------------------|-------|------|----------------------------------------------|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 15 Culture, Psychosomatics and Substance Abuse: The Example of Body Image Drugs | USA   | 2012 | Kanayama, G., Hudson, J.I and Pope, Jnr. H.G | editorial      | This editorial looks at use of drugs such as AAS to enhance the body. AAS use has transgressed subcultural use by competitive athletes to mainstream society. Now millions of AAS users source the drug to enhance their appearance. This kind of drug use is largely a Western phenomenon and this editorial links psychosomatics such as the depiction of musculature in the Bible and ancient Roman literature and paintings. Whereas in the Far East, there is no such cultural history of muscle worship. It seems unlikely AAS use will infiltrate the Far East, as chemical enhancement of the body is at odds with Japanese emphasis on discipline over mind and body. However, increases in body image concerns in Asian countries, alongside the widespread of such substances online, may lend itself to adaptation of body image drug use in these regions |

| Title                                   | Place | Year | Author/s      | Type of report | Summary                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-----------------------------------------|-------|------|---------------|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 16 Abuse of Performance Enhancing Drugs | USA   | 2013 | Hildebrant, T | book chapter   | This chapter focuses on AAS and their increasing use. It summarises documented psychiatric effects and discusses AAS dependence. Recommendations are made for future research to include neuroimaging in humans to investigate whether findings in rat studies can be duplicated in humans, and further research to investigate the effects of exercise in AAS users. Future work also recommended to determine what clinical intervention is most effective in AAS users. |

| Title                                                                                       | Place | Year   | Author/s                       | Type of report    | Summary                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|---------------------------------------------------------------------------------------------|-------|--------|--------------------------------|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 17 The Fitness Revolution: Historical Transformations in the Global Gym and Fitness Culture | 2014  | Sweden | Andreasson, J., & Johansson, T | Theoretical paper | <p>Since the 1970s the fitness industry has evolved in many forms. An initial breakthrough for females in weightlifting was perhaps the 1985 film “Pumping Iron” during the decade where general interest in fitness and working out exploded. During the 1990s bodybuilding became a subversive to the mainstream trend through its association with drug use. Today it is still regarded as subcultural, but mainstream fitness has taken inspiration from it through the popularity of weighttraining in the general population. In the 1990s female weightlifting grew in popularity to achieve the hard body ideal.</p> |

| Title                                                                                                    | Place | Year | Author/s                                                        | Type of report   | Summary                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|----------------------------------------------------------------------------------------------------------|-------|------|-----------------------------------------------------------------|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 18 Harm reduction interventions should encompass people who inject image and performance enhancing drugs | 2016  | UK   | McVeigh, J., Kimergård, A., Bates, G., Hope, V. D., & Ncube, F. | Short commentary | Injecting PIED use has been overlooked in relation to the risk of transmitting blood borne viruses. With a global lifetime prevalence of 3.3%, and high NSP uptake by PIED injectors, there is evidence of HIV within this group, with a HIV prevalence of 1.5% in men who inject PIEDs—comparable to that in those who inject psychoactive drugs. People who use PIEDs are very sexually active, with low rates of condom uses which also increases likelihood of BBV transmission. |



## Appendix G. Search strategy workbook

| FORUM URL               | KEY WORD                | INITIAL SEARCH RESULTS | RELEVANT THREADS SAVED |
|-------------------------|-------------------------|------------------------|------------------------|
| 1. www.elitefitness.com | <i>masculinity</i>      | 93                     | 50                     |
|                         | <i>manliness</i>        | 15                     | 7                      |
|                         | <i>femininity</i>       | 48                     | 23                     |
|                         | <i>womanly</i>          | 35                     | 17                     |
|                         | <i>health</i>           | 7,440                  | 35                     |
|                         | <i>healthy glow</i>     | 17                     | 3                      |
|                         | <i>physical fitness</i> | 1,570                  | 23                     |
|                         | <i>strength</i>         | 29,100                 | 51                     |
|                         | <i>speed</i>            | 5,020                  | 35                     |
|                         | <i>muscle recovery</i>  | 9,570                  | 26                     |
|                         | <i>attractive</i>       | 1,200                  | 24                     |
|                         | <i>sexy</i>             | 2,130                  | 5                      |
|                         | <i>virile</i>           | 43                     | 9                      |
|                         | <i>antiaging</i>        | 1,930                  | 44                     |
|                         | <i>wrinkles</i>         | 366                    | 24                     |
|                         | <i>toned</i>            | 583                    | 34                     |
|                         | <i>longevity</i>        | 1,540                  | 18                     |
|                         | <i>youth</i>            | 706                    | 16                     |
|                         | <i>normal</i>           | 10,900                 | 65                     |
|                         | <i>injecting</i>        | 4,930                  | 91                     |

|                    |                         |       |    |
|--------------------|-------------------------|-------|----|
|                    | <i>needle</i>           | 4,380 | 92 |
|                    | <i>stigma</i>           | 152   | 24 |
|                    | <i>identity</i>         | 418   | 7  |
|                    | <i>choice</i>           | 5,160 | 54 |
|                    | <i>control</i>          | 6,890 | 19 |
|                    | <i>danger</i>           | 5,990 | 38 |
|                    | <i>safe</i>             | 8,510 | 50 |
|                    | <i>risk</i>             | 6,500 | 28 |
|                    | <i>reckless</i>         | 197   | 49 |
|                    | <i>abnormal</i>         | 2,900 | 38 |
|                    | <i>freak</i>            | 5,260 | 24 |
|                    | <i>extreme</i>          | 4,880 | 29 |
|                    |                         |       |    |
| 2. www.steroid.com | <i>masculinity</i>      | 148   | 34 |
|                    | <i>manliness</i>        | 74    | 20 |
|                    | <i>femininity</i>       | 88    | 35 |
|                    | <i>womanly</i>          | 61    | 8  |
|                    | <i>health</i>           | 404   | 50 |
|                    | <i>healthy glow</i>     | 365   | 31 |
|                    | <i>physical fitness</i> | 395   | 35 |
|                    | <i>strength</i>         | 424   | 75 |
|                    | <i>speed</i>            | 394   | 44 |
|                    | <i>muscle recovery</i>  | 421   | 54 |
|                    | <i>attractive</i>       | 336   | 25 |
|                    | <i>sexy</i>             | 209   | 11 |
|                    | <i>virile</i>           | 37    | 14 |
|                    | <i>antiaging</i>        | 149   | 79 |

|                                                                 |                         |        |     |
|-----------------------------------------------------------------|-------------------------|--------|-----|
|                                                                 | <i>wrinkles</i>         | 320    | 52  |
|                                                                 | <i>toned</i>            | 378    | 51  |
|                                                                 | <i>longevity</i>        | 422    | 18  |
|                                                                 | <i>youth</i>            | 411    | 54  |
|                                                                 | <i>normal</i>           | 434    | 34  |
|                                                                 | <i>injecting</i>        | 467    | 100 |
|                                                                 | <i>needle</i>           | 415    | 100 |
|                                                                 | <i>stigma</i>           | 331    | 50  |
|                                                                 | <i>identity</i>         | 349    | 30  |
|                                                                 | <i>choice</i>           | 424    | 50  |
|                                                                 | <i>control</i>          | 410    | 56  |
|                                                                 | <i>danger</i>           | 429    | 41  |
|                                                                 | <i>safe</i>             | 448    | 65  |
|                                                                 | <i>risk</i>             | 449    | 62  |
|                                                                 | <i>reckless</i>         | 349    | 72  |
|                                                                 | <i>abnormal</i>         | 408    | 64  |
|                                                                 | <i>freak</i>            | 279    | 34  |
|                                                                 | <i>extreme</i>          | 408    | 26  |
|                                                                 |                         |        |     |
| 3. <a href="http://www.uk.muscle.co.uk">www.uk.muscle.co.uk</a> | <i>masculinity</i>      | 195    | 17  |
|                                                                 | <i>manliness</i>        | 90     | 9   |
|                                                                 | <i>femininity</i>       | 111    | 18  |
|                                                                 | <i>womanly</i>          | 81     | 14  |
|                                                                 | <i>health</i>           | 24,179 | 15  |
|                                                                 | <i>healthy glow</i>     | 20     | 8   |
|                                                                 | <i>physical fitness</i> | 322    | 14  |
|                                                                 | <i>strength</i>         | 67,675 | 18  |

|                                                                   |                              |        |    |
|-------------------------------------------------------------------|------------------------------|--------|----|
|                                                                   | <i>speed</i>                 | 13,813 | 11 |
|                                                                   | <i>muscle recovery</i>       | 3,733  | 18 |
|                                                                   | <i>attractive</i>            | 3,254  | 9  |
|                                                                   | <i>sexy</i>                  | 4,667  | 5  |
|                                                                   | <i>virile</i>                | 37     | 17 |
|                                                                   | <i>antiaging</i>             | 338    | 46 |
|                                                                   | <i>wrinkles</i>              | 263    | 17 |
|                                                                   | <i>toned</i>                 | 2,506  | 35 |
|                                                                   | <i>longevity</i>             | 357    | 21 |
|                                                                   | <i>youth</i>                 | 1,939  | 8  |
|                                                                   | <i>normal</i>                | 50,713 | 34 |
|                                                                   | <i>injecting</i>             | 10,688 | 66 |
|                                                                   | <i>needle</i>                | 11,723 | 39 |
|                                                                   | <i>stigma</i>                | 531    | 22 |
|                                                                   | <i>identity</i>              | 837    | 8  |
|                                                                   | <i>choice</i>                | 22,227 | 20 |
|                                                                   | <i>control</i>               | 18,497 | 15 |
|                                                                   | <i>danger</i>                | 2,312  | 16 |
|                                                                   | <i>safe</i>                  | 19,055 | 29 |
|                                                                   | <i>risk</i>                  | 17,404 | 12 |
|                                                                   | <i>reckless</i>              | 372    | 34 |
|                                                                   | <i>abnormal</i>              | 733    | 16 |
|                                                                   | <i>freak</i>                 | 3,811  | 19 |
|                                                                   | <i>extreme</i>               | 11,132 | 10 |
|                                                                   |                              |        |    |
| 4. <a href="http://www.muscletalk.co.uk">www.muscletalk.co.uk</a> | internal search not possible |        |    |
|                                                                   |                              |        |    |

|                                |                              |     |    |
|--------------------------------|------------------------------|-----|----|
| 5. www.musculardevelopment.com | internal search not possible |     |    |
| 6. www.thinksteroids.com       | <i>masculinity</i>           | 115 | 19 |
|                                | <i>manliness</i>             | 41  | 10 |
|                                | <i>femininity</i>            | 34  | 20 |
|                                | <i>womanly</i>               | 38  | 3  |
|                                | <i>health</i>                | 496 | 20 |
|                                | <i>healthy glow</i>          | 15  | 0  |
|                                | <i>physical fitness</i>      | 252 | 19 |
|                                | <i>strength</i>              | 498 | 20 |
|                                | <i>speed</i>                 | 499 | 14 |
|                                | <i>muscle recovery</i>       | 500 | 25 |
|                                | <i>attractive</i>            | 498 | 9  |
|                                | <i>sexy</i>                  | 498 | 11 |
|                                | <i>virile</i>                | 66  | 30 |
|                                | <i>antiaging</i>             | 290 | 13 |
|                                | <i>wrinkles</i>              | 162 | 22 |
|                                | <i>toned</i>                 | 312 | 22 |
|                                | <i>longevity</i>             | 484 | 22 |
|                                | <i>youth</i>                 | 498 | 13 |
|                                | <i>normal</i>                | 497 | 15 |
|                                | <i>injecting</i>             | 497 | 44 |
|                                | <i>needle</i>                | 495 | 27 |
|                                | <i>stigma</i>                | 343 | 30 |
|                                | <i>identity</i>              | 500 | 3  |
|                                | <i>choice</i>                | 499 | 13 |
|                                | <i>control</i>               | 498 | 16 |

|                       |                         |        |    |
|-----------------------|-------------------------|--------|----|
|                       | <i>danger</i>           | 499    | 22 |
|                       | <i>safe</i>             | 498    | 21 |
|                       | <i>risk</i>             | 498    | 13 |
|                       | <i>reckless</i>         | 499    | 18 |
|                       | <i>abnormal</i>         | 497    | 21 |
|                       | <i>freak</i>            | 494    | 15 |
|                       | <i>extreme</i>          | 498    | 14 |
|                       |                         |        |    |
| 7. www.makemeheal.com | <i>masculinity</i>      | 37     | 0  |
|                       | <i>manliness</i>        | 4      | 0  |
|                       | <i>femininity</i>       | 29     | 0  |
|                       | <i>womanly</i>          | 200    | 0  |
|                       | <i>health</i>           | 9,715  | 7  |
|                       | <i>healthy glow</i>     | 56     | 0  |
|                       | <i>physical fitness</i> | 10     | 0  |
|                       | <i>strength</i>         | 5,304  | 0  |
|                       | <i>speed</i>            | 2,710  | 2  |
|                       | <i>muscle recovery</i>  | 2,665  | 0  |
|                       | <i>attractive</i>       | 2,302  | 0  |
|                       | <i>sexy</i>             | 8,140  | 3  |
|                       | <i>virile</i>           | 2      | 0  |
|                       | <i>antiaging</i>        | 126    | 4  |
|                       | <i>wrinkles</i>         | 4,368  | 15 |
|                       | <i>toned</i>            | 1,227  | 0  |
|                       | <i>longevity</i>        | 291    | 20 |
|                       | <i>youth</i>            | 578    | 5  |
|                       | <i>normal</i>           | 53,518 | 4  |

|                                                                   |                              |        |    |
|-------------------------------------------------------------------|------------------------------|--------|----|
|                                                                   | <i>injecting</i>             | 1,140  | 17 |
|                                                                   | <i>needle</i>                | 2,820  | 8  |
|                                                                   | <i>stigma</i>                | 146    | 1  |
|                                                                   | <i>identity</i>              | 645    | 0  |
|                                                                   | <i>choice</i>                | 11,302 | 1  |
|                                                                   | <i>control</i>               | 7,797  | 1  |
|                                                                   | <i>danger</i>                | 603    | 0  |
|                                                                   | <i>safe</i>                  | 11,217 | 4  |
|                                                                   | <i>risk</i>                  | 11,127 | 0  |
|                                                                   | <i>reckless</i>              | 56     | 1  |
|                                                                   | <i>abnormal</i>              | 995    | 4  |
|                                                                   | <i>freak</i>                 | 5,218  | 2  |
|                                                                   | <i>extreme</i>               | 3,540  | 1  |
|                                                                   |                              |        |    |
| 8. <a href="http://www.skincaretalk.com">www.skincaretalk.com</a> | internal search not possible |        |    |





**Appendix H. NVivo Code Book**

**Contents**

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# Codebook

## Appendix <sup>4</sup>- Codebook\\Phase 2 - Generating Initial Codes (Open Coding)

| Phase 2 (Open Coding) | Code Definitions for Coding Consistency                  | Discussions Coded | Units of Meaning Coded |
|-----------------------|----------------------------------------------------------|-------------------|------------------------|
| Acute events          | Sudden medical events                                    | 19                | 24                     |
| Attention             | Posts describing attention from others as being of value | 10                | 12                     |
| BDD                   | Posts indicating pathological thinking about the body    | 3                 | 3                      |

---

<sup>4</sup> Codebook -Phase 2 – Generating Initial Coding involved deconstructing the data from its original chronology into an initial set of non-hierarchical codes

| Phase 2 (Open Coding)     | Code Definitions for Coding Consistency                                                   | Discussions Coded | Units of Meaning Coded |
|---------------------------|-------------------------------------------------------------------------------------------|-------------------|------------------------|
| Corrective purposes       | Posts indicating PIED injection to correct a perceived or actual medical or cosmetic flaw | 43                | 52                     |
| Cycles                    | Details of length of cycles, combinations and dosages                                     | 203               | 299                    |
| Dependence symptomology   | Indicators of dependence noted in the data according to the DSM 5                         | 22                | 41                     |
| Dissatisfaction with body | People who inject PIED as they are unhappy with their body image, or have low self esteem | 12                | 13                     |
| Dosages                   | Amounts of PIED injected                                                                  | 183               | 299                    |
| Dropping body fat         | PIED injection to lose body fat and become more lean                                      | 23                | 25                     |
| Eternal youth             | PIED injection to eradicate signs of aging                                                | 34                | 41                     |
| Fitness and performance   | Performance in the gym                                                                    | 79                | 93                     |

| Phase 2 (Open Coding)            | Code Definitions for Coding Consistency                                                             | Discussions Coded | Units of Meaning Coded |
|----------------------------------|-----------------------------------------------------------------------------------------------------|-------------------|------------------------|
| Gender ideals                    | Indications of hegemonic masculinity or emphasized femininity                                       | 19                | 29                     |
| Health aestheticism              | Indications that the appearance of health is valued over actual health                              | 17                | 26                     |
| Homebrewing                      | The home manufacture of AAS for injection                                                           | 31                | 149                    |
| Impact of sourcing route on risk | Risks identified by forum discussants that are associated with sourcing from the online PIED market | 51                | 90                     |
| Injecting drug use               | Attitudes toward and experiences of injecting                                                       | 97                | 383                    |
| negative                         | Negative attitudes toward and experiences of injecting                                              | 50                | 89                     |
| positive                         | Positive attitudes toward and experiences of injecting                                              | 52                | 101                    |
| Injecting practice               | Needle size, storage of product, safe/unsafe needle usage                                           | 205               | 574                    |
| Libido                           | PIED injection for the purposes of enhancing sex life                                               | 7                 | 9                      |

| Phase 2 (Open Coding)                             | Code Definitions for Coding Consistency                                        | Discussions Coded | Units of Meaning Coded |
|---------------------------------------------------|--------------------------------------------------------------------------------|-------------------|------------------------|
| Lifestyle change from psychoactive drug addiction | PIED injection as part of recovery from psychoactive drug addiction            | 16                | 28                     |
| Long term physiological side effects              | Physical side effects experienced months or years after use                    | 67                | 100                    |
| Long term psychological side effects              | Mental or mood changes experienced months or years after cessation of use      | 8                 | 10                     |
| Needle exchange                                   | Posts relating to needle exchange services                                     | 16                | 65                     |
| Normalisation                                     | Injecting use of PIED becoming a normative behaviour rather than a deviant act | 8                 | 10                     |
| Other                                             | Emergent PIED use patterns                                                     | 36                | 66                     |
| Placebo effect                                    | Posts relational to a placebo effect                                           | 19                | 23                     |

| Phase 2 (Open Coding)                 | Code Definitions for Coding Consistency                                                                                        | Discussions Coded | Units of Meaning Coded |
|---------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|-------------------|------------------------|
| Pleasure or hedonism                  | People who inject PIED as it satisfies them in a pleasurable or hedonistic way or people who inject PIED for fun or excitement | 13                | 22                     |
| Polypharmacy                          | Use of other substances alongside primary PIED injected                                                                        | 64                | 88                     |
| Product presentation                  | What products bought online appear as when they arrive                                                                         | 68                | 115                    |
| Quick fix                             | PIED injection to achieve goals quickly with minimum effort                                                                    | 12                | 12                     |
| Recovery                              | PIED injection to aid recovery from training or injury                                                                         | 21                | 24                     |
| Short term physiological side effects | Physical side effects experienced during or shortly after cessation of PIED use                                                | 325               | 639                    |
| Short term psychological side effects | Psychological side effects experienced during or shortly after cessation of PIED use                                           | 65                | 179                    |

| Phase 2 (Open Coding)  | Code Definitions for Coding Consistency                                                         | Discussions Coded | Units of Meaning Coded |
|------------------------|-------------------------------------------------------------------------------------------------|-------------------|------------------------|
| Side effect management | Posts detailing how side effects are managed by forum discussants                               | 149               | 308                    |
| Site of injection      | Where on the body PIEDs are injected                                                            | 114               | 279                    |
| Size                   | People who inject PIED solely for size or mass, with less emphasis on strength                  | 27                | 29                     |
| Social stigma          | How forum discussants perceive social stigma towards PIED injection                             | 69                | 254                    |
| Synthol use            | Posts relational to synthol use                                                                 | 4                 | 13                     |
| The porn body          | Posts detailing aspirations to create a sexualised body ideal represented in media              | 47                | 80                     |
| The supernormal body   | Posts detailing pushing body ideals past what is socially acceptable to the extreme or freakish | 28                | 41                     |

| Phase 2 (Open Coding) | Code Definitions for Coding Consistency                                                                                 | Discussions Coded | Units of Meaning Coded |
|-----------------------|-------------------------------------------------------------------------------------------------------------------------|-------------------|------------------------|
| Wellbeing             | PIED injection to increase wellbeing, quality and enjoyment of life e.g. reduce stress, enhance mood, sleeping patterns | 48                | 59                     |



## Appendix<sup>5</sup> - Codebook\\Phase 3 - Searching for Themes (Developing Categories)

| Phase 3 (Developing Categories) | Code Definitions for Coding Consistency                     | Discussions Coded | Units of Meaning Coded |
|---------------------------------|-------------------------------------------------------------|-------------------|------------------------|
| Drug Use Patterns               | injection site, injecting practices, poly drug use, dosages | 583               | 1761                   |
| <i>cycles</i>                   | length of cycles, combinations and dosages                  | 203               | 299                    |
| <i>dosages</i>                  | amounts injected                                            | 183               | 299                    |
| <i>other</i>                    | emergent PIED use patterns                                  | 255               | 796                    |
| <i>homebrewing</i>              | home manufacture of AAS                                     | 31                | 149                    |
| <i>injecting practice</i>       | needle size, storage of product, clean/dirty needle usage   | 205               | 574                    |

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<sup>5</sup> Codebook – Phase 3 – Searching for Themes – involved merging, renaming, distilling, and clustering related codes into broader categories of codes, to reconstruct the data into a framework that made sense to further the particular piece of analysis.

| Phase 3 (Developing Categories)              | Code Definitions for Coding Consistency                                       | Discussions Coded | Units of Meaning Coded |
|----------------------------------------------|-------------------------------------------------------------------------------|-------------------|------------------------|
| <i>polypharmacy</i>                          | use of other substances alongside primary substance                           | 64                | 88                     |
| <i>site of injection</i>                     | where on the body PIED is injected                                            | 114               | 279                    |
| Health outcomes                              | short and long term effects experienced by subjects                           | 459               | 1325                   |
| <i>acute events</i>                          | serious and sudden medical events                                             | 19                | 24                     |
| <i>dependence symptomology</i>               | indicators of dependence noted in the data according to DSM V                 | 22                | 41                     |
| <i>long term physiological side effects</i>  | physical side effects experienced months or years after use                   | 67                | 100                    |
| <i>long term psychological side effects</i>  | psychological side effects experienced months or years after cessation of use | 8                 | 10                     |
| <i>placebo effect</i>                        | Posts relational to a placebo effect                                          | 19                | 23                     |
| <i>short term physiological side effects</i> | physical side effects experienced during or shortly after cessation of        | 325               | 639                    |

| Phase 3 (Developing Categories)              | Code Definitions for Coding Consistency                                              | Discussions Coded | Units of Meaning Coded |
|----------------------------------------------|--------------------------------------------------------------------------------------|-------------------|------------------------|
|                                              | PIED use                                                                             |                   |                        |
| <i>short term psychological side effects</i> | psychological side effects experienced during or shortly after cessation of PIED use | 65                | 179                    |
| <i>side effect management</i>                | how forum discussants manage side effects                                            | 149               | 308                    |
| Motives                                      | Initiating factors for use                                                           | 288               | 607                    |
| <i>Attention</i>                             | Posts describing attention from others as being of value                             | 10                | 12                     |
| <i>BDD</i>                                   | Posts indicating pathological thinking about the body                                | 3                 | 3                      |
| <i>Corrective purposes</i>                   | PIED injection to correct a perceived or actual medical or cosmetic flaw             | 43                | 52                     |
| <i>Dissatisfaction with body</i>             | PIED injection due to unhappiness with body image, or low self                       | 12                | 13                     |

| Phase 3 (Developing Categories)                          | Code Definitions for Coding Consistency                                | Discussions Coded | Units of Meaning Coded |
|----------------------------------------------------------|------------------------------------------------------------------------|-------------------|------------------------|
|                                                          | esteem                                                                 |                   |                        |
| <i>Eternal youth</i>                                     | PIED injection to eradicate signs of aging                             | 34                | 41                     |
| <i>Fitness and performance</i>                           | Performance in the gym                                                 | 115               | 147                    |
| <i>dropping body fat</i>                                 | PIED injection to lose body fat and become more lean                   | 23                | 25                     |
| <i>size</i>                                              | PIED injection solely for size or mass, with less emphasis on strength | 27                | 29                     |
| <i>Gender ideals</i>                                     | Indications of hegemonic masculinity and emphasized femininity         | 19                | 29                     |
| <i>Health aestheticism</i>                               | Indications that the appearance of health is valued over actual health | 17                | 26                     |
| <i>Libido</i>                                            | PIED injection for the purpose of enhancing sex life                   | 7                 | 9                      |
| <i>Lifestyle change from psychoactive drug addiction</i> | PIED injection as part of recovery from psychoactive drug addiction    | 16                | 28                     |

| Phase 3 (Developing Categories) | Code Definitions for Coding Consistency                                                               | Discussions Coded | Units of Meaning Coded |
|---------------------------------|-------------------------------------------------------------------------------------------------------|-------------------|------------------------|
| <i>Normalisation</i>            | PIED injection becoming a normative behaviour rather than a deviant act                               | 8                 | 10                     |
| <i>Pleasure or hedonism</i>     | Descriptions of PIED injection satisfying in a pleasurable or hedonistic way or for fun or excitement | 13                | 22                     |
| <i>Quick fix</i>                | PIED injection to achieve goals quickly with minimum effort                                           | 12                | 12                     |
| <i>Recovery</i>                 | PIED injection to aid recovery from training or injury                                                | 19                | 22                     |
| <i>The porn body</i>            | Posts detailing aspirations to create a sexualised body ideal represented in media                    | 47                | 80                     |
| The supernormal body            | Posts detailing pushing body ideals past what is socially acceptable to the extreme or freakish       | 28                | 41                     |
| Wellbeing                       | PIED injection to increase wellbeing, quality and enjoyment of life e.g.                              | 48                | 59                     |

| Phase 3 (Developing Categories) | Code Definitions for Coding Consistency                                                                                | Discussions Coded | Units of Meaning Coded |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------|-------------------|------------------------|
|                                 | reduce stress, enhance mood, sleeping patterns                                                                         |                   |                        |
| Perceptions                     | How do forum discussants view their use of the needle and how do they understand societies perception of injecting use | 168               | 746                    |
| <i>injecting drug use</i>       | Attitudes toward and experiences of injecting                                                                          | 97                | 383                    |
| <i>negative</i>                 | Negative attitudes toward and experiences of injecting                                                                 | 50                | 89                     |
| <i>positive</i>                 | Positive attitudes toward and experiences of injecting                                                                 | 52                | 101                    |
| <i>needle exchange</i>          | Posts relating to needle exchange services                                                                             | 16                | 65                     |
| <i>social stigma</i>            | How forum discussants perceive social stigma towards PIED injection                                                    | 69                | 254                    |
| <i>synthol use</i>              | Perceptions of synthol use                                                                                             | 4                 | 13                     |
| Product Endorsement             | Favoured or popular PIED injectable products                                                                           | 149               | 274                    |

| Phase 3 (Developing Categories)         | Code Definitions for Coding Consistency                                                        | Discussions Coded | Units of Meaning Coded |
|-----------------------------------------|------------------------------------------------------------------------------------------------|-------------------|------------------------|
| Risk Navigation                         | Risk navigation strategies                                                                     | 108               | 154                    |
| Risk Perceptions                        | Forum discussants perception of PIED related risk                                              | 220               | 408                    |
| Sourcing route                          | Information with regard to online UGLs or cyberpharmacies where PIED injectables are purchased | 195               | 513                    |
| <i>impact of sourcing route on risk</i> | Risks identified by forum discussants relational to online sourcing of PIEDs                   | 51                | 90                     |
| <i>product presentation</i>             | What PIED products sourced online appear as when they arrive                                   | 62                | 109                    |

## Appendix<sup>6</sup> - Codebook\\Phase 4 - Developing Themes (Coding on)

| Phase 4 (Developing Themes)                                       | Code Definitions for Coding Consistency                                                                                                                                                                                                                                                                                                                                                                                                                  | Discussions Coded | Units of Meaning Coded |
|-------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|------------------------|
| 1 - Motivating Factors for Initiating and Continuance of PIED Use | Motivating Factors for Initiating and Continuance of PIED Use                                                                                                                                                                                                                                                                                                                                                                                            | 278               | 593                    |
| 1.1 - Recreational Weighttraining Lifestyle                       | Forum discussants who are devoted to recreational weighttraining and absorbed in the culture of gym attendance, diet and training                                                                                                                                                                                                                                                                                                                        | 157               | 238                    |
| 1.2 - Aesthetic Idealisation                                      | Conforming to a socially prescribed aesthetic ideal as seen in media, celebrities.                                                                                                                                                                                                                                                                                                                                                                       | 70                | 118                    |
| 1.3 - Lifestyle Recovery                                          | PIED injection to fix or correct a perceived or actual flaw. Dissatisfaction with the body or a lifestyle change                                                                                                                                                                                                                                                                                                                                         | 59                | 80                     |
| 1.4 - Life Satisfaction                                           | PIED injection to enhance quality of life and life satisfaction                                                                                                                                                                                                                                                                                                                                                                                          | 95                | 157                    |
| 2 - Sourcing Routes                                               | This theme relates to the processes of buying PIEDs online as described by people who inject PIED in this study. It will identify common sourcing routes and the decision making process by which people who inject PIED select their vendor. It will describe the risks associated with purchasing from online sellers as experienced by people in this study. It will describe the presentation of products sourced and problems experienced with same | 222               | 861                    |

<sup>6</sup> Codebook – Phase 4 – Reviewing Themes involved breaking down the now reorganised categories in to sub-codes to better understand the meanings embedded therein and developing them into a broader thematic framework based on recurring phenomena



| Phase 4 (Developing Themes)                         | Code Definitions for Coding Consistency                                                                                                                                                                                                              | Discussions Coded | Units of Meaning Coded |
|-----------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|------------------------|
|                                                     | with regard to contamination and counterfeit goods.                                                                                                                                                                                                  |                   |                        |
| 2.1 - Sourcing Routes                               | Urls of websites that forum discussants report purchasing PIED from                                                                                                                                                                                  | 195               | 513                    |
| 2.2 - Impact of sourcing routes on risk             | How forum discussants understand risk in relation to sourcing PIEDs online. Risks which are identifiable from the data in relation to sourcing PIEDs online. Accounts of experiences from people in this study in relation to sourcing PIEDS online. | 51                | 90                     |
| 2.3 - Product presentation                          | Descriptions of products and packaging (and pictures) as they arrive from online sellers. Accounts of how to identify fakes.                                                                                                                         | 62                | 109                    |
| 2.4 - Homebrewing AAS                               | The home manufacture of AAS for injection by forum discussants                                                                                                                                                                                       | 31                | 149                    |
| 3 - PIED Injecting Practices                        | This theme relates to the injecting drug use practices of forum discussants who inject PIEDs including those who prepare homemade AAS and use DIY botox and dermal filler injecting kits.                                                            | 590               | 2283                   |
| 3.1 - Cycling and dosing                            | This category relates to the length of time people who inject PIEDs use their drug of choice and dosing, and the decision making processes relational to these                                                                                       | 323               | 598                    |
| 3.2 - Storage of products                           | How PIED products are reconstituted/stored/refrigerated once they arrive by post to the person who uses PIEDs home                                                                                                                                   | 255               | 796                    |
| 3.3 - Polypharmacy                                  | The use of multiple compounds, PIEDs and non PIEDs, to achieve body goals or to alleviate side effect symptomology                                                                                                                                   | 149               | 308                    |
| 3.4 - Injecting                                     | Knowledge and practising of safe injecting technique, storing and reconstitution of products, sourcing of needles, sites of injection, whether the person injected themselves or was injected by a friend or partner, types of injection (sub q, im) | 206               | 581                    |
| 4 - Beliefs and values around injecting in PIED use | This theme relates to the perception and experience of injecting drug use in the context of bodywork or self-improvement                                                                                                                             | 156               | 712                    |
| 4.1 - normalisation                                 | PIED injection as a normative behaviour rather than a deviant act also micro normalisation within the discussion forum context                                                                                                                       | 8                 | 10                     |
| 4.2 - Fearless injecting vs Injecting Anxiety       | The majority of forum discussants considered injecting to be part and parcel of PIED use. Some considered it emasculating for others to be scared of it. There were heroic undertones                                                                | 97                | 383                    |

| Phase 4 (Developing Themes)                               | Code Definitions for Coding Consistency                                                                                                                                                                                                                                                                                                                          | Discussions Coded | Units of Meaning Coded |
|-----------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|------------------------|
|                                                           | to injecting. Some considered it fun. Others saw injecting as terrifying and this fear was an obstacle to be overcome to continue their use of PIEDs. However, they were encouraged to be brave by others and just do it. Anxiety did not stop people from injecting but they perceived it as a necessary evil.                                                  |                   |                        |
| 4.3 - Social Stigma                                       | Forum discussants who inject PIEDs feel they deserve respect from the rest of society but recognize a strong stigma.                                                                                                                                                                                                                                             | 74                | 319                    |
| 5 - Risk perceptions and navigation in PIED injecting     | This theme relates to the risk navigation strategies of people who inject PIEDs, which are largely self-taught through researching online and self-directed through trial and error. Risks are for the majority seen as negligible and risk comparisons are consistently made between the unhealthy life choices of others and those who choose to inject PIEDs. | 282               | 1124                   |
| 5.1 - Perceptions of reckless use vs moderated use        | People who inject PIEDs perceptions of what constitutes reckless use and what is acceptable and considered moderated use.                                                                                                                                                                                                                                        | 220               | 408                    |
| 5.2 - Perceptions of safe injecting                       | Forum discussants concepts of safe practice when injecting                                                                                                                                                                                                                                                                                                       | 220               | 408                    |
| 5.3 - Self-directed use and self-experimentation          | Self-direction in PIED injection from self-teaching how to inject to self-regulation and moderation of use                                                                                                                                                                                                                                                       | 108               | 308                    |
| 6 - Health Outcomes                                       | This theme refers to the health outcomes self-reported by forum discussants in this study. These include desirable side effects, long and short term physical and psychological side effects, disclosures of dependence, acute events, and placebo effects                                                                                                       | 412               | 1632                   |
| 6.1 - Long term and short term physiological side effects | Physical side effects from taking PIEDs that last the duration of use or that last for a period of time afterwards                                                                                                                                                                                                                                               | 368               | 739                    |
| 6.2 - Long term and short term psychological side effects | Psychological changes that last the duration of PIED use or that last for a period of time afterwards                                                                                                                                                                                                                                                            | 73                | 189                    |
| 6.3 - Acute events                                        | Medical events which required emergency treatment or serious events that came on suddenly during PIED use                                                                                                                                                                                                                                                        | 19                | 24                     |
| 6.4 - Dependence symptomology                             | Symptoms that indicate dependence (DSM V) or disclosures of dependence                                                                                                                                                                                                                                                                                           | 22                | 41                     |

| Phase 4 (Developing Themes)  | Code Definitions for Coding Consistency                                                                    | Discussions Coded | Units of Meaning Coded |
|------------------------------|------------------------------------------------------------------------------------------------------------|-------------------|------------------------|
| 6.5 - Desirable side effects | Certain side effects from PIED use such as increased libido and increased confidence are seen as desirable | 325               | 639                    |

## Appendix <sup>7</sup>- Codebook\\Phase 5 - (Data Reduction/Consolidation)

| Phase 3 (Developing Categories)                             | Discussions Coded | Units of Meaning Coded |
|-------------------------------------------------------------|-------------------|------------------------|
| 1 - Selfhood in PIED injecting use                          | 265               | 949                    |
| 2 - Communal folk pharmacology                              | 716               | 3556                   |
| 3 - The relationship with the syringe in injecting PIED use | 777               | 6402                   |

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<sup>7</sup> Codebook – Phase 5 – Data Reduction involved conceptually mapping thematic framework into a conceptual framework.

## **Appendix <sup>8</sup>- 1113 discussions loaded into database for analysis**

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<sup>8</sup> 1113 discussions loaded into database for analysis

Final dataset.nvp - NVivo Plus

FILE HOME CREATE DATA ANALYZE QUERY EXPLORE LAYOUT VIEW

Go Refresh Open Properties Edit Paste Copy Merge B I U Format Paragraph Styles Select Text Region Find Replace Delete Spelling

Workspace Item Clipboard Format Paragraph Styles Editing Proofing

Sources Look for Search In Internals Find Now Clear Advanced Find

Internals

| Name                                                                                                      | Nodes | References | Created On           | Created By | Modified On      | Modified By |
|-----------------------------------------------------------------------------------------------------------|-------|------------|----------------------|------------|------------------|-------------|
| 10 vs 12 week cycle _ MESO-Rx Forum                                                                       |       | 47         | 204 07/08/2016 11:46 | RB         | 10/08/2016 18:00 | RB          |
| 10 vs 12 week cycle_ Page 2_ MESO-Rx Forum                                                                |       | 17         | 18 07/08/2016 11:46  | RB         | 10/08/2016 18:19 | RB          |
| 100 mg winstrol per day after 1 gram test cycle                                                           |       | 24         | 74 07/08/2016 11:46  | RB         | 10/08/2016 18:38 | RB          |
| 100 mg winstrol per day after 1 gram test cycle - Page 2                                                  |       | 26         | 74 07/08/2016 11:46  | RB         | 10/08/2016 18:38 | RB          |
| 100 mg winstrol per day after 1 gram test cycle - Page 3                                                  |       | 1          | 2 07/08/2016 11:46   | RB         | 10/08/2016 21:01 | RB          |
| 14 week cycle tnt 450 excel pharma_dbol - Steroid and Testosterone information - UK Muscle Bodybuilding   |       | 34         | 90 07/08/2016 11:10  | RB         | 10/08/2016 22:14 | RB          |
| 150mg strength test-How many ml to equal 500mg a week_ How many injections best_                          |       | 46         | 376 07/08/2016 11:31 | RB         | 11/08/2016 18:49 | RB          |
| 15st 7 to 12st 8 .lost weight.                                                                            |       | 8          | 8 07/08/2016 11:15   | RB         | 11/08/2016 18:50 | RB          |
| 17 year old on steroids                                                                                   |       | 34         | 66 07/08/2016 11:46  | RB         | 11/08/2016 18:52 | RB          |
| 17 year old on steroidsb                                                                                  |       | 17         | 36 07/08/2016 11:46  | RB         | 11/08/2016 18:52 | RB          |
| 17 year old on steroidsc                                                                                  |       | 25         | 39 07/08/2016 11:46  | RB         | 11/08/2016 18:52 | RB          |
| 17 year old to 19 year old 2 year blast results                                                           |       | 49         | 92 07/08/2016 11:15  | RB         | 11/08/2016 19:17 | RB          |
| 1st cycle help keep me safe                                                                               |       | 17         | 18 07/08/2016 11:46  | RB         | 11/08/2016 19:47 | RB          |
| 1st cycle please help!!!!!!!!!!!!!!!!!!!!                                                                 |       | 28         | 33 07/08/2016 11:13  | RB         | 11/08/2016 19:55 | RB          |
| 1st Cycle Test only - opinions_ - Steroid and Testosterone information - UK Muscle Bodybuilding Forum (2) |       | 58         | 172 07/08/2016 11:46 | RB         | 11/08/2016 20:12 | RB          |
| 1st nose bleed ever on cycle                                                                              |       | 8          | 36 07/08/2016 11:49  | RB         | 11/08/2016 20:13 | RB          |
| 1st time, what would be best_ - Steroid and Testosterone information - UK Muscle Bodybuilding Forum       |       | 28         | 53 07/08/2016 11:31  | RB         | 11/08/2016 20:21 | RB          |
| 1st Winstrol Only Cycle- Female                                                                           |       | 8          | 27 07/08/2016 11:31  | RB         | 11/08/2016 20:23 | RB          |
| 2 cycles, 9 month transformation                                                                          |       | 17         | 18 07/08/2016 11:04  | RB         | 12/08/2016 12:22 | RB          |
| 2 weeks until finish - Test E + Winstrol + ECA                                                            |       | 31         | 45 07/08/2016 11:30  | RB         | 12/08/2016 12:31 | RB          |
| 20 years old with low test. Did 2 cycles as a teen                                                        |       | 18         | 45 07/08/2016 11:31  | RB         | 12/08/2016 12:34 | RB          |
| 2016 log..                                                                                                |       | 17         | 54 07/08/2016 11:49  | RB         | 12/08/2016 12:43 | RB          |
| 21 and taking anabolics_ MESO-Rx Forum                                                                    |       | 27         | 71 07/08/2016 11:15  | RB         | 12/08/2016 13:00 | RB          |
| 21 and taking anabolics_ Page 2_ MESO-Rx Forum                                                            |       | 6          | 6 07/08/2016 11:15   | RB         | 12/08/2016 13:00 | RB          |
| 2-3 week cycles                                                                                           |       | 25         | 54 07/08/2016 11:17  | RB         | 13/08/2016 11:59 | RB          |
| 24k Test E - Tren E Cycle _)_ MESO-Rx Forum                                                               |       | 37         | 48 07/08/2016 11:07  | RB         | 13/08/2016 12:02 | RB          |
| 24k Test E - Tren E Cycle _)_ Page 2_ MESO-Rx Forum                                                       |       | 8          | 9 07/08/2016 11:07   | RB         | 13/08/2016 12:06 | RB          |
| 25g 5_8 orange needle - Steroid and Testosterone information - UK Muscle Bodybuilding Forum               |       | 17         | 36 07/08/2016 11:31  | RB         | 13/08/2016 12:07 | RB          |
| 48 and cant lost fat Im getting very cheesed off_ MuscleTalk Bodybuilding Forum                           |       | 17         | 18 07/08/2016 11:00  | RB         | 13/08/2016 12:11 | RB          |
| 5 weeks into Hgh cycle                                                                                    |       | 31         | 54 07/08/2016 11:30  | RB         | 13/08/2016 12:21 | RB          |
| 5 year cruise comes to end                                                                                |       | 34         | 69 07/08/2016 11:15  | RB         | 13/08/2016 12:22 | RB          |
| 50 and Cruising                                                                                           |       | 25         | 27 07/08/2016 11:04  | RB         | 13/08/2016 12:26 | RB          |
| 57 year old - two cycles                                                                                  |       | 48         | 67 07/08/2016 11:04  | RB         | 13/08/2016 12:32 | RB          |
| 6 Finger Pharmaceutical HGH_ MESO-Rx Forum                                                                |       | 28         | 30 07/08/2016 11:07  | RB         | 13/08/2016 12:52 | RB          |

Sources Nodes Classifications Collections Queries Reports Maps Folders

MH 1113 Items

## **Appendix <sup>9</sup>- Example of Analytical Memo**

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<sup>9</sup> Analytical memos used for systematic review of thematic framework

The screenshot displays the NVivo Plus interface. The main window shows a table titled "Phase 3 - Developing a Thematic Framework" with columns for Name, Description, Sources, and References. A blue callout box points to node 4.3 - Social Stigma in the table and to its detailed view on the right.

| Name              | Description                                                                                                            | Sources | References |
|-------------------|------------------------------------------------------------------------------------------------------------------------|---------|------------|
| 1 - Motivating F  |                                                                                                                        | 278     | 593        |
| 2 - Sourcing Rou  | This theme relates to the processes of buying PIEDs online as described by people who inject PIED in this study. It    | 222     | 861        |
| 3 - PIED Injectin | This theme relates to the drug use practices of people who inject PIEDs including those who prepare homemade A         | 590     | 2283       |
| 4 - Beliefs and v | This theme relates to the perception of injecting drug use in the context of bodywork or self improvement rather th    | 156     | 712        |
| 4.1 - normali     | Looking at whether injecting use of PIED becoming a normative behaviour rather than a deviant act through acces        | 8       | 10         |
| 4.2 - Fearless    | The majority of forum discussants considered injecting to be part and parcel of PIED use. Some considered it emasc     | 97      | 383        |
| 4.3 - Social S    | People who inject PIEDs feel they deserve respect from the rest of society but recognize a strong stigma. There is a   | 74      | 319        |
| Attitudes         | People who inject PIEDs in this study had a negative view of research and harm reduction services, engaging in eith    | 16      | 65         |
| social st         |                                                                                                                        | 69      | 254        |
| 5 - Risk percepti | This theme relates to the risk navigation strategies of people who inject PIEDs, which are largely self taught through | 282     | 1124       |
| 6 - Health Outco  | This theme relates to the health outcomes self reported by people who inject PIEDs in this study. These include desir  | 412     | 1632       |

**4.3 - Social Stigma** social stigmatisation

Discriminatory social discourse in wider society around PIED was evidenced to be impactful on how forum discussants felt about their social position, where they were motivated not to use needle exchange and "add to statistics". Demonisation of 'syringe data' amongst people who inject drugs was also seen in Vitellone, 2017 (pg 84) where the concept of statistics and social scientific facts was explored as constraining and denying injecting physicality, emotionality and intimacy contexts. Vitellone (2017) suggests that an individual who injects drugs may internalise the notion of the syringe as deviant, therefore the needle stands between the individual and the rest of society from the very first injection. To be visible as a group of injectors to institutions such as legal and healthcare systems is to be labelled "at risk", which as Lupton states, marginalises and victimises groups through placing them under surveillance and interventionist monitoring (Lupton, 1999 pg 114). While expert voices govern risk, and construct self-regulating norms for individuals to comply with, resistance to such governmentality was seen in forum discourse. Vitellone (2017) suggests that being 'overwhelmed by the syringe' may impact on how individuals who inject access drug services and engage in research. Negative concepts of injecting coloured forum discussants opinions of needle exchange services. Bodily control, and governmentality over substances ingested into the body are symbolic for social control (Douglas, 1966). The needle exchange space represents a regulation of impure and 'polluting people' (Lupton, 1999 pg 49) which forum discussants rebelled against and sought to disconnect from.

Analytical Memos were used to conduct a systematic review of the thematic framework; to summaries and synthesize content down to manageable proportions and draft early findings



## Appendix <sup>10</sup>- Example of Annotations

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<sup>10</sup> Annotations allowed for documenting systematic review of thematic framework

Final dataset.nvp - NVivo Plus

Annotations

| Source Name                                         | Number |
|-----------------------------------------------------|--------|
| Blood Borne Viruses among AAS users _ MESO-Rx Forum | 1      |
| MCT vs grapeseed oil _ MESO-Rx Forum                | 1      |

Annotations allowed the researcher to integrate soft data such as coding assumptions or researcher thoughts and ideas throughout the encoding cycles

to it possible enough there is a group of younger, inexperienced guys who are at greater risk from their injecting practices?

Username #11

Username #12

Not only should we not share needles, we should not share vials of AAS or other substances. If someone were to re-use their needle in a vial and contaminate it, then using that vial just exposes you to the contamination in the used vial. So to be sure you are not exposed to the contamination, you should never ever use a vial that has been used by someone else.

Username #12

Username

(You must log in or sign up to reply here.)

| Item | Content                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | Prototypical group behaviour (Hogg, 2008) in forums was that of safe injecting - avoidance of needle sharing, clean needle usage, sterilisation, use of low deadspace needles. Successful injecting and demonstration of injecting knowledge has value in forums as prototypical group behaviour. Performing injecting competence through forum posts is to comply with the ingroup prototype and strengthen group membership (Hogg, 2008). While indigenous and reciprocal care for the drug using self and others (Keane, 2003) was typically evidenced, some risk behaviours were also identified - re-use of needles, poor injecting technique |

# Appendix I – prepublications

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## An unhealthy glow? A review of melanotan use and associated clinical outcomes



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### ABSTRACT

*Aim:* Socio-cultural emphasis on having a tan has led to blackmarket diversion of synthetic-tanning products Melanotan I and II. This review of literature on clinical outcomes of Melanotan I and II aims to present extant literature on synthetic-tanning and its range of effects.

*Methods:* A review was conducted according to The Critical Appraisal Skills Programme (CASP). A database search was conducted to identify relevant publications. Clinical trials and clinical case presentations relating to melanotan use were included. Publications not in English and with a lack of specificity to the topic were excluded.

*Results:* The review yielded eighteen clinical trials and twenty-one clinical case presentations. Side effects observed include nausea, darkening of existing naevi and yawning. Systemic toxidrome and melanoma have also been evidenced. Potential harms include bloodborne virus, infection and contaminated and mislabelled products. Shortcomings in clinical reporting have limited determinations of causality in diagnoses.

*Conclusion:* Side effects observed in clinical trials are largely minor. Long-term health outcomes are as yet undocumented. Much of the harms related to melanotan use are associated with online sourcing of unregulated products. A systematic approach to clinical case reporting is needed in melanotan associated adverse health outcomes. The counterfeit PIEDs market and polypharming practices amongst users must be considered in reports of harm.

*Implications:* This review makes recommendations to inform enhanced clinical responses, and has underscored the need for future Internet and clinical research to investigate prevalence and user profiling, and to map health outcomes in melanotan users.

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### 1. Introduction

Contemporary individual, social and cultural values placed on aesthetic ideals to conform to the 'cult of the body beautiful' have fuelled 'health marketability', popularity and diffusion of image enhancement drugs via under the counter and web sources (Brennan, Van Hout, & Wells, 2013; Evans-Brown, McVeigh, Perkins, & Bellis, 2012). Westernised values attribute tanned skin to beauty, success and health, and have encouraged public consumerism to avoid UV exposure known to cause premature ageing and carcinogenesis, in favour of the use of sunless-tanning agents (Evans-Brown, Dawson, Chandler, & McVeigh, 2009; Evans-Brown et al., 2012; Hadley & Dorr, 2006). These agents are synthetic

analogues of the endogenous melanocortin peptide hormone alpha-melanocyte stimulating hormone ( $\alpha$ -MSH) and were first synthesised in the 1980s for photoprotective effects (Langan, Nie, & Rhodes, 2010). This paper focuses on the health consequences and clinical outcomes of melanotan clinical trials and clinical case presentations. Desirable, minor, chronic and acute side effects of melanotan use are identified.

#### 1.1. Background

At present, three main formulations, Melanotan I (afamelanotide), Melanotan II, and bremelanotide, exist. Afamelanotide, the first regulated  $\alpha$ -MSH analogue, stimulates melanogenesis (pigmentation of the hair and skin in mammals) by heightening the production of eumelanin (O'Leary, Diehl, & Levins, 2014). Research continues on its use for vitiligo, solar urticarial, polymorphous light eruption, and prevention of squamous cell carcinoma and actinic

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keratoses in photosensitive subjects and organ-transplant recipients (O'Leary et al., 2014). Since afamelanotide was developed in the 1980s, a surge in demand for sunless-tanning agents has resulted in the marketing of multiple unregulated  $\alpha$ -MSH analogues (Evans-Brown et al., 2009, 2012; O'Leary et al., 2014). Melanotan I was the first of these unregulated analogues with reported structure similar to afamelanotide, and with names often used interchangeably (Evans-Brown et al., 2009, 2012; McVeigh, Evans-Brown, & Bellis, 2012). Another synthetic analogue of  $\alpha$ -MSH called Melanotan II has since emerged, and whilst it increases pigmentation at lower cumulative doses than Melanotan I, higher levels of side effects relating to effects on satiety for weight loss and sexual stimulation are reported (Mahiques-Santos, 2012; Mataix, 2012). Melanotan I and II are more than 1000 times more potent than endogenous  $\alpha$ -MSH (Hadley & Dorr, 2006; Langan et al., 2010). Bremelanotide is the third available variation of Melanotan II and was specifically designed for sexual stimulation (Evans-Brown et al., 2009).

Synthetic analogues of  $\alpha$ -MSH are not illegal to use, possess or import, but domestic sale and supply outside of clinical trials is legislated in the UK and other countries. Of concern, however, is that these products (commonly injected) sold to the public are unregulated and untested (Evans-Brown et al., 2012), sold without prescription, potentially contaminated (Breindahl et al., 2015), counterfeit and with contents unverified (McVeigh, Evans-Brown, & Bellis, 2012) and also occurring in other image enhancement compounds (Kimergård, McVeigh, Knutsson, Breindahl, & Stensballe, 2014).

## 1.2. Identified concerns

### 1.2.1. User groups

Studies collecting demographics on tanners have found females to be more likely to engage in tanning behaviours (Harrington et al., 2011; Lostritto et al., 2012; Petit, Karila, Chalmin, & Lejoyeux, 2014), however, both females and males use melanotan (Hope et al., 2013; Van Hout & Brennan, 2013). Cultural ideals of health (Glassner, 1990), gender and sexual attractiveness (Lynch, 2012) have initiated the transgression of melanotan use from subcultural groups such as bodybuilders and sex workers (Mahiques-Santos, 2012; Van Hout & Brennan, 2013) to the general population.

### 1.2.2. Authenticity and nature of sourcing

Sourcing of melanotan largely occurs through web retailing by unregulated vendors (Evans-Brown et al., 2012). Sourcing routes are commonly identified through online information exchange between users (Van Hout, 2014).

### 1.2.3. Health risks

Very little is known about long-term outcomes of use (Mahiques-Santos, 2012) despite reporting of adverse reactions such as episodic nausea and vomiting, cardiac conditions, collapse, fatigue, hypertension, facial redness, blood and skin infections (Brennan et al., 2013; Van Hout & Brennan, 2013) and clinical concerns relating to increased skin pigmentation, rhabdomyolysis, systemic toxicity with sympathomimetic symptoms, renal dysfunction and reversible encephalopathy syndrome (Brennan et al., 2013; Evans-Brown et al., 2012; Javed, Yarrow, & Hemmington Gorse, 2013).

Although the risk of bloodborne virus is lower for performance and image enhancing drug (PIED) users than for other injecting drug user groups (NICE, 2014), online normalisation of unsupervised use and self-experimentation (Van Hout, 2014) to include polypharming (Van Hout & Brennan, 2013) supports the adaptation of injecting risk behaviours and high risk tanning behaviours (Langan et al., 2010). Potential for dependence has been noted by researchers

(Evans-Brown et al., 2009; Mahiques-Santos, 2012; Mataix, 2012; McVeigh, Evans-Brown and Bellis, 2012) and some indicators of dependence have been noted in a single case study (Van Hout & Brennan, 2013).

### 1.2.4. Danger to regulatory regimes/law enforcement

Unauthorised routes to retail promote consumer anonymity and supplier protection (Kimergård et al., 2014) and have resulted in great difficulties in estimating manufacture of products, prevalence of use and vendor supply chains (O'Leary et al., 2014).

### 1.2.5. Public health responses to date

Public health responses have been primarily reactive in attempting to curb unauthorised supply channels via the internet, tanning and beauty salons, gyms, and cosmetic physicians (Langan et al., 2010; Mahiques-Santos, 2012), and medical responses within the clinical setting (McVeigh, Evans-Brown and Bellis, 2012). Targeted health education efforts are hampered by a rise in 'short cut' beauty consumerism and the immediately salient nature of tanned skin (Brennan et al., 2013; Mahiques-Santos, 2012). In research, recent efforts to understand this form of image enhancement drug use have focused on engaging with melanotan user forums and user case studies (Van Hout & Brennan, 2013; Van Hout, 2014).

This review is intended to further our knowledge on the issue of health consequences of synthetic-tanning and aimed to present the extant literature base pertaining to Melanotan I and II use and associated clinical outcomes. In order to achieve this, a review of literature, pertaining to melanotan clinical trials, and clinical case presentations of melanotan use were conducted.

## 2. Methodology

A comprehensive review of the literature was conducted to identify clinical trial research, and clinical case presentations, in relation to Melanotan I and II. Bremelanotide was excluded from the literature search as it is less commonly used in the general population. Due to the specificity of the research topic, systematic review was according to The Critical Appraisal Skills Programme (CASP) guidelines (Public Health Resource Unit, 2006). The CASP is widely used and provides a comprehensive system for assessing quality of the literature chosen for the purpose of review. The Critical Appraisal Skills Programme (CASP) uses specific tools to rigorously assess the quality of studies using various research designs, developed from research conducted by the Evidence Based Medicine Working Group published in the *Journal of the American Medical Association* (Public Health Resource Unit, 2006). These tools were developed to assess the quality of the literature and overarch all types of study. For the purpose of this review, CASP was chosen as it identifies methodological flaws and considers its relevance to the outcome of practice.

Search terms used included generic and brand names for Melanotan I and II including "Melanotan I", "Melanotan II", "afamelanotide", and "tanning peptides" in combination with additional search terms including "desired effects", "side effects" "adverse effects", "adverse reactions" and "harms". These search terms were generated from analysis of the key concepts of the research topic – clinical outcomes of melanotan use. Publications from 1960 to the present day were included in the literature search, as this covers the period during which afamelanotide was being developed and subsequently marketed. Original empirical research was collected using electronic databases relative to health science including Psycinfo, Pubmed, Science Direct and Wiley Online with additional references suitable for inclusion in the literature review found in the reference lists of published works ( $n=7$ ).

Through database searching, 2253 records were identified and 767 records remained after duplicates were removed. Remaining

articles were then screened to exclude results which were not relevant to the aims of the review ( $n = 621$ ). A total of 146 articles remained, which were then assessed for eligibility using CASP guidelines. One hundred and seven articles were removed including articles which were non-specific to the topic, written in another language, not relative to potential health outcomes in melanotan users and those which had non-precise results. Thirty-nine articles remained for analysis. The next phase involved charting key information from the records, which is a technique used to interpret qualitative data by sorting text according to the key areas of interest (Ritchie & Spencer, 1994). The data were thematically organised through results analysis under headings relating to user profiles and characteristics, and health outcomes. In this regard the findings are presented in a "narrative review" design (Pawson, 2002: 171).

### 3. Results

#### 3.1. Clinical trials

Afamelanotide (also known as Melanotan I), the first regulated  $\alpha$ -MSH analogue, was the subject of several clinical trials in the nineties. These early clinical trials sought to investigate the tanning effect in subjects (Levine et al., 1991; Levine, Dorr, Ertl, Brooks, & Alberts, 1999), determine the most effective route of administration (Ugwu et al., 1997), optimum dosage (Levine et al., 1999) and to examine its effects on melanoma cells in vitro, in which an inhibitory effect was found (Jiang et al., 1995).

Findings from initial trials indicated that afamelanotide was a potentially safer method of skin tanning, reducing the need for excessive UV B light exposure (Levine et al., 1991). Side effects observed in subjects were minor, to include gastrointestinal upset and facial flushing (Ugwu et al., 1997) and in one study attributed to supratherapeutic dosages only (Levine et al., 1999). Melanotan II was also tested for its tanning effect in human subjects with similar findings (Dorr et al., 1996).

However, early trials were generally conducted with small number of subjects (Ugwu et al., 1997; Levine et al., 1999) or subjects were treated with afamelanotide over short periods of time (Levine et al., 1991, 1999; Ugwu et al., 1997) where long-term effects could not be determined. Two early trials investigated the erectogenic effects of afamelanotide on subjects with erectile dysfunction (Wessells et al., 1998; Wessells, Levine, Hadley, Dorr, & Hruby, 2000) observing penile erection in the majority of subjects with minimal side effects to include nausea, in line with previous trials.

Subsequent trials undertaken at the University of Arizona between 2000 and 2006 (Dorr et al., 2000, 2004a, 2004b; Hadley & Dorr, 2006) echoed earlier findings that afamelanotide was a safe method of skin tanning in human subjects, as an "injectable sunscreen" with no carcinogenic potential (Hadley & Dorr, 2006), minor toxic effect (Dorr et al., 2004a, 2004b) and with some desirable effects such as improved sexual function (Hadley & Dorr, 2006). However, many of these trials had an open-label design which may have introduced a positive bias, and were also conducted with small number of subjects over a short period.

Two double-blinded, randomised, placebo-controlled trials were conducted in 2006 (Barnetson et al., 2006; Fitzgerald, Fryer, Dwyer, & Humphrey, 2006) with larger number of subjects. One of these (Barnetson et al., 2006) was conducted over a three month period, making it the first trial to examine the effect of afamelanotide in subjects over a prolonged period of time. Both trials found afamelanotide to have protective properties for people susceptible to sun damage and skin cancers, and noted non-serious side effects in line with previous trials to include nausea, facial flushing and fatigue (Barnetson et al., 2006).

Afamelanotide has undergone and continues to undergo clinical trials for the treatment of skin conditions such as erythropoietic protoporphyria (Biolcati et al., 2015; Harms, Lautenschlager, Minder, & Minder, 2009), Hailey-Hailey disease (Biolcati et al., 2013) and solar urticarial (Haylett, Nie, Brownrigg, Taylor, & Rhodes, 2011). No serious side effects have ever been noted in subjects in these trials, with one recent trial conducted over a period of eight years (Biolcati et al., 2015). However this study had an observational design with self-reporting of side effects, and unblinding of subjects occurred due to the tanning effect of afamelanotide which may have introduced a positive bias. The photoprotective action of afamelanotide is currently being studied in Phase II and III trials, with efficacy in treatment of actinic keratoses, squamous cell carcinoma in photosensitive and organ transplant recipient subjects and in skin conditions such as vitiligo ([www.clinuvel.com](http://www.clinuvel.com)).

#### 3.1.1. Illicit market

Despite the lack of evidence of serious harm associated with therapeutic use of afamelanotide, evidence for the potentially hazardous melanotan online market was contributed by two clinical trials which analysed the contents of vials sold on the Internet (Breindahl et al., 2015; Kimergård et al., 2014). In one case, a user purchased what was sold as growth hormone, only to develop tanning of the skin upon administration (Kimergård et al., 2014). Analysis of the vial contents found that the material inside was Melanotan II. Breindahl et al. (2015) study was the first attempt to quantitatively analyse the contents of melanotan vials online. Findings indicated that the majority of vials were understrength and contained impurities, although the study did not determine the characteristics of these impurities. It is clear from the findings of both these studies that the potential for harms associated with mislabelling of melanotan products, contamination and counterfeiting is significant.

#### 3.2. Clinical case report literature

Twenty-one separate case reports were identified in the scientific literature, describing twenty-nine patients (see Table 1). These are accounts of patient presentations to dermatology clinics, general practitioner surgeries or emergency departments with symptoms relating to Melanotan I or II use. Findings are limited to those who presented to the health system for medical care, and will now be discussed under the identified concerns associated with Melanotan I and II use described in the introduction to this review.

#### 3.2.1. User groups

Patients were aged between sixteen and sixty-three years of age, with seventeen female patients and twelve male patients. Three cases identified themselves as bodybuilders (Shelley, Husain, & Lawrence, 2009; Cardones, Rand, & Richnik, 2009; Schulze et al., 2013).

#### 3.2.2. Authenticity and nature of sourcing

Of the reports which collected information on sourcing routes, thirteen patients sourced their Melanotan I/II product online (Devlin & Pomerleau, 2012; Langan, Ramlogan, Jamieson, & Rhodes, 2009; Nelson, Bryant, & Aks, 2012; Ong & Bowling, 2012; Shelley et al., 2009; Sivyver, 2012; Wijnands-Kleukers, Vries, Meulenbelt, & Van Riel, 2014) with one patient sourcing from a "cosmetic physician" (Paurobally, El Hayderi, Richert, Andre, & Nikkels, 2011) and one other from a "beautician" (Reid, Fitzgerald, Fabre, & Kirby, 2013).

From the clinical case presentations reviewed, Melanotan II is most commonly reported by patients as the injected substance (Cardones et al., 2009; Cousen, Colven, & Helbling, 2009; Devlin & Pomerleau, 2012; Fjellhuagan Hjuler & Lorentzen, 2014; Hueso-Gabriel, Mahiques Santos, Terrádez Mas, & Santonja López,

**Table 1**  
Clinical trials.

| Theme                                                                                                                                                       | Authors                                                                                                | Year | Methods                                                                                                                                                                      | Main findings                                                                                                                                                                                                                                | Contribution to the literature                                                                                                                                                                                                           | Strengths                                                                                                                                                              | Limitations                                                                                                                                                                                                                                                                                                                                        |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 Long-term observational study of afamelanotide in 115 patients with erythropoietic protoporphyria                                                         | Biolcati, G. Marchesini, E. Sorge, F. Barbieri, L. Schneider-Yin, X., Minder, E.I.                     | 2015 | 115 ambulatory erythropoietic protoporphyria (EPP). Patients were treated with a total of 1023 afamelanotide implants over an or up to a eight year period                   | The quality of life of EPP patients, using specific measures, rose to 74% after commencing afamelanotide remaining at this level during the entire observation period. Only minor adverse events were noted, including nausea                | As only minor side effects were observed, this study contributes to the safety of afamelanotide when used in the treatment of EPP                                                                                                        | Addressed a clearly focused issue. Longitudinal observation of patients over an eight year period                                                                      | Observational study not usually used to determine efficacy of a drug. Tanning effect causes unblinding of patients, which may introduce positive bias.                                                                                                                                                                                             |
| 2 Efficacy of the melanocortin analogue Nle4-D-Phe7- $\alpha$ -melanocyte-stimulating hormone in the treatment of patients with Hailey-Hailey disease       | Biolcati, G., Aurizi, C., Barbieri, L., Ciaffi, S., Screpanti, I. and Talora, C.                       | 2013 | In a phase II open-label pilot study, two patients with Hailey-Hailey disease (HHD) were treated with 16 mg of afamelanotide, administered subcutaneously in implant form.   | For both patients, total clearance of HHD lesions had occurred 60 days after treatment with afamelanotide. Moderate skin tanning noted. No notable side effects.                                                                             | This study contributes to the efficacy of afamelanotide in the treatment of Hailey-Hailey disease (HHD)                                                                                                                                  | Addressed a clearly focused issue, precise results. Methods well described.                                                                                            | Small pilot study, larger number of patients needed. Open-label study                                                                                                                                                                                                                                                                              |
| 3 Identification and characterisation by LC-UVMS/2014 MS of Melanotan II skin-tanning products sold illegally on the internet                               | Breindahl, T., Evans-Brown, M., Hindersson, P., McVeigh, J., Bellis, M., Stenshølle, A., Kimergård, A. | 2015 | Samples of melanotan products were purchased from three online shops. Newly developed methods of liquid chromatography were used to identify the contents of vials purchased | Melanotan II was identified in all vials purchased. Varying levels of unidentified impurities were also found. melanotan vials were sold as containing 10 mg of melanotan but vials were understrength, containing between 4.32 and 8.84 mg. | New analytical methods to clearly identify Melanotan II, determine contents of vials and measure levels of impurities were developed and validated. This study also provides evidence that melanotan is available on the illicit market. | First quantitative report on analysis of melanotan products sourced online. Addressed a clearly focused issue with precise results. Methods of testing well described. | Products were sourced from three websites. Results cannot be generalised to all melanotan products for sale from these vendors nor to any other vendors online. Levels of impurities in vials were measured but impurities were not characterised. Analysis of one product. Findings cannot be generalised to other melanotan products sold online |
| 4 Online marketing of synthetic peptide hormones: poor manufacturing, user safety, and challenges to public health                                          | Kimergård, A., McVeigh, J., Knutsson, S., Breindahl, T., and Stenshølle, A.                            | 2014 | The contents of a vial presented by a male who purchased from a cyberpharmacy were analysed using a reference standard and liquid chromatographic-tandem mass spectrometry.  | The vial was labelled 'GHRP-6 – a muscle building drug – the contents were entirely Melanotan II.                                                                                                                                            | This study contributed evidence for the potential for melanotan users to be exposed to mislabelled and contaminated products when purchasing melanotan online.                                                                           | Addressed a clearly focused issue with precise results. Methods of testing well described.                                                                             | Small number of patients used. Open-label study                                                                                                                                                                                                                                                                                                    |
| 5 Systemic photoprotection in solar urticaria with $\alpha$ -melanocyte-stimulating hormone analogue [Nle <sup>4</sup> -d-Phe <sup>7</sup> ]- $\alpha$ -MSH | Haylett, A.K., Nie, Z., Brownrigg, M., Taylor, R. and Rhodes, L.E.                                     | 2011 | Five patients with solar urticaria (hives) were treated with 16 mg of afamelanotide subcutaneously through an implant in winter time                                         | A reduction in solar urticaria response was noted with a lack of serious adverse effects.                                                                                                                                                    | This study contributes evidence for afamelanotide efficacy in treating solar urticaria.                                                                                                                                                  | Addressed a clearly focused issue with precise results. Methods well described.                                                                                        | Small number of patients used. Open-label study                                                                                                                                                                                                                                                                                                    |

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Table 1 (Continued)

| Theme                                                                                                                                                       | Authors                                                                                                              | Year | Methods                                                                                                                                                                                                                                          | Main findings                                                                                                                                                                                                                                                                                                                                                                                 | Contribution to the literature                                                                                                                                                                                                                | Strengths                                                                                                                                                               | Limitations                                             |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|
| 6 An $\alpha$ -Melanocyte-Stimulating Hormone Analogue in Erythropoietic Protoporphyria                                                                     | Harms, J., Lautenschlager, S., Minder, C. E. and Minder, E.I.                                                        | 2009 | Phase II trial with 5 subjects with erythropoietic protoporphyria, administered with an implant formulation of afamelanotide, administered subcutaneously at a dose of 20 mg, given twice, at an interval of 60 days                             | Afamelanotide was found to be effective in the treatment of erythropoietic protoporphyria. Additional side effects observed included headache and nausea.                                                                                                                                                                                                                                     | This study contributes evidence for the beneficial effects of afamelanotide in patients with erythropoietic protoporphyria                                                                                                                    | Addressed a clearly focused issue with precise results. Methods well described.                                                                                         | Small number of patients enrolled, open-label study     |
| 7 Nle4-D-Phe7]- $\alpha$ -melanocyte stimulating hormone significantly increased pigmentation and decreased UV damage in fair-skinned Caucasian volunteers. | Barnetson, R.S., Ooi, T.K.T., Zhuang, L., Halliday, G.M., Reid, C.M., Walker, P.C., Humphrey, S.M., and Kienig, M.J. | 2006 | a trial with afamelanotide administered by subcutaneous injection into the abdomen at 0.16 mg/kg for three 10-day cycles over 3 months.                                                                                                          | Afamelanotide stimulates skin tanning by increasing levels of eumelanin throy interacting with the melanocortin 1 receptor (MC1R). Side effects observed included nausea, facial flushing, fatigue and vomiting.                                                                                                                                                                              | This is the first study to show the potential ability of afamelanotide to provide photoprotection to people sensitive to sunlight and likely to sunburn. This is the first study to administer afamelanotide over a prolonged period of time. | A double-blinded, randomised, placebo-controlled study with a large number of subjects. Addressed a clearly focused issue with precise results. Methods well described. | Long-term effects cannot be determined from this study. |
| 8 Effect of MELANOTAN <sup>®</sup> , [Nle <sup>4</sup> , D-Phe <sup>7</sup> ]- $\alpha$ -MSH, on melanin synthesis in humans with MC1R variant alleles      | Fitzgerald, L.M., Fryer, J.L., Dwyer, T. and Humphrey, S.M.                                                          | 2006 | Seventy-seven subjects received three 10 days series of subcutaneous injections of either 0.16 mg/kg/day of melanotan or the placebo – 0.01 mL/kg/day of sterile saline.                                                                         | Findings were that melanotan increases melanin synthesis in those with fairer skin types in most need of photoprotection                                                                                                                                                                                                                                                                      | This study was the first to investigate the effect of melanotan in humans with a variant MC1R genotype – fairer skinned and more at risk of sunburn and skin cancer.                                                                          | Addressed a clearly focused issue with precise results. Methods well described.                                                                                         | Long-term effects cannot be determined from this study. |
| 9 Melanocortin Peptide Therapeutics: Historical Milestones, Clinical Studies and Commercialisations.                                                        | Hadley, M. E., and Dorr, D.T.                                                                                        | 2006 | This paper reviews the findings of the following trials: Phase I and II clinical trials to establish skin darkening effects of Melanotan I and II. Preclinical rat and pig studies to determine dosage and carcinogenic potential of Melanotan I | All preclinical studies showed Melanotan to be non toxic and non carcinogenic. In humans, melanotan causes skin darkening, reduces sunburn in individuals who usually find it hard to tan. Side effects were found to be minimal and it was found that Melanotan I could be the first "injectable sunscreen" to prevent cancer in those susceptible. Improved sexual function was also noted. | This paper reviews the first trials for Melanotan I and II in University of Arizona.                                                                                                                                                          | Comprehensive preclinical, Phase I and Phase II trials of Melanotan I and II.                                                                                           | Small groups of subjects used for trials.               |

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|    |                                                                                                                                                       |                                                                                                                     |      |                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                            |                                                                                     |                                                                                                                    |                                                                                                                                                                                    |
|----|-------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 10 | Effects of a superpotent melanotropic peptide in combination with solar UV radiation on tanning of the skin in human volunteers                       | Dorr, R.T., Ertl, G., Levine, N., Brooks, C., Bangert, J.L., Powell, M.B., Humphrey, S. and Alberts, D.S.           | 2004 | Three open-label studies using four and eight subjects administered 2 dose levels of Melanotan I combined with small doses of UV-B over periods of up to four weeks | Tanning in the first study was achieved in 3 of 4 subjects after administration of Melanotan I. Increased tanning effect was noted in the second study with higher dosages. In the third study, there was significantly increased tanning in the melanotan group and this was maintained at least 3 weeks longer than in the controls. Minor toxic effects included nausea and facial flushing. | This study concluded that Melanotan I could be safely used to achieve skin tanning alongside UV B light.                                                                   | Addressed a clearly focused issue with precise results. Methods well described      | Small group of subjects, open-label design. Long-term effects cannot be determined from this study.                |                                                                                                                                                                                    |
| 11 | Increased eumelanin expression and tanning is induced by a superpotent melanotropin [Nle <sup>4</sup> , D-Phe <sup>7</sup> ]- $\alpha$ -MSH in humans | Dorr, R.T., Dvorakova, K., Brooks, C., Lines, R., Levine, N., Schram, K., Milekova, P., Hruby, V. and Alberts, D.S. | 2000 | Seven subjects with tanning skin types III or IV (Fitzpatrick scale) were given 10 daily subcutaneous injections of Melanotan I over two weeks.                     | Findings indicated that the tanning response induced by melanotan is caused by the increases of eumelanin content in the human skin. Additional side effects observed included flushing of the skin, penile erection, changes in taste, stretching and yawning. 17 out of 20 men experienced erection. Additional side effects observed included nausea and yawning.                            | One of the first clinical trials to investigate the effects of melanotan in human subjects.                                                                                | Addressed a clearly focused issue with precise results. Methods well described      | Small group of subjects, open-label design. Long-term effects cannot be determined from this study.                |                                                                                                                                                                                    |
| 12 | Melanocortin receptor agonists, penile erection, and sexual motivation: human studies with Melanotan II                                               | Wessells, H., Levine, N., Hadley, M.E., Dorr, R. and Hruby, V.                                                      | 2000 | Melanotan II was administered to 20 men with erectile dysfunction. Penile rigidity was measured and levels of sexual desire, and side effects were self-reported.   | A clinical dose ranging study treated 8 male subjects with skin that easily tanned with 0.16 mg/kg Melanotan I for ten daily subcutaneous injections                                                                                                                                                                                                                                            | 0.16mgmg/kg was found to be the optimum dose. Skin tanning was observed. Additional side effects observed included gastrointestinal upset and fatigue with higher dosages. | First study to contribute evidence for the effects of Melanotan on sexual function. | A double-blind placebo-controlled crossover design. Clearly focused issue, precise results, methods well described | Small number of subjects. Long-term effects cannot be determined from this study.                                                                                                  |
| 13 | Effects of a potent synthetic melanotropin, Nle <sup>4</sup> -D-Phe <sup>7</sup> - $\alpha$ -MSH (Melanotan-1) on tanning: a dose-ranging study       | Levine, N., Dorr, R., Ertl, G., Brooks, C. and Alberts, D.                                                          | 1999 | A clinical dose ranging study treated 8 male subjects with skin that easily tanned with 0.16 mg/kg Melanotan I for ten daily subcutaneous injections                |                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                            | One of the first studies to investigate the use of Melanotan I as a tanning agent.  | Clearly focused issue, precise results, methods well described.                                                    | Open-label, non-placebo controlled trial with a small number of subjects. Limited to describing short term (ten days) use. Long-term effects cannot be determined from this study. |

Table 1 (Continued)

| Theme | Authors                                                                                                                                           | Year                                                                                                    | Methods | Main findings                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Contribution to the literature                                                                                                                                                                                                                  | Strengths                                                                                                                                                             | Limitations                                                                                                                                            |                                                                                                                                 |
|-------|---------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|
| 14    | Synthetic melanotropic peptide initiates erections in men with psychogenic erectile dysfunction: double-blind, placebo controlled crossover study | Wessells, H., Fuciarelli, K., Hansen, J., Hadley, M.E., Hruby, V., Dorr, R. and Levine, N.              | 1998    | 10 men with erectile dysfunction in a double-blind, placebo-controlled crossover study were administered Melanotan II                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 8 out of 10 men experienced erection. Additional side effects observed included nausea and yawning.                                                                                                                                             | This study contributed evidence for the erectogenic properties of Melanotan-II with manageable side effects at a dose of 0.025 mg./kg                                 | A double-blind placebo-controlled study. Clearly focused issue, precise results, methods well described                                                | Small number of subjects. Long-term effects cannot be determined from this study.                                               |
| 15    | Skin pigmentation and pharmacokinetics of Melanotan-I in humans                                                                                   | Ugwu, S.O., Blanchard, J., Dorr, R.T., Levine, N., Brooks, C., Hadley, M.E., Aickin, M. and Hruby, V.J. | 1997    | A comparative pharmacokinetic trial was performed with a superpotent synthetic melanotropic peptide, [Nle <sup>4</sup> -D-Phe <sup>7</sup> ]- $\alpha$ -MSH-13 (Melanotan-I or MT-I) given by three routes of administration. Plasma levels were measured by RIA and tanning was quantitated using serial reflectometry. Doses of 0.16 mg/kg <sup>-1</sup> were administered intravenously (IV) and orally (PO), and doses from 0.08 to 0.21 mg kg <sup>-1</sup> subcutaneously (SC), in a randomised crossover fashion to three male volunteers over five consecutive days for 2 weeks (ten doses) | Trial with 3 subjects, where subcutaneous administration was found to be the most effective route to deliver melanotan, over intravenous and oral routes. Additional side effects observed included gastrointestinal upset and facial flushing. | One of the first studies to contribute evidence on the tanning effects of Melanotan I. This study found subcutaneous administration to be the most efficacious route. | Clearly focused issue with precise results. Methods well described. Randomised method of administering Melanotan I through various routes to subjects. | Small number of subjects. Limited to describing short term effects of use. Long-term effects cannot be determined by this study |
| 16    | Evaluation of Melanotan-II, a super potent cyclic melanotropic peptide in a pilot phase-I clinical study                                          | Dorr, R.T., Lines, R., Levine, N., Xiang, L., Hruby, V.J. and Hadley, M.E.                              | 1996    | Three subjects were subcutaneously administered a starting dose of 0.01 mg/kg of MT-II. MT-II or placebo were given daily for two consecutive weeks.                                                                                                                                                                                                                                                                                                                                                                                                                                                | Observed effects included tanning, somnolence and fatigue, nausea, stretching and yawning and spontaneous, penile erections, depending on the MT-II dose were noted                                                                             | This study contributes evidence for the tanning effect of Melanotan II on low dosages given every other day.                                                          | Placebo controlled, single blind trial. Addressed a clearly focused issue with precise results, methods well described.                                | Small number of subjects over a short period of time (two weeks). Long-term effects cannot be determined.                       |

|    |                                                                                                                                                         |      |                                                                                                                                     |                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                  |                                                                                             |                                                                                                                                      |
|----|---------------------------------------------------------------------------------------------------------------------------------------------------------|------|-------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|
| 17 | The Melanotropic Peptide, [Nle <sup>4</sup> , d-Phe <sup>7</sup> ]α-MSH, Stimulates Human Melanoma Tyrosinase Activity and Inhibits Cell Proliferation. | 1995 | Jiang, J., Sharma, S.D., Nakamura, S., Lai, J.Y., Fink, J.L., Hruby, V.J., and Hadley, M.E.                                         | Seventeen incubated human melanoma cell (HMC) lines, were kept with αMSH (afamelanotide) for 72 h with daily changes of medium.                                                                                        | Under certain conditions cells can be enhanced by stimulation with α-MSH. Under conditions of increased cell number, the presence of α-MSH caused changes in cell shape, enlarging them and they became dendritic. The number of cells drastically reduced when incubated with α-MSH. Skin darkening activity was noted in 28 subjects who were administered α-MSH by subcutaneous injection and without sun exposure. | This study contributes evidence that melanotropic peptides inhibit human melanoma cell growth in vitro                                                           | Addressed a clearly focused issue with precise results, methods well described.             | In vitro study which examines a cell outside of its natural environment may not be representative of results in real life conditions |
| 18 | Induction of skin tanning by subcutaneous administration of a potent synthetic melanotropin                                                             | 1991 | Levine, N., Sheffield, S.N., Eyan, T., Dorr, R.L., Hadley, M.E., Weinrach, J.C., Ertle, G.A., Toth, K., McGee, D.L. and Hruby, V.J. | Twenty-eight male subjects with various skin types (either easily tanned or resistant to tanning) 10 subcutaneous injections of either synthetic melanotropin or a placebo were administered over a twelve day period. | Randomised, placebo-controlled, double-blind clinical trial, addressed a clearly focused issue with precise results. Methods well described.                                                                                                                                                                                                                                                                           | This study contributes evidence to the tanning effect of synthetic melanotropin indicating a potentially safer method of skin tanning reducing need for UV light | Limited to short term effects of use (twelve days). Long-term effects cannot be determined. |                                                                                                                                      |

2012; Kaski, Stafford, Mehta, Jenkins, & Malhotra, 2013; Nelson, Bryant, & Aks, 2013; Ong & Bowling, 2012; Schulze et al., 2013; Shelley et al., 2009; Sivyver, 2012). In three cases, Melanotan I was named by the patient (Ellis, Kirkham, & Seukeran, 2009; Ferrándiz-Pulido, Fernández-Figueras, Quer, & Ferrándiz, 2011; Paurobally, El Hayderi, et al., 2011) with one additional case using the term "afamelanotide" (Von Bartenwerffer, Siebenhaar, & Hunzelmann, 2011).

In three cases, whether the product injected was Melanotan I or II was not recorded (Kjærgaard & Dalhoff, 2010; Reid et al., 2013; Thestrup-Pedersen & Søndergaard, 2010). In one report (Langan et al., 2009) it is said that patients used Melanotan I and II, but it is unclear which patient used which product, or whether both patients had used both products.

### 3.2.3. Health risks

**3.2.3.1. Dosing.** Of the reports which contained information on melanotan dosages, patients reported administering varying dosages from 20–50 mg of melanotan over a period of one to two months (Von Bartenwerffer et al., 2011; Shelley et al., 2009). Some patients reported administration of supraphysiological dosages far in excess of what is recommended (Devlin & Pomerleau, 2012; Nelson et al., 2012; Wijnands-Kleukers et al., 2014).

**3.2.3.2. Injecting behaviours.** Patient reported injecting melanotan once (Schulze et al., 2013), twice (Reid et al., 2013) and one hundred and fifty times (Thestrup-Pedersen & Søndergaard, 2010). Twenty-three of twenty-nine patients reported injecting subcutaneously, with the remainder of reports not stating route of administration (Ellis, Kirkham, & Seukeran, 2009; Hueso-Gabriel et al., 2012; Kjærgaard & Dalhoff, 2010; Ong & Bowling, 2012; Paurobally, El Hayderi, et al., 2011; Thestrup-Pedersen & Søndergaard, 2010) No patients reported intranasal administration. None of the reports reviewed contained information on melanotan user risk behaviours such as sharing of injecting equipment (e.g. needles, vials, barrels).

**3.2.3.3. Polysubstance use.** One patient disclosed use of anabolic-androgenic steroids (AAS) (Shelley et al., 2009). Use of ecstasy on one occasion was reported in one case (Kaski et al., 2013) and alcohol use reported in another (Kjærgaard & Dalhoff, 2010). Ingestion of an unknown "pain pill" was reported by one patient who tested positive for opiates (Nelson, Bryant, & Aks, 2012).

**3.2.3.4. High risk tanning behaviours.** Of the reports which collected information on use of artificial UV light to enhance the tanning outcome, eleven patients reported use of sunbeds (Ellis, Kirkham, & Seukeran, 2009; Cousen, Colver, & Helbing, 2009; Fjellhuagan Hjuler & Lorentzen, 2014; Hueso-Gabriel et al., 2012; Langan et al., 2009; Ong & Bowling, 2012; Paurobally, Jason, Dezfoulian, & Nikkels, 2011; Schulze et al., 2013; Shelley et al., 2009; Sivyver, 2012). In the remainder of cases, whether the patient had used artificial UV light or not was not described.

### 3.2.4. Clinical outcomes

**3.2.4.1. Desired effects.** All patients reported the desired effect of skin darkening or tanning. As three patients were identified as bodybuilders (Shelley et al., 2009; Cardones et al., 2009; Schulze et al., 2013) an additional desired outcome in this group may be enhanced appearance of muscle through tanning (Mahiques-Santos, 2012; Strange, 2009). In contrast to findings of clinical trials, where erectogenic properties of melanotan were a desired outcome for males with erectile dysfunction (Wessells et al., 1998, 2000), a patient in clinical case presentation experienced refractory priapism as a negative event (Devlin & Pomerleau, 2012).



**Table 2**  
Clinical case presentations.

|   | Year | Authors                                                     | Country | Key findings                                                                                                                                                                                                                                                                                                                                                                                                  | Strengths                                                                                                                                                                                                                                                                                              | Limitations                                                                                                                                                                                                                                                                                                                   |
|---|------|-------------------------------------------------------------|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | 2009 | Cardones, A.R. and Grichnik, J.M.                           | US      | 40-year-old male, bodybuilder. Medical history of melanoma and multiple dysplastic naevi. Reported using Melanotan II for bodybuilding competition tan. Purchased product online. Presented with new pigmented naevi. Pre-existing naevi also grew and darkened in colour. Upon cessation of tanning injections, issues subsided                                                                              | Reports motivation for use (Bodybuilding)<br>Reports sourcing route (online)<br>Reports whether product was disclosed to be Melanotan I/II                                                                                                                                                             | No information on additional PIED or illicit drug use. Though this case was aware of UV damage due to history of melanoma, report does not state whether use of sunbeds had ceased as a result. No information on Melanotan II sourcing, or evidence that product was Melanotan II.                                           |
| 2 | 2009 | Cousen, P., Colver, G. and Helbling, I.                     | UK      | 19-year-old female. Presented with 60 new eruptive naevi after four injections of Melanotan II. Described darkening of pre-existing larger moles. Heavy sunbed use was reported.                                                                                                                                                                                                                              | Reports use of artificial UV light for tanning<br>Reports whether product was disclosed to be Melanotan I/II                                                                                                                                                                                           | No information on additional PIED or illicit drug use. No information on Melanotan II sourcing, or evidence that product was Melanotan II.                                                                                                                                                                                    |
| 3 | 2009 | Ellis, R., Kirkham, N. and Seukeran, D.                     | UK      | A 23-year-old male with four weeks Melanotan I use presented with enlarged and darkened pigmented lesion. Heavy sunbed use was reported. Biopsy showed the lesion to be a melanoma.                                                                                                                                                                                                                           | Reports use of artificial UV light for tanning<br>Reports whether product was disclosed to be Melanotan I/II                                                                                                                                                                                           | No information on additional PIED or illicit drug use. No information on Melanotan I sourcing, or evidence that product was Melanotan I.                                                                                                                                                                                      |
| 4 | 2009 | Langan, E.A., Ramlogan, D., Jamieson, L.A. and Rhodes, L.E. | UK      | Case 1: A 42-year-old female had two moles on her sole which had enlarged and darkened. They were benign. Case 2: A 30-year-old female reported recent darkening of several moles on her back. Both had been injecting Melanotan I and II sourced online. Both reported sunbed use.                                                                                                                           | Reports sourcing route (online)<br>Reports use of artificial UV light                                                                                                                                                                                                                                  | It is unclear whether both patients had injected both Melanotan I and II concurrently, and if not, which patient had injected Melanotan I or II. No information on dosages or length of cycles of melanotan administered. No information on other PIEDs or illicit drugs used if any. No evidence that product was melanotan. |
| 5 | 2009 | Shelley, J., Husain, A. and Lawrence, C.M.                  | UK      | A 19-year-old male body builder presented eruptive new naevi darkening of pre-existing moles, very dark skin tone and hair darkening. He disclosed injecting Melanotan II approximately 20 times, 1 mg, over a 4-week period. Use of sunbeds disclosed. Product was sourced online. History of anabolic steroid use. Two naevi were excised and found to be benign.                                           | Reports motivation for use (bodybuilder)<br>Reports dosages administered over a period of time<br>Reports use of artificial UV light<br>Reports sourcing route (online)<br>Reports additional PIED use (history of anabolic steroid use)<br>Reports whether product was disclosed to be Melanotan I/II | No evidence that product injected was Melanotan II.                                                                                                                                                                                                                                                                           |
| 6 | 2010 | Kjærgaard C.T. and Dalhoff, K.                              | Denmark | Case 1: A 23-year-old female developed a haematoma after injecting melanotan. Case 2: An 18-year-old female with a history of alcohol abuse and hyperventilation had palpitations of the heart after taking melanotan. Nausea and abdominal pain also described. Case 3: A 22-year-old male presented with difficulty in breathing, dizziness and a tingling sensation in both arms after injecting melanotan | Reports drug history (alcohol use)                                                                                                                                                                                                                                                                     | No information on additional PIED use if any. No information on whether products were Melanotan I or II. No information on dosages or length of cycles administered. No information on source of melanotan product, no evidence that product injected was melanotan.                                                          |
| 7 | 2010 | Thestrup-Pedersen, K. and Søndergaard, K.                   | Denmark | A 25-year-old male presented with brown markings all over his body particularly penis, having injected approx. 150 injections of melanotan. Two naevi were excised but found to be benign.                                                                                                                                                                                                                    | Reports dosages administered                                                                                                                                                                                                                                                                           | No information given on whether product administered was Melanotan I or II. No other PIED use history or illicit drug use history given. No information on source of melanotan given. No evidence that product injected was melanotan. No information regarding use of sunbeds                                                |

Table 2 (Continued)

|    | Year | Authors                                                                         | Country | Key findings                                                                                                                                                                                                                                                                                                                                                                                                         | Strengths                                                                                                                                  | Limitations                                                                                                                                                                                   |
|----|------|---------------------------------------------------------------------------------|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 8  | 2011 | Fernandez-Figueras, M. T., Quer, A. and Ferrandiz, C.                           | Spain   | A 63-year-old male with eruptive naevi after Melanotan I use. Medical history of carcinoma. Self injected subcutaneously for 15 days.                                                                                                                                                                                                                                                                                | Reports length of cycle<br>Reports whether product was disclosed to be Melanotan I/II                                                      | No information on additional PIED or illicit drug use, or on use of sunbeds. No information on Melanotan I sourcing, or evidence that product was Melanotan I. No information on dosages.     |
| 9  | 2011 | Paurobally, D., Jason, F., Dezfoulian, B. and Nikkels, A.F.                     | Belgium | A 42-year-old with changing naevi after injecting Melanotan II (100 mg daily for 2 days, followed by 50 mg daily for 5 days) into her abdomen. New naevi had also appeared. Nausea prevented her from continuing Melanotan II use. No other medications taken. Some sunbed use reported. No family history of melanoma or other cancers. Excision and histology revealed the naevi to be melanoma.                   | Reports dosages administered<br>Reports use of artificial UV light<br>Reports whether product was disclosed to be Melanotan I/II           | No evidence that the product used was Melanotan II. No information on where Melanotan II was sourced.                                                                                         |
| 10 | 2011 | Paurobally, D., El Hayderi, L., Richert, B., Andre, J. and Nikkels, A.F.        | Belgium | A 54-year-old female presented to the dermatology department for treatment of transverse pigmented streaks on her fingernails. She disclosed use of Melanotan I four months previously. She had sourced the product from a "cosmetic physician". She injected 0.4 ml once a day for five days. The hyperpigmentation began about 1.5 months after the injections. Patient reported not taking any other medications. | Reports sourcing route (cosmetic physician)<br>Reports dosages administered.<br>Reports whether product was disclosed to be Melanotan I/II | No evidence that the product was Melanotan I. No information on sunbed use.                                                                                                                   |
| 11 | 2011 | Von Bartenwerffer, W., Siebenhaar, G. and Hunzelmann, N.                        | Germany | A 30-year-old male presented with patchy pigmentation of skin on his torso. Disclosed use of afamelanotide (Melanotan I) after several visits, a total dosage of 50 mg administered over two months. Additional side effects he experienced included headache, nausea and fatigue. Eight weeks after cessation of melanotan use the patchy pigmentation had resolved.                                                | Reports dosages administered<br>Reports whether product was disclosed to be Melanotan I/II                                                 | No other PIED use history or illicit drug history given. No information on source of Melanotan I. No evidence that product injected was Melanotan I. No information regarding use of sunbeds. |
| 12 | 2012 | Devlin, J.J. and Pomerleau, A.C.                                                | US      | A 60-year-old male with refractory priapism and a sympathomimetic toxidrome after self-injecting an unknown dose of Melanotan II, sourced on the internet. Developed tachycardia, diaphoresis, hypertension, and back-arching.                                                                                                                                                                                       | Reports sourcing route (online)<br>Reports whether product was disclosed to be Melanotan I/II                                              | Dosage of Melanotan II administered was unknown. No information on other drug use. No evidence that the product self-injected was Melanotan II.                                               |
| 13 | 2012 | Hueso-Gabriel, L., Mahiques Santos, L., Terrádez Mas, L. and Santonja López, N. | Spain   | A 25-year-old male presented with sudden eruption of multiple melanocytic naevi and changes in pre-existing naevi. Use of Melanotan II was reported. Histopathology revealed dysplastic melanocytic naevi, which carry a high risk of developing into melanoma, with severe dysplasia. One carcinoma was also removed. Use of sunbeds was confirmed.                                                                 | Names whether Melanotan I/II<br>Reports use of artificial UV light                                                                         | No information on additional PIED or illicit drug use. No information on Melanotan II sourcing, or evidence that product was Melanotan II.                                                    |

Table 2 (Continued)

|    | Year | Authors                                                            | Country   | Key findings                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Strengths                                                                                                                           | Limitations                                                                                                                                                                  |
|----|------|--------------------------------------------------------------------|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 14 | 2012 | Nelson, M.E., Bryant, S.M and Aks, S.E.                            | US        | A 39-year-old male injected 6 mg (six times the recommended starting dose) of Melanotan II purchased online in an attempt to tan during winter. Symptoms 2 h post injection included diffuse body aches, sweating, anxiety, mydriasis, diaphoresis, tachycardia, and diffuse muscle tremors. Diagnosis of systemic toxicity with sympathomimetic excess, rhabdomyolysis, and renal dysfunction. Product administered was sourced online and was tested and found to be Melanotan II. Opiates were found in patient's system and patient disclosed taking an unnamed "pain pill". | Reports whether product was disclosed to be Melanotan I/II<br>Reports dosages administered<br>Reports sourcing route (online)       | No information on additional PIEDs used if any                                                                                                                               |
| 15 | 2012 | Ong, S. and Bowling, J.                                            | UK        | A 23-year-old female presented with a darkening naevi on her knee after self injecting Melanotan II over a period of weeks. melanotan product was sourced online. Sunbed use was also disclosed, but only on three occasions. The naevi was excised and it was diagnosed as melanoma.                                                                                                                                                                                                                                                                                            | Reports whether product was disclosed to be Melanotan I/II<br>Reports sourcing route (online)<br>Reports use of artificial UV light | No information on additional PIEDs or illicit drugs used if any. No evidence that product used was Melanotan II.                                                             |
| 16 | 2012 | Reid, C., Fitzgerald, T., Fabre, A. and Kirby, B.                  | Ireland   | A 33-year-old female presented with changes in moles after having Melanotan injected on two occasions by a beautician. Use of sunbeds was disclosed. In particular one naevi was enlarged and darkened. Upon excitation it was found to be benign.                                                                                                                                                                                                                                                                                                                               | Reports sourcing route (beautician)<br>Reports use of artificial UV light                                                           | No information on whether the product injected was Melanotan I or II. No information on additional PIED or drug use if any. No evidence that product injected was Melanotan. |
| 17 | 2012 | Sivyer, G.W.                                                       | Australia | A 16-year-old female presented multiple dark melanocytic naevi and an enlarging nevus in her left groin following self administration of Melanotan II. Product was sourced online. Use of sunbeds disclosed. Three months later the patient was reviewed. She had ceased using Melanotan II but still used sunbeds frequently. Her skin and moles appeared much lighter on examination.                                                                                                                                                                                          | Reports whether product was disclosed to be Melanotan I/II<br>Reports sourcing route                                                | No other PIED use history or illicit drug history given. No evidence that product injected was Melanotan II.                                                                 |
| 18 | 2013 | Kaski, D., Stafford, N., Mehta, A., Jenkins, I.H. and Malhotra, P. | UK        | A 20-year-old woman had a single generalised tonic-clonic seizure while boarding an aeroplane to return from holidays. 6 days later on examination in the United Kingdom, she reported weakness of the right arm, reduced concentration, and difficulties with word-finding. Two days after admission, she disclosed her Melanotan II use while on holiday. Symptoms resolved over a period of two weeks. Some illicit drug use history disclosed.                                                                                                                               | Reports drug history (illicit)<br>Reports whether product was disclosed to be Melanotan I/II                                        | No evidence that the product injected on holiday was Melanotan II, no information on source.                                                                                 |

Table 2 (Continued)

| Year | Authors | Country                                                                                           | Key findings    | Strengths                                                                                                                                                                                                                                                                                                                                                                                              | Limitations                                                                                                                                                                  |                                                                                                                                                                                                                                              |
|------|---------|---------------------------------------------------------------------------------------------------|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 19   | 2013    | Schulze, F., Erdmann, H., Hardkop, L.H., Anemüller, W., Rose, C., Zillikens, D. and Fischer, T.W. | Germany         | A 24-year-old male bodybuilder, presented with eruption of multiple new moles and darkening of pre-existing naevi 24 h after one single injection of Melanotan II. Regular use of sunbeds. No signs of malignancy and naevi were found to be benign.                                                                                                                                                   | Reports motivation for use (bodybuilding)<br>Reports dosage administered<br>Reports use of artificial UV light<br>Reports whether product was disclosed to be Melanotan I/II | Reports that Melanotan II was illegally acquired but no information on whether this was through online sources or peer selling. No evidence that product injected was Melanotan II. No other PIED use history or illicit drug history given. |
| 20   | 2014    | Fjellhaugen Hjulær, K.F. and Lorentzen, H.F.                                                      | Denmark         | A 20-year-old female with 3/4 weeks of Melanotan II use three months prior to examination. Presented with a black lesion in her left gluteal region. She had an overall deep tan. Biopsy confirmed melanoma. She confirmed use of sunbeds also. Patient brought melanotan vial to clinic.                                                                                                              | Reports whether product was disclosed to be Melanotan I/II<br>Reports use of artificial UV light                                                                             | No information on additional PIED or illicit drug use. No information on melanotan sourcing.                                                                                                                                                 |
| 21   | 2014    | Wijnands-Kleukers, A.P., Vries, I.D., Meulenbelt, J. and Van Riel, A.J.                           | The Netherlands | Five females and one male reported adverse effects after using Melanotan II, sourced online. Two patients took therapeutic doses with four other patients injected suprathreshold doses. Effects suffered included nausea, vomiting, diaphoresis, dizziness, and angina pectoris. The male patient suffered priapism. In one patient who injected a suprathreshold dose the effects lasted for a week. | Reports whether product was disclosed to be Melanotan I/II<br>Reports dosages administered                                                                                   | No information regarding use of other PIEDs or illicit drugs in patients. No evidence that the product injected was melanotan.                                                                                                               |

3.2.4.2. *Minor effects.* Minor effects reported included patchy pigmentation of the skin (Thestrup-Pedersen & Søndergaard, 2010; Von Bartenwerffer et al., 2011), pigmentation of the nails (Paurobally, El Hayderi, et al., 2011), nausea (Von Bartenwerffer et al., 2011; Kjærgaard & Dalhoff, 2010) headache and fatigue (Von Bartenwerffer, Siebenhaar, & Hunzelmann, 2011).

3.2.4.3. *Chronic effects.* Of adverse effects experienced, most prevalent amongst clinical case presentation reports are eruptive new naevi and darkening/enlargement of existing naevi (Burian & Burian, 2013; Cardones et al., 2009; Cousen, Colven and Helbling, 2009; Ellis, Kirkham, & Seukeran, 2009; Ferrándiz-Pulido et al., 2011; Fjellhuagan Hjulær & Lorentzen, 2014; Hueso-Gabriel et al., 2012; Langan et al., 2009; Ong & Bowling, 2012; Reid et al., 2013; Schulze et al., 2013; Shelley et al., 2009; Sivyer, 2012; Thestrup-Pedersen & Søndergaard, 2010). In five clinical case presentations, melanoma was reported (Ellis, Kirkham, & Seukeran, 2009; Fjellhuagan Hjulær & Lorentzen, 2014; Hueso-Gabriel et al., 2012; Ong & Bowling, 2012; Paurobally, Jason, et al., 2011). In all melanoma cases, concurrent sunbed use was disclosed by the patient.

3.2.4.4. *Acute effects.* Acute side effects reported include clonic seizure (Kaski et al., 2013) and systemic toxicity or toxidrome, reported in two cases (Devlin & Pomerleau, 2012; Nelson, Bryant, & Aks, 2013). In one of these cases, six times the recommended dosage was administered (Nelson, Bryant, & Aks, 2013) and in the remaining cases, dosages were unknown.

Other acute adverse effects documented include refractory priapism (Devlin & Pomerleau, 2012), haematoma, heart palpitations, hyperventilation, dizziness and abdominal pain (Kjærgaard & Dalhoff, 2010).

#### 4. Discussion

This is the first attempt to scope and collate the existing literature base on melanotan clinical outcomes to include clinical trial results and clinical case presentation reports. The aim of the review was to identify the effects of melanotan use to include desirable, minor and more serious outcomes. An additional aim was to provide further information from the clinical literature on two key areas of concern: types of user, and authenticity of sourcing routes and associated dangers. A final aim was to highlight shortcomings of current clinical reporting systems which limit our knowledge on melanotan use in the general population, and in this regard to inform future research, health promotion, education, harm reduction interventions and enhanced clinical responses.

Phase I, II and III clinical trials have found several potential benefits of afamelanotide to include treatment of a range of skin conditions and carcinoma (Biolcati et al., 2015; Harms et al., 2009). Side effects observed in clinical trials are largely minor, and include nausea, facial flushing, darkening of existing naevi, penile erection, gastrointestinal upset, yawning, stretching and fatigue (Barnetson et al., 2006; Harms et al., 2009; Haylett et al., 2011). The photoprotective effects of  $\alpha$ -MSH analogues known as Melanotan I and II which result in a skin tan with less sun exposure (Hadley & Dorr, 2006) have led to a blackmarket diversion of these products, sourced to enhance the user cosmetically. Largely operational in an online setting, easily accessible melanotan markets (Breindahl et al., 2015) have been found to be high risk for distribution of contaminated and mislabelled products (Kimergård et al., 2014). A serious health risk is posed to users who access illicit melanotan products sourced online, through exposure to unknown compounds and impurities. This is of concern as the majority of patients in clinical case presentation reports disclosed sourcing their melanotan online.

**Table 3**  
Melanotan associated clinical outcomes.

|           | Type of side effect                                                      | Clinical trials                                                                  | Clinical case presentations                                                                                                                                                                                                                                                                                                                                                                      |
|-----------|--------------------------------------------------------------------------|----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Desirable | Skin tanning/darkening                                                   | All cases ( <i>n</i> = 18)                                                       | All cases ( <i>n</i> = 21)                                                                                                                                                                                                                                                                                                                                                                       |
|           | Improved sexual function                                                 | <i>n</i> = 4<br>(Dorr et al., 1996, 2000; Wessells et al., 1998, 2000)           | n/a                                                                                                                                                                                                                                                                                                                                                                                              |
| Minor     | Spontaneous penile erection                                              | <i>n</i> = 4<br>(Dorr et al., 1996, 2000; Wessells et al., 1998, 2000)           | n/a                                                                                                                                                                                                                                                                                                                                                                                              |
|           | Yawning                                                                  | <i>n</i> = 2<br>(Dorr et al., 2000, 1996; Wessells et al., 1998, 2000)           | n/a                                                                                                                                                                                                                                                                                                                                                                                              |
|           | Facial flushing                                                          | <i>n</i> = 2<br>(Barnetson et al., 2006; Dorr et al., 2000, 2004a,b)             | n/a                                                                                                                                                                                                                                                                                                                                                                                              |
|           | Gastrointestinal upset/nausea/vomiting                                   | <i>n</i> = 3<br>(Barnetson et al., 2006; Levine et al., 1999; Ugwu et al., 1997) | <i>n</i> = 2<br>(Kjærgaard & Dalhoff, 2010; Von Bartenwerffer et al., 2011)                                                                                                                                                                                                                                                                                                                      |
|           | Fatigue                                                                  | <i>n</i> = 2<br>(Barnetson et al., 2006; Levine et al., 1999)                    | <i>n</i> = 1<br>(Von Bartenwerffer et al., 2011)                                                                                                                                                                                                                                                                                                                                                 |
|           | Headache                                                                 | <i>n</i> = 1<br>(Harms et al., 2009)                                             | <i>n</i> = 1<br>(Von Bartenwerffer et al., 2011)                                                                                                                                                                                                                                                                                                                                                 |
|           | Changes in taste                                                         | <i>n</i> = 1<br>(Dorr et al., 2000)                                              | n/a                                                                                                                                                                                                                                                                                                                                                                                              |
|           | Stretching                                                               | <i>n</i> = 2<br>(Dorr et al., 1996, 2000)                                        | n/a                                                                                                                                                                                                                                                                                                                                                                                              |
|           | Patchy pigmentation of the skin/nails                                    | n/a                                                                              | (Thestrup-Pedersen & Søndergaard, 2010; Von Bartenwerffer et al., 2011), Paurobally, El Hayderi, et al. (2011)                                                                                                                                                                                                                                                                                   |
| Chronic   | Eruptive new naevi/darkening of existing naevi                           | <i>n</i> = 1<br>(Haylett et al., 2011)                                           | <i>n</i> = 14<br>(Burian & Burian, 2013; Cardones et al., 2009; Cousen, Colven & Helbling, 2009; Ellis, Kirkham & Seukeran, 2009; Ferrándiz-Pulido et al., 2011; Fjellhuagan Hjulær & Lorentzen, 2014; Hueso-Gabriel et al., 2012; Langan et al., 2009; Ong & Bowling, 2012; Reid et al., 2013; Schulze et al., 2013; Shelley et al., 2009; Sivyer, 2012; Thestrup-Pedersen & Søndergaard, 2010) |
|           | Melanoma                                                                 | n/a                                                                              | <i>n</i> = 5<br>(Ellis, Kirkham & Seukeran, 2009; Fjellhuagan Hjulær & Lorentzen, 2014; Hueso-Gabriel et al., 2012; Ong & Bowling, 2012; Paurobally, Jason, et al., 2011) Kaski et al. (2013)                                                                                                                                                                                                    |
| Acute     | Clonic seizure                                                           | n/a                                                                              | <i>n</i> = 2<br>(Devlin & Pomerleau, 2012; Nelson, Bryant & Aks, 2013)                                                                                                                                                                                                                                                                                                                           |
|           | Systemic toxicity or toxidrome                                           | n/a                                                                              | <i>n</i> = 1<br>(Devlin and Pomerleau (2012)                                                                                                                                                                                                                                                                                                                                                     |
|           | Refractory priapism                                                      | n/a                                                                              | <i>n</i> = 1<br>(Devlin and Pomerleau (2012)                                                                                                                                                                                                                                                                                                                                                     |
|           | Haematoma Heart palpitations, Hyperventilation, Dizziness Abdominal pain | n/a                                                                              | <i>n</i> = 1<br>(Kjærgaard & Dalhoff, 2010)                                                                                                                                                                                                                                                                                                                                                      |

Findings extrapolated from the clinical case presentation literature on melanotan user groups indicate both male and female use, in line with previous findings (Hope et al., 2013; Van Hout & Brennan, 2013). Three cases were identified as bodybuilders (Shelley et al., 2009; Cardones et al., 2009; Schulze et al., 2013) evidencing melanotan use within bodybuilding subculture (Mahiques-Santos, 2012). In this regard, AAS using subsets may be representative of certain melanotan user groups. Reluctance to disclose use of PIEDs has been found in previous studies (Pope & Kanayama, 2005; Pope, Kanayama, Ionescu-Pioggia, & Hudson, 2004) and reluctance to disclose melanotan use was evidenced in one clinical case report (Kaski et al., 2013). This reticence may contribute to underreporting of prevalence.

A major limitation of clinical case reporting is that findings are limited to melanotan users who presented to health services for treatment. Many of the wider population of melanotan users may be experiencing additional effects currently undocumented. Additional limitations include unknown and potentially complicating factors. This review has identified several shortcomings in existing clinical case presentation reports to include incomplete drug use histories, where dosages and cycles of melanotan use are not well described (Devlin & Pomerleau, 2012; Langan et al., 2009) or polypharming with other substances is not accounted for (Cardones et al., 2009; Cousen, Colver, & Helbling, 2009; Devlin & Pomerleau, 2012). Heavy use of artificial UV tanning is commonly disclosed (Fjellhuagan Hjulær & Lorentzen, 2014; Hueso-Gabriel et al., 2012; Ong & Bowling, 2012) which complicates diagnoses of melanoma

in melanotan users. In some case reports, whether the patient had used sunbeds was not described. These unknown determinants hinder findings of causality in clinical case presentation reports.

Failure to identify the type of product – Melanotan I or II – is also seen in some reports (Reid et al., 2013; Kjærgaard & Dalhoff, 2010). In all but two cases (Fjellhuagan Hjuler & Lorentzen, 2014; Nelson, Bryant and Aks, 2013) the vial of melanotan product was not produced for testing and analysis. Only one of these reports tested the vial contents and confirmed the product injected to be melanotan (Nelson, Bryant, & Aks, 2013). In all other cases where the substance administered was not tested, there is no evidence that the injectable used was a melanotan product. It is imperative that clinicians take a full drug history from patients presenting with melanotan associated symptomatology and correctly identify whether the product injected was Melanotan I or II, or another named product. Where possible, samples of product should be collected from patients and tested to determine whether the injectable used was in fact melanotan, in consideration of the extensive online counterfeit market and the mislabelling of products which have been detailed in previous reports (Kimergård et al., 2014).

Normalisation of self-experimentation with PIEDs in online user networks is of concern. There is evidence of reckless use in one clinical case report (Nelson, Bryant, & Aks, 2012). There is potential for transmission of bloodborne viruses and for poor injecting technique to result in infection in melanotan injectors. Targeted interventions in this regard are needed to inform melanotan users on safe injecting practices. Accessing of online lay epidemiology for medical advice may lead to disengagement with healthcare professionals. In this regard, a non-judgemental approach is needed from clinicians when met with melanotan users. Additionally an understanding that patients may be engaging in drug use practices not yet known to healthcare workers is warranted, as well as consideration to potential underlying body dysmorphic disorder.

The literature base is expanding to reveal information on melanotan user profiling, trajectories of use and perception of health related harms. Longterm health consequences of PIED use remain unknown due to the relative recency of the PIED use phenomenon, and the lack of longitudinal and observational studies to track health outcomes in users. Future work should include further studies conducted with other PIED users such as AAS users and users of cosmetic injectables, to investigate prevalence of melanotan use, including demographics and current drug use histories. In consideration of the robust online context of melanotan user communities, further online ethnographical studies are needed to collect rich data on patterns of use, injecting technique, product endorsement and health outcomes in users (Tables 2 and 3).

## 5. Conclusion

The popularity of melanotan peptides is grounded in short cut pharmaceutical consumerism (Brennan et al., 2013). Toxicological profiles are largely unknown, with long-term health outcomes as yet undocumented. This review has made recommendations to address the limitations in current reporting systems, in order to inform enhanced clinical responses, and has underscored the need for future internet and clinical research to investigate prevalence and user profiling, and map health outcomes in melanotan users.

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## Review

### The injecting use of image and performance-enhancing drugs (IPED) in the general population: a systematic review

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#### What is known about this topic

- Injectors of IPED are a heterogeneous, multi ethnic group of males, females, young and older users.
- IPED use has an extensive online context with product sourcing through unregulated online routes, and information swapping in IPED-specific discussion forums.
- Injecting IPED use has signalled the emergence of a new group of injecting drug users who self differentiate from traditional injecting user groups in their motivators for use.

#### What this paper adds

- Moderated use of IPED is semi-normalised as health and beauty consumerism with a subset of high-risk IPED users engaging in pathological use.
- Key motivators for use in the general population include the visual representation of health, pursuit of a sexualised body ideal and retention of youth.
- Perceptions of risk among IPED user communities are disordered through dissemination of ethnopharmacology within online settings.

#### Abstract

Injecting use of image and performance-enhancing drugs (IPED) in the general population is a public health concern. A wide and varied range of IPED are now easily accessible to all through the online market. A comprehensive literature review was undertaken according to Critical Appraisal Skills Programme (CASP) guidelines for systematic review, to identify the relevant literature. No date restrictions were placed on the database search in the case of human growth hormone melanotan I and II, and oil and cosmetic injectables. In the case of anabolic androgenic steroids search dates were restricted to January 2014–2015. Publications not in English and with a lack of specificity to the topic were excluded. The review yielded 133 relevant quantitative and qualitative papers, clinical trials, clinical case presentations and editorials/reports. Findings were examined/reviewed under emergent themes which identified/measured extent of use, user profiling, sourcing, product endorsement, risk behaviours and health outcomes in users. Motivation for IPED use may be grounded in appearance, pursuit of health and youth, and body image disturbance. IPED users can practice moderated use, with pathological use linked to high-risk behaviours, which may be normalised within IPED communities. Many IPED trajectories and pathways of use are not scientifically documented. Much of this information may be available online in IPED specific discussion forums, an underutilised setting for research, where uncensored discourse takes place among users. This review underscores the need for future internet and clinical research to investigate prevalence and patterns of injecting use, and to map health outcomes in IPED users. This paper provides community-based clinical practice and health promotion services with a detailed examination and analysis of the injecting use of IPED, highlighting the patterns of this public health issue. It serves to disseminate updated publication information to health and social policy makers and those in health service practice who are involved in harm reduction intervention.

**Keywords:** anabolic steroids, body image, community based health, image and performance enhancing, injecting drug use, internet, IPED, needle and syringe programs



## Introduction

The image and performance enhancement drug (IPED) market has become increasingly accessible through online sellers (Evans-Brown *et al.* 2012, Brennan *et al.* 2013). A range of IPED are now available, to include enhancement of muscle, skin tone, facial features and to boost longevity (Evans-Brown *et al.* 2012), which has broadened their appeal to a wider market. The semi-normalisation of injecting IPED use in beauty consumerism is a public health concern. Of particular significance is the injecting use of IPED from which a new and unique group of injecting drug users has emerged. IPED injector engagement with needle exchange services (Kimergard 2015) has mainstreamed the provision of such services which were traditionally confined to injecting psychoactive drug user groups. IPED users typically disassociate from an injecting drug user identity (Brennan *et al.* 2013) as use is perceived as socially acceptable bodywork, motivated through pursuit of health and appearance ideals.

The literature is expanding to describe IPED use in the general population and profile the typical IPED user in the community. This paper will provide a review of the extant literature concerning injecting use of IPEDs with regard to anabolic androgenic steroids (AAS), human growth hormone (hGH), tanning peptides melanotan I and II and bremelanotide, cosmetic injectables Botox and dermal fillers, and oil injectable synthol, used to enlarge the appearance of muscle. AAS, hGH and melanotan I and II were chosen for this review due to being indicated in surveys (Chandler & McVeigh 2013), needle exchange data (Hope *et al.* 2013, Jennings *et al.* 2014) and in reports (Evans-Brown *et al.* 2012) as some of the most commonly used. Synthol injection and unregulated Botox/dermal filler injectables were chosen as the most undocumented scientifically despite anecdotal reporting of high prevalence of use (Pickett & Mewies 2008, Pickett 2011, Schafer *et al.* 2012, Zilinskas & Coleman, 2011).

The aim of this review was to summarise what is currently known on the increasing trend of injecting IPED use, to identify challenges to community-based health services and to highlight gaps in the literature where further research is needed. In this regard, the key review questions were as follows:

- 1 What is the extent of injecting use of IPED?
- 2 What is the typical demographic profile of the injecting IPED user?
- 3 What are the identified motivators for use?
- 4 Where do users source their IPED?
- 5 What are the identified patterns of IPED use?

- 6 What are the identified health risks and consequences?
- 7 What are the perceptions of risk among IPED user groups?

## Methodology

The Critical Appraisal Skills Programme (CASP) was chosen to guide this literature review. The CASP is widely used and provides for assessing quality of the literature chosen for the purposes of review. CASP is comprised of seven tools developed from guides produced by the Evidence Based Medicine Working Group published in the *Journal of the American Medical Association* (Public Health Resource Unit 2006). These tools were developed to assess the quality of the literature from different types of studies.

## Search strategy

Search terms used included generic, brand and street names for IPED (see Table 1) used in combination with 'illicit use' and 'non medical use'.

There were no date restrictions placed on searches for melanotan, hGH site enhancement oils or cosmetic injectables studies, due to the limited literature base on unregulated use of these particular IPED. In the case of AAS, dates were restricted from 2004 to 2015, as the literature prior to this interval is already well summarised in prior publications (Perry *et al.* 1992, Yesalis *et al.* 1993, Brower 2002, Evans 2004).

Electronic databases relative to health science were consulted including Academic Search Complete, British Nursing Index, Cinahl, Cochrane, Eric, PsyARTICLES, PsycINFO, PubMed, Science Direct, Sports Discus, Web of Science and Wiley Online. Additional 'grey' references suitable for inclusion in the literature review were found in the reference lists of published works ( $n = 230$ ). Through database searching, 86,829 records were identified and 57,829 records remained after duplicates were removed (see Figure 1).

Remaining articles were then screened to exclude results which were not relevant to the aims of the review ( $n = 56,627$ ). Twelve hundred and two articles remained. One thousand and sixty-nine articles were removed including articles which were non-specific to the topic and written in a language other than English. This left 133 articles for quality analysis according to CASP guidelines (see Tables 2–7). Although quality assessment can be used to exclude certain studies on the basis of methodological flaws, this is uncommon practice (CRD 2009). For this review, papers were not excluded through quality

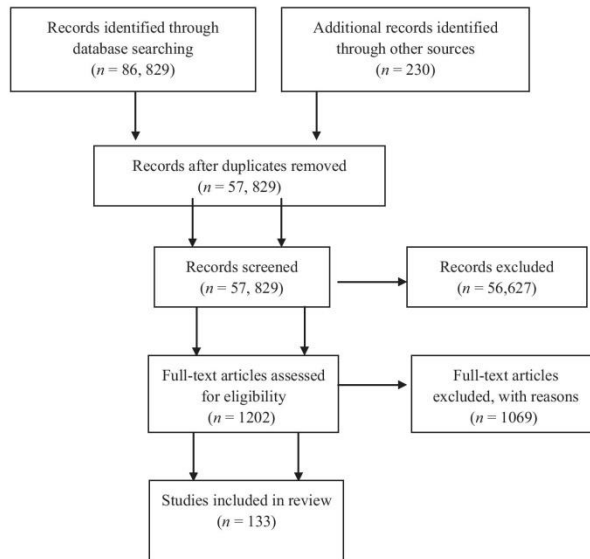
**Table 1** Search terms

| IPED                                                      | Generic name                                                                                                                                                                                                                                                    | Brand name                                                                                                                                                                                                                                                                                            | Other                                                                                                                                                                      |
|-----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Anabolic Androgenic Steroids                              | "boldenone undecylenate" "Dromostanolone Dipropionate" Testosterone esters<br>"Testosterone undecanoate" "Trenbolone Acetate" Oxymetholone, "Nandrolone Phenylpropionate" "Fluoxymesterone"<br>"Methandrostenolone" "Methenolone Enantate" "Methyltestosterone" | "Equipoise", "Ganabol", "Equigan", "Ultragan", "Masteron", "NPP"<br>"Oxandrolone", "Anavar", "Anadrol"<br>"Anapolon", "Stanozolol" "Winstrol Depot" "Testred", "Virilon", "Nandrolone"<br>"Decanoate" "Deca-Durabolin" "Averbol"<br>"Dianabol" "Danabol" "Halotestin"<br>"Primobolan Depot" "Android" | "Anabolic Androgenic Steroids" "AAS"<br>"anabolic steroids"                                                                                                                |
| Human Growth Hormone<br>Melanotan I, II and bremelanotide | "human growth hormone", "somatotropin", "somatotropin"<br>"Melanotan I"; "melanotan II",<br>"bremelanotide", "afemelanotide"                                                                                                                                    | "Saizen", "Omnitrope", "Zorbtive",<br>"Genotropin", "Norditropin"                                                                                                                                                                                                                                     | "HGH", "GH", "peptide hormone"<br>"tanning peptides";<br>"tantastic" "MSH analogues"; "tanning injections"; "Barbie drug", "tanning jab",<br>"posing oil", "oil injection" |
| Synthol<br>Dermal fillers and Botox                       | "botox", "botulinum toxin A"<br>"dermal filler"                                                                                                                                                                                                                 | "Synthol", "Syntherol", "ADE"<br>"dysport", "Xeomin", "MyoBloc",<br>"Novotox Ultra", "Canitox"                                                                                                                                                                                                        |                                                                                                                                                                            |

assessment, although limitations were identified (see Tables 2–7). Papers found to be most methodologically strong and relevant to the aims of the review were more influential in the synthesis (Gough 2007).

Textual narrative synthesis was selected as an approach to summarise and explain findings, and

was chosen due to the importance of quality appraisal associated with this method of synthesis (Lucas *et al.* 2007) and due to the heterogeneous nature of the studies reviewed (Popay *et al.* 2006). Textual narrative synthesis uses an inductive method to identify common themes within multiple study results accord-



**Figure 1** Record inclusion and exclusion.

**Table 2** Quantitative studies

|   | Theme                                                                                                                                                       | Year | Place | Authors                                                                  | Design          | Data collection method | Setting              | Sample size               |
|---|-------------------------------------------------------------------------------------------------------------------------------------------------------------|------|-------|--------------------------------------------------------------------------|-----------------|------------------------|----------------------|---------------------------|
| 1 | Gym and tonic: A profile of 100 male steroid users                                                                                                          | 1997 | UK    | Evans, N. A.                                                             | Cross-sectional | Questionnaire          | Gym                  | 100                       |
| 2 | A preliminary investigation into the relationship between anabolic-androgenic steroid use and the symptoms of reverse anorexia in both current and ex-user. | 2003 | UK    | Cole, J.C., Smith, R., Halford, J.C. and Wagstaff, G.F.                  | Cross-sectional | Questionnaire          | Gym, needle exchange | 137                       |
| 3 | New challenges for agency-based syringe exchange schemes: analysis of 11 years of data (1991–2001) in Merseyside and Cheshire, UK                           | 2003 | UK    | McVeigh, J., Beynon, C. and Bellis, M.A.                                 | Longitudinal    | SEP monitoring system  | Needle exchange      | 206,789 syringe exchanges |
| 4 | Anabolic steroid users' attitudes towards physicians                                                                                                        | 2004 | USA   | Pope, H.G., Jr., Kanayama, G., Ionescu-Proggia, M and Hudson, J.I.       | Cross-sectional | Interview              | Research offices     | 80                        |
| 5 | Anabolic steroid use in weightlifters and bodybuilders: an internet survey of drug utilization                                                              | 2005 | USA   | Perry, P.J., Lund, B.C., Deninger, M.J., Kutscher, E.C and Schneider, J. | Cross-sectional | Questionnaire          | Online               | 207                       |

| Response rate | Outcome measures                                                                                                                                                       | Main findings                                                                                                                                                                                                                                                                                                                                                | Contribution                                                                                                                                                           | Strengths                                                                                                                                           | Weaknesses                                                                                                                                                                                                               |
|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| n/a           | Demographics, type of AAS used, duration of use, dosages used, use of other substances, adverse effects                                                                | AAS dosages ranged from 250 to 3200 mg week <sup>-1</sup> . Combinations of drugs were used. Cycles ranged from 4 to 12 weeks. 86% reported polydrug use regimens in addition to AAS use. Acne, striae, and gynecomastia were among the adverse effects reported                                                                                             | One of the first studies to look at AAS use in gyms, profile users and drug use patterns                                                                               | Study addressed a clearly focused issue. Methods of selection clearly described. Representative sample                                              | Selection bias through use of a self-selected sample. Questionnaire left in gyms for participants to voluntarily complete. Cross-sectional design may limit generalisability                                             |
| n/a           | Bodyweight, dieting and nutrition, substance use, the modified eating disorder inventory (EDI), the severity of dependence scale (SDS) for both exercising and AAS use | AAS users sought to create a muscular body more than those who did not use AAS. Those with current and past history AAS use scored higher on the reverse anorexia EDI than non AAS users. AAS use – but not bodybuilding alone – was associated with reverse anorexia                                                                                        | Few studies have focused on whether reverse anorexia or muscle dysmorphia symptoms cease after AAS use is discontinued. This study contributes evidence in this regard | Study addressed a clearly focused issue. Samples taken from four separate gyms randomly reducing selection bias                                     | Small sample. Cross-sectional design may reduce generalisability. Self-report measures may introduce recall bias                                                                                                         |
| n/a           | n/a                                                                                                                                                                    | Numbers of AAS users accessing needle exchange has significantly risen (sixfold) in the 11 years of monitoring                                                                                                                                                                                                                                               | This paper contributes evidence for increasing levels of AAS use in the Merseyside area                                                                                | Study addressed a clearly focused issue. Longitudinal design over 11 years. Method of selection clearly described                                   | Limited to AAS users accessing needle exchange services. Regional study findings are non-generalisable locally                                                                                                           |
| n/a           | Demographic information, athletic history and history of licit and illicit drug use, Structured Clinical Interview for DSM-IV                                          | While participants rated physician knowledge as high on general health, cigarette smoking, alcohol and conventional illicit drugs, knowledge on AAS was rated low and no more reliable than friends, the internet or AAS dealers. 40% of AAS users trusted AAS dealers just as much as any physician, and 56% had not disclosed their AAS use to a physician | This study contributes evidence for mistrust in physicians among AAS users which may hinder intervention                                                               | Study addressed a clearly focused issue. Appropriate methods to answer the research question. Participants were not aware of the focus of the study | Small sample size. Self-selection bias may have been introduced. Self-report measures used                                                                                                                               |
| n/a           | Demographics, AAS use, side effects, information sources, AAS dependence according to DSM-IV criteria                                                                  | A mean of 3.1 agents was found in typical IPED regimens. Cycles ranged from 5 to 10 weeks, and often included supraphysiological dosages 5–29 times greater than therapeutic dose. 33% of respondents met criteria for AAS dependence                                                                                                                        | Potentially complicated drug regimens of AAS users are underdocumented. This study identified drug use patterns of AAS users to further knowledge of same              | Study addressed a clearly focused issue. Results are applicable to the local population. Geographically diverse sample due to internet setting      | Internet study can introduce selection bias due to self-selection and nonrepresentative nature of the internet. Moderate sample size from survey. Survey advertised on bodybuilding sites which may have introduced bias |

Table 2 (continued)

|   | Theme                                                                                                                                  | Year | Place  | Authors                                                                         | Design          | Data collection method   | Setting          | Sample size |
|---|----------------------------------------------------------------------------------------------------------------------------------------|------|--------|---------------------------------------------------------------------------------|-----------------|--------------------------|------------------|-------------|
| 6 | UV light tanning as a type of substance-related disorder                                                                               | 2005 | USA    | Warthan, M.W., Uchida, T. and Wagner, R.F., Jr                                  | Cross-sectional | Questionnaire            | Beach            | 145         |
| 7 | Steroid and prescription medicine abuse in the health and fitness community: a regional study                                          | 2006 | Wales  | Baker, J.S., Graham, M.R. and Davies, B.                                        | Cross-sectional | Questionnaire            | Gym              | 210         |
| 8 | Psychiatric side effects induced by supraphysiological doses of combinations of anabolic steroids correlate with the severity of abuse | 2006 | Greece | Pagonis, T.A., Angelopoulos, N.V., Koukoulis, G.N. and Hadjichristodoulou, C.S. | Cohort study    | Psychometric instruments | Research offices | 320         |
| 9 | Anabolic androgenic steroids: a survey of 500 users                                                                                    | 2006 | USA    | Parkinson, A.B. and Evans, N.A.                                                 | Cross-sectional | Questionnaire            | Online           | 500         |

| Response rate | Outcome measures                                                                                                                         | Main findings                                                                                                                                                                                                                                                                                                                                                                          | Contribution                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Strengths                                                                                                                                                                            | Weaknesses                                                                                                                                                                                                                                              |
|---------------|------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| n/a           | Positive findings from modified versions of the CAGE (Cut down, Annoyed, Guilty, Eye-opener) questionnaire, and modified DSM-IV criteria | 26% met the modified CAGE criteria, and 53% met the modified DSM IV criteria for a substance-related disorder with regard to tanning                                                                                                                                                                                                                                                   | One of the first studies to investigate tanning as an addictive behaviour using modified diagnostic criteria                                                                                                                                                                                                                                                                                                                                                                             | Study addressed a clearly focused issue. Appropriate methods to answer the research question. Results applicable to the local population                                             | Cross-sectional design may not be generalisable. Only refers to outdoor tanning. Small sample size                                                                                                                                                      |
| 69.50%        | Demographic and social characteristics, onset of use, polydrug use                                                                       | This study has estimated one of the highest prevalence rates of AAS use in the published literature. 70% (102) reported using AAS use, 65.8% (96) were currently using, 7% (10) were female. Use of growth hormone was at 24%                                                                                                                                                          | One of the pioneering studies indicating use of IPEDs among recreational athletes in gyms and health clubs                                                                                                                                                                                                                                                                                                                                                                               | Study addressed a clearly focused issue. Appropriate method used to answer the research question. Results applicable to the local population. Methods of selection clearly described | Cross-sectional design may not be generalisable. Sample selected from gyms that were seen to be 'hardcore' through the availability of heavy weightlifting equipment and with a predominantly male clientele. Subject to selection bias for this reason |
| n/a           | The Symptoms Check List-90 (SCL-90) and the Hostility and Direction of Hostility Questionnaire (HDHQ)                                    | The study showed a significant increase in all psychometric subscales recorded in active users of AAS and no statistically significant difference in groups administered placebo drugs, and groups of non users. Heavy abuse patterns were most associated with psychiatric side effects                                                                                               | Previous clinical studies investigating AAS have administered volunteers with unrealistically low dosages of AAS compared to real-life drug regimens. They have also failed to account for the typical polypharming of AAS users due to ethical concerns. This study observed AAS users who were self-administering real-life AAS regimens. It found a wide range of psychiatric symptoms caused by AAS use to be dose responsive and to increase in severity the higher the dose of AAS | Study addressed a clearly focused issue. Psychometric measures were validated prior to study. Precise results that can be applied to the local population                            | Self-selected sample may introduce sampling bias                                                                                                                                                                                                        |
| n/a           | Dosages, regimes demographics, polydrug use and side effects                                                                             | 78.4% were recreational bodybuilders. 59.6% reported using at least 1000 mg of testosterone weekly, 99.2% of AAS users self-inject AAS formulations, and up to 13% reported high-risk injection practices, e.g. reusing needles, sharing needles and sharing vials. 25% admitted to concomitant use of growth hormone and insulin and 99.2% reported adverse side effects from AAS use | Potentially complicated drug regimens of AAS users are underdocumented. This study identified drug use patterns of AAS users to further knowledge of same                                                                                                                                                                                                                                                                                                                                | Study addressed a clearly focused issue. Results are applicable to the local population. Geographically diverse sample due to internet setting                                       | Internet study can introduce selection bias due to self-selection and nonrepresentative nature of the internet. Moderate sample size from survey                                                                                                        |

Table 2 (continued)

|    | Theme                                                                                                                                           | Year | Place   | Authors                                                                                                       | Design          | Data collection method | Setting          | Sample size |
|----|-------------------------------------------------------------------------------------------------------------------------------------------------|------|---------|---------------------------------------------------------------------------------------------------------------|-----------------|------------------------|------------------|-------------|
| 10 | Tanning in body dysmorphic disorder                                                                                                             | 2006 | USA     | Phillips, K.A., Conroy, M., Dufresne, R.G., Menard, W., Didie, E.R., Hunter-Yates, A., Fay, C. and Pagano, M. | Cross-sectional | Interviews             | Research offices | 200         |
| 11 | Anabolic ergogenic substance users in fitness-sports: a distinct group supported by the health care system                                      | 2006 | Germany | Striegel, H., Perikles, S., Frisch, S., Roecker, K., Dietz, K., Dickhuth, H.H. and Ulrich, R.                 | Cross-sectional | Questionnaire          | Fitness centres  | 1802        |
| 12 | A league of their own: demographics, motivations and patterns of use of 1955 male adult non-medical anabolic steroid users in the United States | 2007 | USA     | Cohen, J., Collins, R., Darkes, J. and Gwartney, D.                                                           | Cross-sectional | Questionnaire          | Online           | 2663        |

| Response rate | Outcome measures                                                                                                                                                                                                                                                                                                          | Main findings                                                                                                                                                                                                                                                                                                                                    | Contribution                                                                                                                                                         | Strengths                                                                                                                                                                                                                                                                                                                                                                     | Weaknesses                                                                                                                                                                                                                                      |
|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| n/a           | The Yale-Brown Obsessive Compulsive Scale Modified for Body Dysmorphic Disorder (BDD-YBOCS), LIFE-RIFT (Range of Impaired Functioning Tool), Medical Outcomes Study 36-Item Short-Form Health Survey (SF-36), Structured Clinical Interview for DSM-IV—Non-Patient Version (SCID-I/NP), Clinical Global Impressions Scale | Among tanners, 84% reported their skin as a matter of concern. All tanners had impaired functioning due to body dysmorphic disorder (BDD), 26% had attempted suicide, with poor overall quality of life. 52% of tanners had sought treatment for their skin which had no impact on their BDD. Compulsive skin picking was more likely in tanners | This study contributes evidence for excessive tanning as a body dysmorphic disorder behaviour                                                                        | Study addresses a clearly focused issue. Appropriate design to answer the research question. The first study to systematically investigate tanning as a BDD behaviour. Broader sample than previous BDD studies                                                                                                                                                               | Did not document type or frequency of tanning or determine specific body areas for tanning. The effect of tanning on appearance preoccupations was not assessed. Did not assess negative effects of tanning or the compulsive nature of tanning |
| 34.50%        | Biometric parameters, social indicators, physical fitness, use of stimulants, illicit drug IPEDs                                                                                                                                                                                                                          | 13.5% disclosed lifetime use of IPEDs. Use of IPEDs was positively associated with cocaine use, training years, training frequency, negatively associated with level of education and alcohol intake. IPED use was significantly associated with illicit drug use, particularly cocaine. Sourcing included the healthcare system and physicians  | One of the first studies to indicate the transgression of IPED use from subcultural groups to mainstream populations                                                 | Study addressed a clearly focused issue. Appropriate design to answer the research question. Large representative sample. Results applicable to the local population                                                                                                                                                                                                          | Self-report measures. Unsatisfactory response rate, non-response may introduce selection bias                                                                                                                                                   |
| 73%           | Demographics, AAS use patterns, buying behaviour, positive effects and adverse effects of use, physical and psychiatric health history, drug use history and dietary practices                                                                                                                                            | The majority of respondents did not start using AAS before adulthood. AAS use was not motivated by athletic. Typical user profile was white, educated to a high standard, employed, approximately 30 years of age, above average income, did not play organised sports and whose use was motivated by the creation of a well-built physique      | Much of the existing research on AAS had focused on competitive sporting athletes. This study was one of the first to focus on recreational weight training athletes | Large sample of user participants from across the United States more representative than studies using small selective samples. In-depth survey despite large sample. Results displayed in figures and tables. This study was one of the first to profile the AAS user as a non-sporting professional, with drug use motivated by aesthetics rather than sporting performance | Online sampling may be subject to selection bias. Self-report measures may introduce recall bias                                                                                                                                                |



Table 2 (continued)

|    | Theme                                                                                                                                                | Year | Place     | Authors                                                                                                                                                    | Design                             | Data collection method                                                                            | Setting                  | Sample size |
|----|------------------------------------------------------------------------------------------------------------------------------------------------------|------|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|---------------------------------------------------------------------------------------------------|--------------------------|-------------|
| 13 | Anabolic steroid abuse among teenage girls: an illusory problem?                                                                                     | 2007 | USA       | Kanayama, G.,<br>Boynes, M.,<br>Hudson, J.I., Field,<br>A.E., Pope, H.G.,<br>Jr.                                                                           | Review of cross-sectional research | Questionnaires                                                                                    | National and high school | n/a         |
| 14 | Left ventricular early myocardial dysfunction after chronic misuse of anabolic androgenic steroids: a Doppler myocardial and strain imaging analysis | 2007 | Italy     | D'Andrea, A., Caso, P., Salerno, G., Scarafie, R., De Corato, G., Mita, C., Di Salvo, G., Severino, S., Cuomo, S., Liccardo, B., Esposito, N., Calabro, R. | Case-control                       | Standard Doppler echocardiography, Doppler myocardial imaging (DMI) and strain rate imaging (SRI) | Lab                      | 45          |
| 15 | Injecting risk behaviour and related harm among men who use performance- and image-enhancing drugs                                                   | 2008 | Australia | Larance, B., Degenhardt, L., Copeland, J. and Dillon, P.                                                                                                   | Cross-sectional                    | Interview                                                                                         | Needle exchange          | 60          |

| Response rate | Outcome measures                                                                   | Main findings                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Contribution                                                                                                                                                                                       | Strengths                                                                                                                                                                                                                                           | Weaknesses                                                                                                                                                                                |
|---------------|------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| n/a           | n/a                                                                                | This review of survey data in relation to use of AAS in teenage girls found survey findings to vary greatly, with lifetime prevalence of AAS use estimated between 0.1% and 7.3%. Upon examining surveys with high prevalence, phrasing of certain questions may have led to confusion over which type of steroids the survey referred to, leading to false positives and overestimation of prevalence                                                                                                                                                                                                                                                                                                                                           | This review of survey data raises methodological concerns with regard to surveys estimating prevalence of AAS use among teenage girls                                                              | Study addressed a clearly focused issue. Review of four large national surveys and several smaller surveys. Appropriate design to answer the research questions                                                                                     | Teenage girls may not be representative of the typical female AAS user. Cross-sectional design of surveys reviewed may limit generalisability                                             |
| n/a           | n/a                                                                                | Power athletes with long-term AAS use history, several years after cessation of use, showed subclinical impairment of both systolic and diastolic myocardial function, which was highly dose dependent                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | This study contributes evidence for cardiac dysfunction in AAS users, even several years after cessation of use                                                                                    | Addressed a clearly focused issue. Appropriate method used to investigate AAS-associated myocardial dysfunction in power athletes. Confirmed the validity of DMI and SRI as instruments to investigate cardiac damage in current and past AAS users | Generalisability of findings limited to power athletes. Cross sectional design cannot track participants to investigate later development of cardiac issues. Use of AAS was self reported |
|               | Demographics, patterns of use, injecting risk, health and information/help-seeking | Rates of needle sharing were low (5%), re-use of needles, injecting from a shared container, injecting other drugs of abuse, as well as injecting insulin injecting into small muscle groups were reported. Participants who reported being hepatitis C positive had lifetime heroin use and history of illicit drug injection. HIV-positive participants were gay/ bisexual males. Injuries and diseases reported included fevers, scarring and abscesses. 38% of participants were characterised as 'risky' injectors and were more likely to have early age of onset, use longer IPED cycles and report incidences of aggression than 'low risk' injectors. Participants sought IPED information from internet sites (62%) and friends (55%). | IPED injection is understudied due to difficulties in gaining access to IPED users willing to disclose details of their use. This study examines injecting risk behaviours and harms in IPED users | Study addresses focused issue. Appropriate design to ascertain prevalence and types of risk behaviours among IPED users                                                                                                                             | Small sample size. Generalisability limited as findings are limited to IPED users who access needle exchange services. This could introduce selection bias.                               |

Table 2 (continued)

|    | Theme                                                                                                                                                 | Year | Place  | Authors                                                                                      | Design          | Data collection method                                                                                               | Setting         | Sample size        |
|----|-------------------------------------------------------------------------------------------------------------------------------------------------------|------|--------|----------------------------------------------------------------------------------------------|-----------------|----------------------------------------------------------------------------------------------------------------------|-----------------|--------------------|
| 16 | Prevalence and risk factors for anabolic-androgenic steroid abuse among Jordanian collegiate students and athletes                                    | 2008 | Jordan | Tahtamouni, L.H., Mustafa, N.H., Alfaouri, A.A., Hassan, I.M., Abdalla, M.Y. and Yasin, S.R. | Cross-sectional | Questionnaire                                                                                                        | College and gym | 657                |
| 17 | Doping and effects of anabolic androgenic steroids on the heart: histological, ultrastructural, and echocardiographic assessment in strength athletes | 2009 | Egypt  | Hassan, N.A., Salem, M.F. and Sayed, M.A.                                                    | Case-control    | Two-dimensional, M-mode, tissue Doppler imaging (TDI) and strain rate imaging (SRI) and experimental study with rats | Lab             | 10 human, 30 anima |
| 18 | Oils of local application inside of the muscle: epidemiology of the use in bodybuilding                                                               | 2009 | Brazil | Azevedo, M.P.A., Ferreira, A.C.D. and Ferreira, U.M.G.                                       | Cross-sectional | Questionnaire                                                                                                        | Gym             | 533                |
| 19 | Human growth hormone abuse in male weightlifters                                                                                                      | 2010 | USA    | Brennan, B.P., Kanayama, G., Hudson, J.I. and Harrison, G.P.                                 | Case-control    | Questionnaire                                                                                                        | Gym             | 248                |

| Response rate | Outcome measures                                                                                                                      | Main findings                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Contribution                                                                                                                     | Strengths                                                                                                                                                                                                                            | Weaknesses                                                                                                                                                                    |
|---------------|---------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 100%          | Demographics, prevalence of AAS use and attitude towards AAS use                                                                      | 4.2% of college students were active AAS users and 26% of athletes. Mean age of AAS users was 19.9 in the college student group and 28.1 in the group of athletes. Almost one-third of students commenced AAS use prior to being 15 years old. More than half of the athletes commenced AAS use between 15 and 18 years. Sourcing was reported as being through friends and coaches. Motivation for use included athletic performance enhancement and improvement of appearance        | One of the first studies to investigate prevalence of AAS outside Western countries                                              | Study addressed a clearly focused issue. Appropriate design to answer the research question. Satisfactory response rate                                                                                                              | Self-report measures                                                                                                                                                          |
| n/a           | Structural functions and alterations of the heart                                                                                     | Results were that bodybuilders using steroids have smaller left ventricular dimension with thicker walls, impaired diastolic function as well as higher peak systolic strain rate                                                                                                                                                                                                                                                                                                      | The results of this study confirmed AAS use to be associated with multiple deleterious effects of the cardiac system             | Addressed a clearly focused issue. Appropriate method used to investigate AAS-associated myocardial dysfunction in bodybuilders. Findings echoed in experiment with rats                                                             | Cross-sectional design cannot track participants to investigate later development of cardiac issues. Use of AAS was self-reported                                             |
| n/a           | n/a                                                                                                                                   | 11% of bodybuilders surveyed were using some form of oil injection to boost the appearance of certain muscle groups. Typical users were in their twenties, male and with low income. Adverse effects suffered by participants included pain, fever, boils, tachycardia                                                                                                                                                                                                                 | Very little epidemiological studies exist on oil injection in bodybuilders. Adds to the limited literature base on oil injection | Study addressed a clearly focused issue. Appropriate method used to answer the research question. Adequate sample size. Methods of selection clearly described                                                                       | Cross-sectional design may limit generalisability. Regional sample, results may not be applicable to the local population. Self-report measures may be subject to recall bias |
| 93%           | Demographics, the structured clinical interview for DSM-IV, psychological rating scales, fat-free mass index (FFMI), drug use history | This study is part of a larger scale case-control study of American weightlifters which began in 2005. 27 (12%) used HGH or insulin-like growth factor-1 (IGF-1). All of these 27 men also used AAS and 22 (81%) met criteria for AAS dependence. Fifteen (56%) also disclosed current or past dependence on illicit drugs. There was a significant increase in hGH prevalence when compared with a similar study which the authors conducted in 2003, indicating a rise in popularity | This study contributes evidence to the limited epidemiological data on hGH users in the published literature                     | Study addressed a clearly focused issue. Study design appropriate for assessing hGH use in AAS using male weightlifters. Methods were designed to reduce selection bias, as participants were not informed of the focus of the study | Self-report measures which may introduce recall bias                                                                                                                          |

Table 2 (continued)

|    | Theme                                                                                              | Year | Place   | Authors                                                                  | Design          | Data collection method | Setting      | Sample size |
|----|----------------------------------------------------------------------------------------------------|------|---------|--------------------------------------------------------------------------|-----------------|------------------------|--------------|-------------|
| 20 | Body image disturbance in 1000 male appearance and performance-enhancing drug users                | 2010 | USA     | Hildebrandt, T., Alfano, L. and Langenbucher, J.W.                       | Cross-sectional | Questionnaire          | Online       | 1493        |
| 21 | Women and anabolic steroids: an analysis of a dozen users                                          | 2010 | USA     | Ip, E.J., Barnett, M.J., Tenerowicz, M.J. and Perry, P.J.                | Cross-sectional | Questionnaire          | Online       | 1277        |
| 22 | Use of dietary supplements and anabolic-androgenic steroids among Finnish adolescents in 1991–2005 | 2010 | Finland | Mattila, V.M., Parkkari, J., Laakso, L., Pihlajamaki, H. and Rimpela, A. | Cross-sectional | Questionnaire          | The military | 10,829      |

| Response rate | Outcome measures                                                                                                                                                                           | Main findings                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Contribution                                                                                                                                                                  | Strengths                                                                                                                                                          | Weaknesses                                                                                                                                                                                                                                                                                                                                   |
|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 67%           | Muscle Dysmorphic Disorder Inventory (MDDI), Situational Inventory of Body Image Dysphoria (SIBID-SF), Multidimensional Body-Self Relations Questionnaire (MBSRQ)                          | 94% used AAS, with testosterone the most popularly used AAS (90.3%). 85.3% reported use of fat burning agents. 27.9% reported use of illicit thermogenics such as clenbuterol. 3.1% reported use of insulin growth factor (IGF-1) with 6.1% using human growth hormone (hGH). Median number of cycles undertaken was 2. Median AAS weekly dosage was 1000–1250 mg. Model interpretation found that body image disturbance was heterogeneous and dependent on differing body ideals (leanness, size) within users. Bodybuilders had the most body image disturbance, with powerlifters less affected | Few studies have focused on the heterogeneous nature of body image disturbance within subgroups of AAS users                                                                  | Study addressed a clearly focused issue. Appropriate design to answer the research question. Methods of selection clearly described. Satisfactory response rate    | Online sample selection may introduce bias. Unable to tell whether sample is representative due to the nature of the internet as a research setting. Self-report measures may introduce recall bias                                                                                                                                          |
|               | Demographics, use of AAS and other performance-enhancing agents, alcohol and illicit drug use, substance dependence disorder, DSM-IV criteria, and history of sexual and/or physical abuse | 12 of 1277 respondents were female AAS users (230 women were non users). They reported polysubstance using with an average of 8.8 performance enhancing agents. Female AAS users were more likely to have met criteria for substance-dependence disorder than female non-users and male AAS users and non-users (58.3%). 50% diagnosed with a psychiatric illness and 41.7% reported a history of sexual abuse                                                                                                                                                                                      | This study contributes evidence for female use of AAS which is underresearched due to low prevalence. Study shows high incidence of mental disturbance among female AAS users | Study addressed a clearly focused issue in an underresearched area. Appropriate method used to answer the research question. Method of selection clearly described | Small sample size of female AAS users. Online recruitment and cross-sectional design may introduce sampling bias and limit generalisability                                                                                                                                                                                                  |
| 96%           | Demographics, socioeconomic variables, use of AAS                                                                                                                                          | 0.9% of sample reported AAS use. 0.3% reported that they would use AAS if they had access to them. AAS use was associated with weight training more than three times a week, low educational status and alcohol use. Sports other than weight training were not associated with AAS use                                                                                                                                                                                                                                                                                                             | Exact prevalence of AAS use is unknown. This study aimed to estimate the prevalence of AAS use among young Finnish males                                                      | Study addressed a clearly focused issue. Study design appropriate for answering the research question. Method of selection clearly described. Large sample         | Those exempted from duty in the military service due to health reasons and those who chose to enter the civilian service were not surveyed. There is a possibility conscripts felt pressure not to disclose AAS use. As the original purpose of the survey was not to explore AAS use, type, dosages and cycle details were not investigated |

Table 2 (continued)

|    | Theme                                                                                                                        | Year | Place     | Authors                                                             | Design          | Data collection method | Setting                | Sample size |
|----|------------------------------------------------------------------------------------------------------------------------------|------|-----------|---------------------------------------------------------------------|-----------------|------------------------|------------------------|-------------|
| 23 | Substance abusers' motives for using anabolic androgenic steroids                                                            | 2010 | Sweden    | Petersson, A., Bengtsson, J., Voltaire-Carlsson, A. and Thiblin, I. | Cross-sectional | Questionnaire          | Substance abuse centre | 175         |
| 24 | Sport, and use of anabolic androgenic steroids among Icelandic high school students: a critical test of three perspectives   | 2010 | Iceland   | Thorlindsson, T. and Halldorsson, V.                                | Cross-sectional | Questionnaire          | High schools           | 11,031      |
| 25 | The epidemiology of anabolic-androgenic steroid use among Australian secondary school students                               | 2011 | Australia | Dunn, M. and White, V.                                              | Cross-sectional | Questionnaire          | Secondary schools      | 22,830      |
| 26 | The Anabolic 500 survey: characteristics of male users versus nonusers of anabolic-androgenic steroids for strength training | 2011 | USA       | Ip, E.J., Barnett, M.J., Tenerowicz, M.J. and Perry, P.J.           | Cross-sectional | Questionnaire          | Online                 | 1277        |

| Response rate | Outcome measures                                                                                                                                                                           | Main findings                                                                                                                                                                                                                                                                                                                                                                                                                 | Contribution                                                                                                                                                                                                                          | Strengths                                                                                                                                                                                | Weaknesses                                                                                                                                                                                                                                                                                                                                                                                      |
|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| n/a           | Age of onset of AAS use, total amount of time spent using AAS, number of AAS cycles, motivators for use                                                                                    | 11% reported using AAS. Motives for use included aesthetics, strength and performance enhancement. Also reported as motivators for use were concealing illicit drug use, to improve self-confidence, to boost courage or to assist in committing crimes. Side effects experienced included negative mental effects such as depression                                                                                         | Previous studies have suggested a link between use of AAS and illicit drugs. This study examines motivators for AAS use in people attending a substance abuse centre                                                                  | Study addressed a clearly focused issue. Study design appropriate for answering the research question Method of selection clearly described                                              | Moderate sample size. Generalisability limited as findings are limited to AAS users who access substance abuse centres. This could introduce selection bias                                                                                                                                                                                                                                     |
| n/a           | Use of AAS, engagement in sports, illicit drug use                                                                                                                                         | Prevalence was found to be 0.9%. Use of AAS was not significantly associated with engagement in competitive sports, but is positively associated with recreational fitness training. A strong link between AAS use and illicit drug use was found as well as a moderate association between AAS and tobacco smoking                                                                                                           | This study contributes evidence for use of AAS outside sporting cohorts in a high school sample                                                                                                                                       | Study addressed a clearly focused issue. Appropriate design to answer the research question. Large representative sample                                                                 | Self-report measures                                                                                                                                                                                                                                                                                                                                                                            |
| 76%           | Lifetime and recent use of steroids as well as use of other substances including tobacco and alcohol                                                                                       | Low-level AAS use was found among students: 2.4% – with use more common among 12- to 15-year olds than 16- to 17-year olds. More likely to use AAS were males, those who spoke a language other than English at home, absence from school, self-stated low-level scholastic ability. AAS users reported using other substances also which suggests use of AAS as part of polydrug experimentation                             | High prevalence of AAS use has been documented in previous studies examining secondary school students in other countries. This study addressed the gap in research documenting prevalence of AAS use in Australian secondary schools | Study addressed a clearly focused issue. Large sample size. Appropriate study design to answer the research question. Satisfactory response rate. Methods of selection clearly described | Sample may not be representative of the typical AAS user commencing AAS use in their mid twenties (Pope <i>et al.</i> 2014a,b). This may lead to underestimations of prevalence. Not all students were present for questionnaire, and absentee students are more likely to use AAS according to the results of this survey. Use of school age sample is more likely to produce false positives. |
|               | Demographics, use of AAS and other performance-enhancing agents, alcohol and illicit drug use, substance dependence disorder, DSM-IV criteria, and history of sexual and/or physical abuse | 506 of 1277 respondents reported using AAS. 70.4% of the AAS users strength trained recreationally and used an average of 11.1 agents in a performance-enhancing drug regimen. 23% of the AAS users met DSM criteria for substance dependence disorder, 10.1% met criteria for an anxiety, 11.3% used cocaine within the past 12 months 6.1% reported a history of sexual abuse, all higher percentages than in non-AAS users | This study contributed evidence for associations with AAS use and substance abuse disorder, anxiety disorder and polysubstance use by contrasting results with non-AAS users                                                          | Study addressed a clearly focused issue. Method of selection clearly described. Large sample                                                                                             | Cross-sectional design may limit generalisability. Online recruitment may have introduced sampling bias and be non-representative.                                                                                                                                                                                                                                                              |



Table 2 (continued)

|    | Theme                                                                                                                         | Year | Place   | Authors                                                                                       | Design          | Data collection method                     | Setting                           | Sample size |
|----|-------------------------------------------------------------------------------------------------------------------------------|------|---------|-----------------------------------------------------------------------------------------------|-----------------|--------------------------------------------|-----------------------------------|-------------|
| 27 | Anabolic androgenic steroids in the general population: user characteristics and associations with substance use              | 2012 | Sweden  | Hakansson, A., Mickelsson, K., Wallin, C. and Berglund, M.                                    | Cross-sectional | Questionnaire                              | National survey                   | 22,095      |
| 28 | Evaluating a measure of tanning abuse and dependence                                                                          | 2012 | USA     | Hillhouse, J.J., Baker, M., Turrisi, R., Shield, A., Stapleton, J., Jain, S. and Longacre, I. | Longitudinal    | Questionnaire                              | College campus                    | 360         |
| 29 | Are people who inject performance and image-enhancing drugs an increasing population of Needle and Syringe Program attendees? | 2012 | Denmark | Iversen, J., Topp, L., Wand, H. and Maher, L.                                                 | Cross-sectional | Questionnaire                              | Needle exchange                   | 2395        |
| 30 | Anabolic androgenic steroids in police cases in Sweden 1999-2009                                                              | 2012 | Sweden  | Lood, Y., Eklund, A., Garle, M. and Ahlner, J.                                                | Cross-sectional | Analysis of forensic toxicological results | Department of Forensic Toxicology | 12, 141     |

| Response rate | Outcome measures                                                                                                                                                                            | Main findings                                                                                                                                                                                                                                                                                                                                                                                                               | Contribution                                                                                                                                                            | Strengths                                                                                                                                                                                                                         | Weaknesses                                                                                                                                                                                                  |
|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 38%           | Demographics, income, substance use, education, physical exercise, general health                                                                                                           | 1.7% of males and 0.3% of females reported lifetime use of AAS. Illicit drug use, use of prescription drugs, physical training and lower education were associated with AAS use of other drugs (illicit and prescription) separated those who had used AAS from those who had been offered to use but chose not to. No associations with alcohol use                                                                        | Little is known about AAS use in the general population in Sweden. Data taken from a national survey sought to address this gap in the literature                       | Study addressed a clearly focused issue. Large representative sample. Methods of selection clearly described                                                                                                                      | Unsatisfactory response rate (38%), selection bias introduced through oversampling with risk groups for substance use, no control for criminal behaviour which has been found to be associated with AAS use |
| 90%           | The Structured Interview for Tanning Abuse and Dependence (SITAD), Indoor Tanning (IT) Behavioural Patterns, IT Behaviour, Opiate like reactions to tanning, Abuse and Dependence The SITAD | 32 out of 296 participants (10.8%) met SITAD criteria for tanning dependence. Tanning-dependent participants used indoor tanning facilities ten times more frequently than other participants. Dependent tanners scored higher on the opiate-like reactions to tanning than other participants                                                                                                                              | First study to use the SITAD to assess tanning dependence                                                                                                               | Study addressed a clearly focused issue. Appropriate study design to answer the research question. Methods of selection clearly described. Satisfactory response rate                                                             | Sample taken from college students, may not be representative                                                                                                                                               |
| 41%           | Demographics, IPED use, lifetime imprisonment, HIV/HCV screening, language spoken at home, needle sourcing, injecting behaviours                                                            | Prevalence of IPED injection was low at 1–2% of needle exchange attendees over a period of 10 years (2000–2010). However, this increased to 4.6% in 2011. People who recently injected IPEDs were more likely to be heterosexual males, younger than 25 years, source their needles from needle exchanges and to report no sharing of needles. No IPEDS injectors tested HIV positive with few testing HCV positive         | These survey results contribute evidence for an increase in IPED use in Australia which had been anecdotally described by needle exchange providers prior to the survey | Study addressed a clearly focused issue. Appropriate design to answer the research question. Large sample. Participants were asked to provide a blood sample for testing to determine IPED use and presence of HIV/HCV antibodies | Limited to IPED users who accessed needle exchange services. Self-report measures may introduce recall bias. Cross-sectional design may limit generalisability                                              |
| n/a           | AAS use, age and gender of the users, type of AAS used and the concentration levels determined, use of illicit and licit drugs                                                              | 12,141 urine samples (6362 police cases and 5779 inmates) were analysed in this study. 33.5% of police cases and 11.5% of inmates tested positive for AAS. 99.2% of AAS users were men with an average age of 26.2. Nandrolone was the most popularly used AAS followed by testosterone and methandienone. 60% of the cases from the police tested positive for illicit drugs, indicating polysubstance use among AAS users | There are limited data on correlates of AAS use outside elite athleticism. This study aims to investigate types of AAS use among arrestees in Sweden                    | Study addressed a clearly focused issue. Study design appropriate for answering the research question. Method of selection clearly described. Large sample of urine tests                                                         | Cases were only tested for AAS if a police officer suspected they were using through observation of their physique and behaviours                                                                           |

Table 2 (continued)

|    | Theme                                                                                                                                                      | Year | Place          | Authors                                                                                                     | Design          | Data collection method                 | Setting           | Sample size |
|----|------------------------------------------------------------------------------------------------------------------------------------------------------------|------|----------------|-------------------------------------------------------------------------------------------------------------|-----------------|----------------------------------------|-------------------|-------------|
| 31 | Steroids and Image Enhancing Drugs 2013 Survey Results                                                                                                     | 2013 | UK and Ireland | Chandler, M. and McVeigh, J.                                                                                | Cross-sectional | Questionnaire and follow-up interviews | Online            | 109         |
| 32 | Prevalence of, and risk factors for, HIV, hepatitis B and C infections among men who inject image and performance enhancing drugs: a cross-sectional study | 2013 | UK             | Hope, V.D., McVeigh, J., Maronglu, A., Evans-Brown, M., Smith, J., Kimergård, A., Parry, J.V. and Ncube, F. | Cross-sectional | Questionnaire                          | Needle exchange   | 400         |
| 3  | Monitoring the Future national results on drug use: 2012 Overview, Key Findings on Adolescent Drug Use.                                                    | 2013 | USA            | Johnston, L.D., O'Malley, P.M., Bachman, J.G. and Schulenberg, J.E.                                         | Longitudinal    | Questionnaire                          | Secondary schools | 45,400      |

| Response rate | Outcome measures                                                                                                                                                                      | Main findings                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Contribution                                                                                                                    | Strengths                                                                                                                                                                                                               | Weaknesses                                                                                                                                                                          |
|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 93%           | Age of first use, types of SIEDs used, length of cycles, use of alcohol and psychoactive drugs, sharing and reusing of needles, bloodborne viruses (BBV), adverse effects experienced | First onset of use for the majority of participants was 18-29, with one-third beginning their first cycle before the age of 24. 79.8% (n = 94) reporting ever using injectable AAS. Extensive polypharming with IPEDs such as hGH and peptides was noted. A small number reported longer cycles than the recommended 8 weeks, such as blast and cruise, a cycle of continuous use. 78.7% reported having ever used illicit drugs. Needles were sourced in bulk from needle exchange or online. Few incidences of adverse effect                                                 | Prevalence of self-directed IPED use in the UK is unknown. This study contributes data on IPED use in the scientific literature | Study addressed a clearly focused issue. Study design appropriate for investigating characteristics of IPED use. Follow-up telephone interview which allowed for richer data collection than a survey alone             | Small sample. Potential for selection bias as online survey link was advertised on IPED websites as well as weighttraining websites. Self-report measures may introduce recall bias |
| 98.75         | Anti-HIV, anti-HBc and anti-HCV positivity, equipment sharing, condom use, age, drug use, sexual practice and health services use                                                     | All male participants. 36% of participants had used IPEDs for less than 5 years. Anabolic steroids were injected by 86%. 32% injected growth hormone. 88% injected intramuscularly and 39% subcutaneously. Oral use of IPEDs was reported by two-thirds. Recent polypharming with illicit drugs was common (46% cocaine, 12% amphetamine), 5% had ever injected a psychoactive drug and 9% had shared injecting equipment. Risky sexual practice was also reported. 1.5% had HIV, 9% had antibodies to the hepatitis B core antigen (anti-HBc) and 5% to hepatitis C (anti-HCV) | First study to find HIV antibodies in IPED users                                                                                | The largest study investigating bloodborne virus in IPED users. Study addressed a clearly focused issue. Appropriate research design to answer the research question. Representative sample. Satisfactory response rate | Limited to IPED users who accessed needle exchange services, may have introduced selection bias                                                                                     |
| n/a           | Usage levels, perceived risk, disapproval, perceived availability                                                                                                                     | In 2012, annual prevalence rates for male use of AAS were 0.8%, 1.3% and 1.7% in grades 8, 10 and 12, compared with 0.3%, 0.4% and 0.7% for females, a slight drop from previous years. AAS were perceived as quite risky with 60% of respondents rating them high risk. Disapproval was quite high among respondents. Availability has declined                                                                                                                                                                                                                                | These survey results contribute evidence for low level AAS use among U.S. secondary school students                             | Study addressed a clearly focused issue. Appropriate design to answer the research question. Longitudinal design with a large national sample across 395 schools                                                        | Secondary school setting may not be representative of the typical AAS user and may introduce false positives. Self-report measures may introduce recall bias                        |

Table 2 (continued)

|    | Theme                                                                                                                                                                | Year | Place           | Authors                                                                                                                                                   | Design        | Data collection method                                                         | Setting                   | Sample size |
|----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|--------------------------------------------------------------------------------|---------------------------|-------------|
| 34 | A retrospective 30-year follow-up study of former Swedish-elite male athletes in power sports with a past anabolic androgenic steroids use: a focus on mental health | 2013 | Sweden          | Lindqvist, A.S., Moberg, T., Eriksson, B.O., Ehrnberg, C., Rosén, T. and Fahlke, C.                                                                       | Retrospective | Questionnaire                                                                  | Power sports              | 683         |
| 35 | Anabolic androgenic steroid use is associated with ventricular dysfunction on cardiac MRI in strength trained athletes                                               | 2013 | The Netherlands | Luijckx, T., Velthuis, B.K., Backx, F. G. J., Buckens, C., Prakken, N., Rienks, R., Mali, W. and Cramer, M.J.                                             | Case-control  | Cardiac magnetic resonance                                                     | Laboratory                | 156         |
| 36 | Predictors of Anabolic-Androgenic Steroid Usage                                                                                                                      | 2013 | USA             | Noone, J. and Blanchette, C.M.                                                                                                                            | Longitudinal  | The 1994 National Longitudinal Study of Adolescent Health                      | High schools              | 3028        |
| 37 | Long-Term Anabolic Androgenic Steroid Use Is Associated with Increased Atrial Electromechanical Delay in Male Bodybuilders                                           | 2014 | Turkey          | Akçakoyun, M., Alizade, E., Gündo, R., Bulut, M., Mustafa Tabak, M., Açar, G., Avci, A., Zeki S., Fidan, S., Demir, S., Kargın, R. and Yunus Emiroglu, M. | Case-control  | Questionnaire, physical examination, laboratory tests, echocardiographic tests | Lab                       | 33          |
| 38 | Examining the Profile and Perspectives of Individuals Attending Harm Reduction Services who are Users of Performance and Image enhancing Drugs                       | 2014 | Ireland         | Merchants Quay Ireland, Homeless & Drugs Service                                                                                                          | Mixed method  | Questionnaire                                                                  | Homeless and drug service | 89          |

| Response rate | Outcome measures                                                                                                                                                                                                        | Main findings                                                                                                                                                                                                                                                                                                                                                                                                                                               | Contribution                                                                                                                                                                                                                       | Strengths                                                                                                                                                                                               | Weaknesses                                                                                                                                                                               |
|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 68.60%        | Demographics, AAS use, engagement in sporting activity past and present, mental health issues, past and present substance use                                                                                           | At least 20% of participants (power sports athletes) disclosed past AAS use. AAS users were more likely to have sought professional help for mental health issues and use illicit drugs than non-users                                                                                                                                                                                                                                                      | There is limited knowledge on the long-term effects of AAS use. This study investigates power sports athletes 30 years after engagement in sporting activity and AAS use to examine any mental health effects                      | Study addressed a clearly focused issue. Study design appropriate for answering the research question. Method of selection clearly described. Large representative samples                              | Time lapsed between seeking professional help for mental health issues and AAS use is unknown. Findings limited to men. Cross-sectional design may limit generalisability                |
| n/a           | n/a                                                                                                                                                                                                                     | Strength athletes using AAS show significantly different cardiac dimensions and function when compared with strength athletes who don't use, and non-strength athletes                                                                                                                                                                                                                                                                                      | There is disagreement in the literature on possible cardiac adaptation to strength training and the role of AAS in this. This study seeks to investigate the effects of AAS use and strength training on the cardiovascular system | Study addressed a clearly focused issue. Study design appropriate for answering the research question. Case and controls recruited in an acceptable way. Results are applicable to the local population | Cross-sectional design cannot determine long-term cardiac changes in participants. Participants self-reported AAS use                                                                    |
| n/a           | n/a                                                                                                                                                                                                                     | Mean age of participants was 15. Notable risk factors included: coming from a two-parent household, drinking and driving, intention to participate in comlosive wrestling, and having difficulties with peers at school (Protective factors included: being underweight and a good maternal relationship                                                                                                                                                    | One of the only studies to assess risk factors of AAS use using longitudinal data. Drink driving was the only variable found to be significantly associated with AAS use                                                           | Study addressed a clearly focused issue. Appropriate method for addressing the research question. Longitudinal design. Large sample. Method of selection clearly described                              | n/a                                                                                                                                                                                      |
| n/a           | Medical history, drug use history, urine testing, height, weight, body mass index (BMI) (kg/m <sup>2</sup> ), body surface area (BSA) (m <sup>2</sup> ), heart rate, and blood pressure, echocardiographic measurements | Inter-AEMD and Intra-AEMD, which are associated with arrhythmias, were significantly increased in the AAS using participants compared with non-users, although no arrhythmias were observed                                                                                                                                                                                                                                                                 | Study contributes evidence for arrhythmic cardiac events in AAS users                                                                                                                                                              | Study addressed a clearly focused issue. Appropriate method used to answer the research question. Methods of selection clearly described                                                                | Small sample size. Unable to follow up on participants' future cardiac events. May be subject to selection bias                                                                          |
| n/a           | Demographics, motivators for use, IPED history, type of IPED use, patterns of use, training and exercise programme, injecting practice, BBV prevalence                                                                  | All participants were male with average age 27. Motivators for IPED use included to look good and increase muscle mass. Polypharming with Clenbuterol and other ancillary IPEDs, as well as illicit drugs was reported by participants. 85% reported training at least four times per week. Majority of injectors has learned to inject from peers and injected intramuscularly. No reports of positive HIV status. 4.6% reported positive status for Hep C | One of the first studies to investigate IPED use in an Irish context                                                                                                                                                               | Study addressed a clearly focused issue. Appropriate method used to answer the research question. Methods of selection clearly described                                                                | Generalisability of findings is limited to those who accessed drug services and may not be representative of the typical IPED user. Self-report measures may have introduced recall bias |

Table 2 (continued)

|    | Theme                                                                                                           | Year | Place   | Authors                                                                         | Design          | Data collection method | Setting         | Sample size |
|----|-----------------------------------------------------------------------------------------------------------------|------|---------|---------------------------------------------------------------------------------|-----------------|------------------------|-----------------|-------------|
| 39 | Characteristics and Behaviors of Older Male Anabolic Steroid Users                                              | 2014 | USA     | Ip, E.J., Barnett, M.J., Tenerowicz, M.J. and Perry, P.J.                       | Cross-sectional | Questionnaire          | Online          | 1277        |
| 40 | Melanotan Injecting Survey Results                                                                              | 2014 | Ireland | Irish Needle Exchange Forum                                                     | Cross-sectional | Questionnaire          | Needle exchange | 17          |
| 41 | Anabolic-androgenic steroid use among Brazilian bodybuilders                                                    | 2014 | Brazil  | Nogueira, F.R., Brito Ade, F., Oliveira, C.V., Vieira, T.J. and Gouveia, R.L.   | Cross-sectional | Questionnaire          | Gym             | 510         |
| 42 | Association between AAS use, muscle dysmorphia and illicit drug use among gym frequenters                       | 2014 | Brazil  | Pipet, S., Halpern, R., Woody, G.E. and Szobot, C.                              | Cross-sectional | Questionnaire          | Gym             | 278         |
| 43 | The lifetime prevalence of anabolic-androgenic steroid use and dependence in Americans: current best estimates. | 2014 | USA     | Pope, H.G. Jr., Kanayama, G., Athey, A., Ryan, E., Hudson, J.I. and Baggish, A. | Meta-analysis   | Literature search      | Various         | n/a         |

| Response rate | Outcome measures                                                                                                                                                                           | Main findings                                                                                                                                                                                                                                                                                                                                                                                                                      | Contribution                                                                                                                                                        | Strengths                                                                                                                                                                              | Weaknesses                                                                                                                                          |
|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
|               | Demographics, use of AAS and other performance-enhancing agents, alcohol and illicit drug use, substance dependence disorder, DSM-IV criteria, and history of sexual and/or physical abuse | 67 of 1277 respondents were AAS users over 40 years old. 92.5% of AAS users over 40 years old were Caucasian. 97% were heterosexual and 79.1% strength trained recreationally. On average, over 40 AAS users took 11.5 performance-enhancing agents. 47.8% were reported binge drinking with 21% disclosing heavy alcohol use. 27.4% met criteria for substance dependence disorder and 12% reported an anxiety disorder diagnosis | This study contributed evidence for polysubstance use, binge drinking and mental disorder among AAS users over 40                                                   | Study addressed a clearly focused issue. Appropriate design to answer the research question. Satisfactory sample size. Method of selection clearly described                           | Online setting and cross-sectional design may introduce sampling bias                                                                               |
| n/a           | Gender, region of needle exchange service accessed, negative effects experienced, motives for use, awareness of sourcing routes                                                            | Of 17 respondents, 4 were male and 13 were female. The majority of respondents accessed a traveller-specific service. Effects disclosed were pigmentation of skin, nausea and skin flushing. Motivation for use included to avoid sunbeds, and because melanotan was cheaper than sunbeds                                                                                                                                          | First survey conducted in Ireland investigating use of melanotan                                                                                                    | Appropriate design to answer the research question                                                                                                                                     | Small sample. Five questions in questionnaire. Sampling bias introduced limited to needle exchange service users                                    |
| 89.77%        | Gender, age, education, family income, marital status, training regime, substance used, duration of use, sourcing, motivation for use, consumption guidance, and possible adverse effects  | 20.6% used AAS; 98.1% of these were male, with little education (46.7%), with a training history longer than 4 years (49.5%). AAS use was associated with dietary supplement use. Most popularly used AAS were Deca-Durabolin, Winstrol and Sustanon                                                                                                                                                                               | This paper contributes evidence for prevalence of AAS use and socioeconomic profile of users in the city of Jo'ao Pessoa                                            | Study addressed a clearly focused issue. Appropriate method for addressing the research question. Method of selection clearly described                                                | Convenience sample. The questionnaire utilised was not previously validated                                                                         |
| n/a           | AAS use, illicit drug use, demographics, muscle dysmorphia                                                                                                                                 | 9.7% of sample had AAS use. AAS use was associated with negative body image with illicit drug use such as marijuana and cocaine use                                                                                                                                                                                                                                                                                                | This study contributes evidence for the occurrence of non-health conscious behaviours in IPED users, who have been said to be motivated by health in their IPED use | Study addresses a clearly focused issue. Appropriate design to answer the research question                                                                                            | Self-report measures. Results may not be applicable to the local population                                                                         |
| n/a           | AAS use, age of onset, demographics, AAS dependence                                                                                                                                        | Extrapolated from data pooled from nine and ten studies, AAS use typically begins after the age of 20. 2.9–4.0 million U.S. citizens have used AAS. Approximately 1 million may have AAS dependence                                                                                                                                                                                                                                | This study is unique in pooling data from several surveys to determine various characteristics of AAS use                                                           | Study addressed a clearly focused issue. Appropriate design to answer the research question. Consistent findings across all studies pooled. Results applicable to the local population | Vulnerable to selection bias in the studies pooled. Youth-survey datasets are likely to include false-positive responses leading to overestimations |



Table 2 (continued)

|    | Theme                                                                                                    | Year | Place  | Authors                                                                          | Design                                     | Data collection method | Setting     | Sample size |
|----|----------------------------------------------------------------------------------------------------------|------|--------|----------------------------------------------------------------------------------|--------------------------------------------|------------------------|-------------|-------------|
| 44 | The global epidemiology of anabolic-androgenic steroid use: a meta-analysis and meta-regression analysis | 2014 | Norway | Sagoe, D., Molde, H., Andreassen, C. S., Torsheim, T. and Pallesen, S.           | Meta-analysis and meta-regression analysis | Literature search      | Various     | n/a         |
| 45 | Attitudes towards use of anabolic-androgenic steroids among Ghanaian high school students                | 2015 | Norway | Sagoe, D., Torsheim, T., Molde, H., Andreassen, C.S. and Pallesen, S.            | Cross-sectional                            | Questionnaire          | High school | 2683        |
| 46 | Anabolic-androgenic steroid use in the Nordic countries: a meta-analysis and meta-regression analysis    | 2015 | Norway | Sagoe, D., Torsheim, T., Molde, H., Schou, C., Andreassen, C.S. and Pallesen, S. | Meta-analysis and meta-regression          | Literature search      | Various     | n/a         |

ing to the review questions, and 'tell the story' of findings (Popay *et al.* 2006).

Findings from studies reviewed were therefore analysed under headings derived from the review questions 'Extent of Use', 'User Profile', 'Motivators for Use', 'User Sourcing', 'Patterns of Use', 'Health Risks and Consequences' and 'Perceptions of Health Risk in IPED Users'.

## Results

### Extent of use

Forty-two out of sixty-one quantitative and qualitative studies reviewed (see Tables 8 and 9) concern AAS, which is the most commonly used IPED (Pope *et al.* 2014b). While previous indications were that AAS use was largely a Western trend (Kanayama

*et al.* 2012), with prevalence estimates typically high in the United States (Pope *et al.* 2014a), Australia (Dunn & White 2011), across Europe (Mattila *et al.* 2010, Hakansson *et al.* 2012) particularly in the Nordic countries (Sagoe *et al.* 2015a) and in the United Kingdom (Chandler & McVeigh 2013), recent studies have indicated high prevalence in the Middle East, South America (Sagoe *et al.* 2014a) and Ghana (Sagoe *et al.* 2015b), suggesting that AAS use is a global and cross cultural/ethnicities phenomenon.

Due to the extensive polypharming with AAS documented in previous quantitative studies (Perry *et al.* 2005, Baker *et al.* 2006, Chandler & McVeigh 2013, Jennings *et al.* 2014), use of AAS is a predictor for use of other IPEDs. Findings from these studies indicate that some users may initiate their IPED pathway with use of AAS, introducing additional agents on an IPED use continuum.

| Response rate | Outcome measures                                                          | Main findings                                                                                                                                                                                                                                                                                    | Contribution                                                                                 | Strengths                                                                                                                                                                                                                                           | Weaknesses                                                                                                                                                                                                                |
|---------------|---------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| n/a           | n/a                                                                       | Global prevalence rate for AAS use 3.3%: males 6.4% and females 1.6% AAS use was associated with athletic samples, studies which used interviews and questionnaires as methods, and male samples. High prevalence of AAS use was indicated in non-Western countries as well as Western countries | This study is the first meta-analysis of the global lifetime prevalence rate of AAS use      | Study addressed a clearly focused issue. Appropriate design to answer the research question. Method of selection clearly described. Large number of studies used. Study presents the best estimates for AAS prevalence available due to its methods | Potential for overestimations in studies used with high school samples. Lifetime prevalence is always higher than current prevalence. Self-report measures in many studies used. Lack of studies in non-Western countries |
| 96.8%         | Demographics, participation in sports, AAS use, attitudes towards AAS use | Prevalence of AAS use was 3.8% (males = 4.9%, females = 3.1%). 18.5% knew someone that had used AAS 6.0% had been offered AAS before but could not name the AAS type. AAS use and intent to use was associated with being male, a teenager, an athlete and participation in ball games           | This study contributes evidence for high prevalence of AAS use in non-Western countries      | Study addressed a clearly focused issue. Appropriate design to answer the research question. Satisfactory sample size. Method of selection clearly described. Large sample. High response rate                                                      | Use of high school sample may produce false positives which can lead to overestimations. The five schools used were all located in central Ghana, limiting generalisability of findings. Self-report measures             |
| n/a           |                                                                           | Overall lifetime prevalence was 2.1% with males having 2.9% lifetime prevalence rate, females 0.2%. Sweden had the highest lifetime prevalence rate at 4.4%, followed by Norway: 2.4%, Finland: 0.8%, Iceland: 0.7% and Denmark: 0.5%.                                                           | First study to conduct a meta-analysis of lifetime prevalence of AAS use in Nordic countries | Study addressed a clearly focused issue. Appropriate design to answer the research question. Method of selection clearly described. Large number of studies used. Study presents the best estimates for AAS prevalence available due to its methods | Findings are subject to the limitations of the studies used, including self-report measures. Lifetime prevalence is always higher than current prevalence                                                                 |

In line with this view, studies investigating the prevalence of hGH, synthol (oil injection) and tanning peptide melanotan have been conducted in subsets of AAS users (Evans 1997, Azevedo *et al.* 2009, Brennan *et al.* 2010, Chandler & McVeigh 2013, Hope *et al.* 2013, Nogueira *et al.* 2014) with varying results. Studies yielding the highest prevalence rates for AAS, hGH and synthol injection have used gym and fitness centre settings (Evans 1997, Striegel *et al.* 2006, Azevedo *et al.* 2009, Brennan *et al.* 2010, Lindqvist *et al.* 2012, Pipet *et al.* 2014) indicating that weightlifters are the primary user group of IPED.

Data from needle exchanges indicate a rise in presentations of IPED users sourcing needles over the past decade (McVeigh *et al.* 2003, Larance *et al.* 2008, Evans-Brown *et al.* 2009, Iversen *et al.* 2012). Documentation of hGH and testosterone use as anti-ageing or well-being drugs is restricted to editorials (Drazen

2003, Olshansky & Perls 2008). Similarly with unregulated online sourcing of Botox and dermal filler injectables, widespread availability has been indicated by reports (Pickett & Mewies 2008, Pickett 2011, Coleman & Zilinskas, 2013) with a dearth of field studies estimating prevalence of use.

#### User profile

##### Gender

Use of AAS is largely found to be in males (Kanayama *et al.* 2007, Thorlindsson & Halldorsson 2010, Pope *et al.* 2014a) which has meant that use of AAS and hGH in women has been understudied. Anecdotal evidence of rising IPED use among women can be seen in Jespersen's recent observational study of a Danish bodybuilding website, where women posted in a discussion forum seeking advice on a wide range of IPED

**Table 3** Qualitative studies

|   | Theme                                                                                                                            | Year | Place     | Authors                                         | Design          | Data collections method                                     | Setting                                   | Sample size |
|---|----------------------------------------------------------------------------------------------------------------------------------|------|-----------|-------------------------------------------------|-----------------|-------------------------------------------------------------|-------------------------------------------|-------------|
| 1 | Social capital: implications from an investigation of illegal anabolic steroid networks                                          | 2007 | Australia | Maycock, B.R. and Howat, P.                     | Longitudinal    | Observation and in-depth interviews                         | Gym, nightclub, café, participants' homes | 147         |
| 2 | Getting huge, getting ripped: a qualitative exploration of recreational steroid use                                              | 2008 | USA       | Petrocelli, M., Oberweis, T. and Petrocelli, J. | Longitudinal    | Semi-structured interviews and snowball sampling techniques | Hardcore gym                              | 37          |
| 3 | Performance-Enhancing Drugs on the Web: A Growing Public-Health Issue                                                            | 2010 | USA       | Brennan, B.P., Kanayama, G. and Pope, H.G.      | Internet        | Google search                                               | Online                                    | n/a         |
| 4 | Confidence by injection: male users of anabolic steroids speak of increases in perceived confidence through anabolic steroid use | 2010 | USA       | Vassallo, M.J. and Olrich, T.W.                 | Cross-sectional | In-depth interview                                          | Research offices                          | 39          |
| 5 | Selling androgenic anabolic steroids by the pound: identification and analysis of popular websites on the Internet               | 2011 | Italy     | Cordaro, F.G., Lombardo, S. and Cosentino, M.   | Internet        | Google search                                               | Online                                    | n/a         |

| Response rate | Main findings                                                                                                                                                                                                                                                                                                                                                                                                                                    | Contribution                                                                                                                                                                                                                              | Strengths                                                                                                                                                                                                                                                                                                                                                                                                                                            | Weaknesses                                                                                                                                                                                                                               |
|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| n/a           | AAS dealing networks were found to be grounded in social capital where subcultural group norms and interpersonal trust facilitate AAS dealers to operate without detection                                                                                                                                                                                                                                                                       | Unique study examining the role of social capital in AAS dealing and using networks                                                                                                                                                       | Clear statement of the aims of the research. Methodology appropriate for the research aim. Longitudinal design of the interviewees over a 3-year period. Eight gyms purposefully sampled. Variety of settings to include gyms, nightclubs, cafes and participants homes. Rich data from open-ended interviewing. Clear statement of findings                                                                                                         | Snowballing sampling method may introduce selection bias. Purposeful sampling of AAS using gyms may have introduced selection bias. Close relationship between interviewers and participants may introduce bias                          |
| n/a           | Motivation for AAS use was grounded in the creation of a physique impossible to build through diet and exercise alone. Typical cycling was two to three times annually. Injecting was preferred to oral administration due to better aesthetic outcome. AAS were typically sourced through local networks and gyms, or online. Very few adverse health consequences were reported by users                                                       | Few studies examine the motives and attitudes of AAS user, this study gives an in-depth exploration of user experiences                                                                                                                   | Clear statement of the aims of the research. Methodology appropriate for the research aim. Longitudinal design tracks participants over 4 years. Rich data from open-ended interviewing. Clear statement of findings                                                                                                                                                                                                                                 | Limited to one type of hardcore gym, which may have introduced selection bias. Potential bias introduced through Longitudinal design, and development of relationship between interviewers and participants training together at the gym |
| n/a           | This study surveyed thousands of PIED sites, largely AAS. The researchers noted a pro-drug use position taken by the majority of websites found. Selling of PIEDs was widespread. This study identified two lesser known practices within PIED culture, synthol injection and cattle implants                                                                                                                                                    | This study highlighted a need for further research into the underground practices of many PIED users, which may be largely unknown to clinicians                                                                                          | This study used broader searches than the only previously existing study to use a similar methodology (Cordaro <i>et al.</i> 2011). Clear statement of the aims of the research. Qualitative method appropriate to investigate the nature of the detailed information available on these sites. Clear statement of findings. Valuable contribution to the literature on PIED culture particularly lesser known practices such as syntherol injection | Whereas a previous study (Cordaro <i>et al.</i> 2011) had identified by URL the websites they had found selling AAS, the larger scope of this study means the websites found were not identified                                         |
| n/a           | Use of AAS was grounded in increased confidence through positive impact on physical appearance, and on self-confidence accrued through athletic achievement. Users also described a psychological euphoria through AAS use. All participants agreed that AAS dependence was valid and grounded in psychological effects. Cessation of use was characterised by change of context, marriage, maturity and discontinuation of sporting involvement | Controversy around the phenomenon of AAS dependence has meant user experiences of symptomology relative to this concept is underresearched. This study offers an insight into the perceptions of users of the addictive properties of AAS | Clear statement of the aims of the research. Methodology suitable for examining user attitudes and experiences of aspects of AAS dependence. Rich data collected through open-ended interviewing. Clear statement of findings                                                                                                                                                                                                                        | Potential bias introduced through purposeful sampling and relationship between interviewers and participants                                                                                                                             |
| n/a           | 30 AAS vendor websites were identified using through Google search. A minimum of two products were selected from each website for purchase and examination. Dietary supplements were found to contain fake compounds and DHEA. Adverse effects rarely well described with benefits listed. Supraphysiological dosages were generally recommended                                                                                                 | This study was one of the first to characterise AAS and AAS-related products for sale online, and to analyse their presentation. It highlights the need for future research to investigate the extensive online PIED market               | Clear statement of the aims of the research. Qualitative method appropriate to investigate the nature of the detailed information available on these sites. Clear statement of findings. Identification of 30 AAS vendor sites by URL. Valuable contribution to the literature on online PIED markets                                                                                                                                                | Limited range of search terms used, which may have introduced selection bias                                                                                                                                                             |

**Table 3** (continued)

|    | Theme                                                                                                                              | Year | Place     | Authors                                                                       | Design            | Data collections method           | Setting          | Sample size                      |
|----|------------------------------------------------------------------------------------------------------------------------------------|------|-----------|-------------------------------------------------------------------------------|-------------------|-----------------------------------|------------------|----------------------------------|
| 6  | Nonprescription steroids on the internet                                                                                           | 2012 | USA       | Clement, C.L., Marlowe, D.B., Patapis, N.S., Festinger, D.S. and Forman, R.F. | Internet          | Google search                     | Online           | n/a                              |
| 7  | "Definitely Not for Women": An Online Community's Reflections on Women's Use of Performance Enhancing Drugs in Recreational Sports | 2012 | Denmark   | Jespersen, M.R.                                                               | Internet          | Discussion forum posts            | Online           | 59 threads on 1 discussion forum |
| 8  | Body conceptions and virtual ethnopharmacology in an online bodybuilding community                                                 | 2012 | Australia | Smith, A.C.T. and Stewart, B.                                                 | Longitudinal      | Online ethnography                | Online           | 34 threads, 2894 posts           |
| 9  | "Will steroids kill me if I use them once?" A qualitative analysis of inquiries submitted to the Danish anti-doping authorities    | 2012 | Denmark   | Vest Christiansen, A. and Bojsen-Møller, J.                                   | Longitudinal      | Analysis of enquiries to helpline | Research offices | 1398 inquiries                   |
| 10 | An in-depth case examination of an exotic dancer's experience of melanotan                                                         | 2013 | Ireland   | Van Hout, M.C. and Brennan, R.                                                | Single case study | In-depth interview                | Research offices | 1                                |

| Response rate | Main findings                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Contribution                                                                                                                                                                                                                                                     | Strengths                                                                                                                                                                                                                                                                                                                                                                                                        | Weaknesses                                                                                                                                                                                                                                      |
|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| n/a           | Searches for specific product names (e.g. Dianabol) between March 2006 and June 2006 found that half of the websites declared the products as safe, and approximately one-third sold the products without a prescription. Misinformation about steroids and their harms was often presented. Less than 5% of sites studied presented accurate information about steroids or provided self help information for those wishing to discontinue their use                                                      | Little research has been published on the online selling of PIEDs                                                                                                                                                                                                | Important study highlighting the pro-drug use stance of many PIED vendor websites and the ease of which PIEDs are available for sale, potentially to minors, online. Results of study presented in tables                                                                                                                                                                                                        | Drugs advertised were not ordered and tested. Multiple websites may be owned by the same companies                                                                                                                                              |
| n/a           | Use of performance enhancing drugs among women is grounded in a short cut to their ideal body, unachievable through diet and exercise alone. From analysis of forum postings, the members of the bodyhouse forum generally support well informed, educated PIED use and advise against use by women and young people                                                                                                                                                                                       | This study offers an insight into the female use of performance-enhancing drugs, utilising information available online in discussion forums specific to recreational weighttraining and PIED use                                                                | Clear statement of the aims of the research. Qualitative method of analysis of internet postings appropriate to collect rich descriptive and in-depth data on female use of IPEDs. Clear statement of findings                                                                                                                                                                                                   | Restricted to members of one discussion forum. Findings cannot be representative as they are limited to a small number of people at a certain time. Demographical information is difficult to ascertain from internet discussion forum postings |
| n/a           | Motivation for AAS use was grounded in heroic feats of strength and physical power and pursuit of a masculine ideal. Hyper masculinity of AAS use was contradicted by emotional side effects. Polypharming and stacking regimes were normalised                                                                                                                                                                                                                                                            | Unique online study mapping discussion forum postings gives an insight into a subcultural network of AAS users                                                                                                                                                   | Clear statement of the aims of the research. Longitudinal design tracked forum posts over 3 years. Rich data collection due to access to conversations between users which play out over time and are very detailed. Online setting an easy observational and safe place for researchers. Practices discussed by users may not have been revealed through face to face interviewing. Clear statement of findings | Online identities may not be representative of reality. Collection of user demographics is not possible using this methodology                                                                                                                  |
| n/a           | Four different types of enquirers were identified: (1) those with no knowledge of AAS; (2) those seeking help with side effects; (3) those with some knowledge of AAS; and (4) those which posed harm reduction dilemmas for the service. Enquiries included advice sought on cycling, worries about positive dope tests, description of adverse effects to include psychological harm (low mood) and cardiac symptoms                                                                                     | Anti Doping Denmark (ADD) campaign to stop use of IPEDs in fitness centres is the largest and most comprehensive in the world. This study gives an insight into the types of enquiries received to their helpline, which in turn helps categorise AAS user types | Clear statement of the aims of the research. Methodology appropriate for the investigation of helpline enquiries to ADD. Longitudinal design over 18 months analysing a large sample (1398) of enquiries. Clear statement of findings                                                                                                                                                                            | ADD operate an anti-drug policy which although did not deter some AAS users from detailing their use, may have deterred others. Limited to those who accessed the helpline                                                                      |
| n/a           | Use of melanotan was grounded in the achievement of a healthy looking, attractive tan and avoidance of a naturally pale and freckly appearance. Topical tanners were not used due to streaking and interference with exotic dancing routines using ice. Side effects noted were nausea, which the case self managed with Xanax to promote sleeping through sick feeling. Sourced melanotan through bodybuilder friend or online. Case had awareness of dangers of unregulated products but was unconcerned | User attitudes and motivations for melanotan use are underresearched. This single case presentation contributes an in-depth exploration of one melanotan user's experiences                                                                                      | Clear statement of the aims of the research. Methodology suitable for an in-depth account of a melanotan user's experience, motivation and attitude to use. Clear statement of findings                                                                                                                                                                                                                          | Findings limited to one melanotan user and cannot be generalised                                                                                                                                                                                |

Table 3 (continued)

|    | Theme                                                                                                                                                           | Year | Place   | Authors                               | Design          | Data collections method               | Setting                 | Sample size                       |
|----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|------|---------|---------------------------------------|-----------------|---------------------------------------|-------------------------|-----------------------------------|
| 11 | Anabolic-androgenic steroids and heroin use: a qualitative study exploring the connection                                                                       | 2014 | UK      | Cornford, C.S., Kean, J. and Nash, A. | Cross-sectional | Focus groups and in-depth interviews  | Needle exchange         | 41                                |
| 12 | An internet study of users' experiences of synthetic tanning                                                                                                    | 2014 | Ireland | Van Hout, M.C.                        | Cross-sectional | Analysis of discussion forum postings | Online                  | The first 10 pages of 467 threads |
| 13 | Variability and dilemmas in harm reduction for anabolic steroid users in the UK: a multi-area interview study                                                   | 2014 | UK      | Kimergard, A. and McVeigh, J.         | Cross-sectional | In-depth interviews                   | Needle exchange         | 33                                |
| 14 | Environments, risk and health harms: a qualitative investigation into the illicit use of anabolic steroids among people using harm reduction services in the UK | 2014 | UK      | Kimergard, A. & McVeigh, J.           | Cross-sectional | In-depth interviews                   | Harm reduction services | 24                                |

| Response rate | Main findings                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Contribution                                                                                                                                                                                                                        | Strengths                                                                                                                                                                                                                                                                                                                                                  | Weaknesses                                                                                                                                                                                                                                             |
|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 73%           | Results showed that participants used AAS to conceal the weight loss associated with their heroin use to avoid stigmatisation and detection. The intimidating nature of musculature achieved through AAS use was also described as functional in drug dealing networks                                                                                                                                                                                                                                                                                                                                                       | Previous studies have noted a link between heroin use and AAS (Pettersson <i>et al.</i> , 2010; McCabe <i>et al.</i> , 2007). This study offers a unique in-depth exploration of one aspect of this connection through user reports | Clear statement of the aims of the research. Qualitative method appropriate to investigate the nature of current and past heroin users motives for use of AAS. Clear statement of findings                                                                                                                                                                 | Use of needle exchange service users may have introduced selection bias and is limited to AAS and heroin users who accessed these services                                                                                                             |
| n/a           | Users sought to conceal their melanotan use and pass off their skin tan as natural. Despite awareness of risks associated with use of unregulated tanning injectables, user's experiences are driven by and grounded in positive outcomes. Products are sold online as 'lifestyle choices', 'research chemicals' and labelled 'not for human use' to circumvent legislation. Adverse health consequences include pigmentation changes, nausea, darkening of fingernail beds and facial flushing. Management of side effects was characterised by polypharming with substances such as marijuana and retinal                  | First online study mapping discussion forum postings gives an insight into a subcultural network of melanotan users                                                                                                                 | Clear statement of the aims of the research. Rich data collection due to access to conversations between users which play out over time and are very detailed. Online setting an easy observational and safe place for researchers. Practices discussed by users may not have been revealed through face to face interviewing. Clear statement of findings | Online identities may not be representative of reality. Collection of user demographics is not possible using this methodology. Limited to one site. Excludes bodybuilding collective who also use melanotan                                           |
| n/a           | All service providers reported an increase in IPED users sourcing needles. IPED user sourcing of needles is dynamic and can include peer-led distribution networks in addition to needle exchange services available at clinics. Disagreements arose where service providers were unsure of their boundaries when offering harm reduction advice to service users. Regular medical examinations were offered to service users. Significant tensions and dilemmas in policy implementation due to differing perspectives between service providers and service users relating to practices, risks and effective interventions | Few studies have examined the impact of harm reduction services on the injecting risk behaviours of IPED users. This study contributes evidence in this regard                                                                      | Clear statement of the aims of the research. Methodology suitable for an in-depth account of service providers and clientele experiences of harm reduction. Clear statement of findings                                                                                                                                                                    | Service providers may have leaned towards speaking in a positive manner about the benefits of harm reduction services, while underplaying the negative aspects. Generalisability of findings are limited to those who accessed harm reduction services |
| n/a           | Motivation for use was grounded in improving body image. Some users showed a lack of awareness of the harms associated with online sourcing of IPEDs. Others used adapted self-designed risk negotiation strategies to navigate potential risk. Group norms and lay epidemiology supported ideas of moderated drug use and harm reduction measures like visiting needle exchange services but also promoted some high-risk practices to increase effects of AAS                                                                                                                                                              | This study contributes evidence for perceptions of risk and risk navigation by users of AAS                                                                                                                                         | Clear statement of the aims of the research. Methodology suitable for an in-depth account of AAS user's drug use patterns and perceptions of risk. Clear statement of findings. A broad cross section of AAS users                                                                                                                                         | Generalisability of findings is limited to those who attend at harm reduction services                                                                                                                                                                 |



Table 3 (continued)

| Theme                                                                                                   | Year | Place | Authors      | Design          | Data collections method | Setting                 | Sample size |
|---------------------------------------------------------------------------------------------------------|------|-------|--------------|-----------------|-------------------------|-------------------------|-------------|
| 15 Qualitative study of anabolic steroids amongst gym users in the UK, motives beliefs, and experiences | 2015 | UK    | Kimergard, A | Cross-sectional | In-depth interviews     | Harm reduction services | 24          |

(Jespersen 2012). Empirical evidence of female use of AAS can also be seen in two recent web-based surveys (Ip *et al.* 2010, Chandler & McVeigh 2013). It is likely that use of muscle-enhancing IPED among women has risen in recent years considering the current cultural climate which favours female weighttraining (Andreasson & Johansson 2014).

With regard to melanotan use, the clinical case report literature describes both male and female use. Use of melanotan by bodybuilding or weighttraining males was reported in three case reports (Cardones *et al.* 2009, Shelly *et al.* 2009, Schulze *et al.* 2012). This is further evidenced by melanotan use in AAS users accessing needle exchange services (Chandler & McVeigh 2013, Hope *et al.* 2013). There is lack of research on use of melanotan in weightlifting subsets, yet plentiful anecdotal evidence exists online pertaining to its use in this regard (Mahiques-Santos 2012).

Despite evidence online, use of unregulated Botox and dermal fillers has rarely been described in the scientific literature, and no data exist on user demographics. Similarly, while there is discussion and images available through a Google search regarding female use of synthol, no published scientific studies on this topic were identified through this review.

#### Age of onset

Previous U.S. studies have found age of onset for AAS use to be over 20 (Kanayama *et al.* 2009a,b) which was supported by a recent meta-analysis of nine U.S. studies (Pope *et al.* 2014a). Another meta-analytical study, one using 187 studies worldwide, found highest prevalence of AAS use to be among teenagers (Sagoe *et al.* 2014a). However, this may be a cohort effect, as studies using secondary/highschool samples have typically found low prevalence (Thorlindsson & Halldorsson 2008, Johnston *et al.* 2013).

Findings from some small-scale qualitative and quantitative studies indicate that older and younger IPED user groups are characterised by different types of use. There is some evidence to suggest that those over the age of 24 (Chandler & McVeigh 2013) tend to practise moderated use, adhering to recommended cycle duration and dosages, thereby experiencing mainly positive outcomes and reporting relatively few adverse effects (Cohen *et al.* 2007, Chandler & McVeigh 2013). Alternatively, reckless drug use practices, such as excessively long cycles, have been reported in relation to some younger subsets (Vest Christiansen & Bojsen-Møller 2012, Chandler & McVeigh 2013). Supraphysiological dosages are reported as normative across all age groups of AAS users (Evans-Brown *et al.* 2012, Pope *et al.* 2014a,b). Data from needle exchange services in the United Kingdom indicate that users of hGH were typically older (>35 years) than other IPED users (Hope *et al.* 2013) which is likely to be due to the elevated financial cost of this IPED compared to others. There is a lack of data available on age of onset for use of melanotan, synthol, Botox and dermal filler. The largest field study on melanotan use to date, which analysed forum posts online (Van Hout 2014), was unable to collect demographic data on users such as age and gender due to the passive and observational nature of the study. Similar to AAS users, clinical presentations of synthol injection report most patients aged in their twenties (Iversen *et al.* 2009, Henriksen *et al.* 2010, Schafer *et al.* 2012).

#### Motivators for use in the general population

The reviewed literature suggests that IPED use is heterogeneous in nature, with many different motivators (Evans-Brown *et al.* 2012, Brennan *et al.* 2013b,

| Response rate | Main findings                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Contribution                                                                          | Strengths                                                                                                                                                                                                          | Weaknesses                                                                             |
|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|
| n/a           | Motivators for AAS usage were associated with wanting a better looking body, anti-ageing and muscle definition strength, maintaining appearance when getting older and enhancement of muscle definition. AAS use patterns were highly dynamic. The internet was a valued source of information for users. AAS users' self-assessment of health was typically very good, with concepts of AAS using and gym lifestyle as healthy and better to a sedentary one | This study contributes evidence for perceptions, motives and experiences of AAS users | Clear statement of the aims of the research. Methodology suitable for an in-depth account of AAS user's drug use patterns and perceptions of risk. Clear statement of findings. A broad cross section of AAS users | Generalisability of findings is limited to those who attend at harm reduction services |

Sagoe *et al.* 2014a). Motivators for IPED use were found to be enhanced appearance (Van Hout 2014), sporting achievement (Sagoe *et al.* 2014b), increased musculature (Petrocelli *et al.* 2008), increased strength (Smith & Stewart 2012), occupational functioning (Van Hout & Brennan 2013), enhanced self-confidence (Vassello & Olrich, 2010), body image disturbance (Sagoe *et al.* 2014a), a healthy appearance (Van Hout 2014) and sexual attraction (Petrocelli *et al.* 2008). Of the above listed motivators, athletic performance, appearance enhancement, the appearance of health and body image disturbance were most prominent in the literature.

#### Athletic performance

A history of participation in sports was identified in Sagoe *et al.*'s (2014b) systematic review as an indicator for AAS use, albeit less prominent than bodybuilding and weightlifting. The importance of strength as a motivator for use is illustrated in qualitative studies where weightlifters describe their enjoyment of almost supernatural feats of strength in the gym powered by AAS (Smith & Stewart 2012) and also in heroin users also using AAS, where participants describe the social currency of a strong physique in risky drug-dealing environments (Cornford *et al.* 2014). Clinical studies which have investigated the efficacy of hGH in enhancing the user's athletic performance found limited evidence to support this (Liu *et al.* 2008, Meinhardt *et al.* 2010, Birzniece *et al.* 2011). However, these studies may not have utilised the suprapharmacological dosages typical of an illicit hGH user's regimen due to ethical restrictions.

#### Appearance enhancement

Motivators disclosed by participants in field studies have shown its use to be grounded in building an

aesthetically pleasing physique (Perry *et al.* 2005, Parkinson & Evans 2006, Ip *et al.* 2011, Jennings *et al.* 2014). Participants in qualitative studies describe how AAS is sourced to increase sexual attractiveness to prospective partners (Petrocelli *et al.* 2008) and to boost feelings of self-confidence (Vassello & Olrich 2010).

Studies on melanotan users also describe motivation for use as grounded in appearance. An internet study of forum posts found descriptions of desired side effects listing benefits such as being slimmer, enhanced eye colour and clearing skin with acne (Van Hout 2014). The surveyed site was found to contain messages such as 'melanotan will make you tan, slim and hot' (Van Hout 2014). However, this study was limited to a melanotan-specific forum and isolated multiple bodybuilding fora where use of melanotan may be discussed with differing motivators (Mahiques-Santos 2012). Appearance enhancement was also described as increased occupational functioning in a case study, as the case described melanotan as more effective than topical tanners when working as a dancer under hot lights (Van Hout & Brennan 2013). This has also been seen in the use of AAS to increase size by doormen and security officers as well as sexworkers (Maycock & Howat 2007, Sagoe *et al.* 2014a) and drug dealers (Cornford *et al.* 2014).

Users also source IPED to combat Cornford *et al.* 2014 the appearance of ageing, as can be seen with the use of Botox, dermal filler injectables, hGH and testosterone to combat the physiological and psychological effects of ageing on the body (Drazen 2003, Olshansky & Perls 2008, Conrad, 2007). Use of hGH as an anti-ageing supplement is understudied, with little documentation in the scientific literature apart from some editorials (Drazen 2003, Olshansky & Perls

Table 4 Literature reviews

| Theme                                                                                               | Place | Year | Authors                                                             | Results                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Contribution                                                                                                                                          | Strengths                                                                                                                                                                                      | Weaknesses                                                                                                                                                                                                                                                                     |
|-----------------------------------------------------------------------------------------------------|-------|------|---------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 Growth Hormone & Exercise: Physiology, Use & Abuse                                                | UK    | 2001 | Jenkins, P.J.                                                       | This review summarises the interactions between human growth hormone (hGH) and exercise. While exercise impacts naturally occurring hGH, the efficacy of illicit hGH use by bodybuilders and athletes is unproven. Due to its undetectable nature, the abuse of hGH is likely to increase. Adverse side effects suffered are indicated by acromegaly, a condition where the sufferer has excess production of hGH                                                                                                                                                                                                                                                    | Collates the literature on interaction between hGH and exercise                                                                                       | Clearly focused research question, clear overall results. All important outcomes considered. Applicable to the local population                                                                | Literature search method not described                                                                                                                                                                                                                                         |
| 2 Claims for the anabolic effects of growth hormone: a case of the Emperor's new clothes?           | UK    | 2003 | Rennie, M.J.                                                        | Several online sites promote the use of hGH as a health, well-being or longevity supplement, or muscle enhancer for bodybuilders. This is largely due to a tenuous link made between the efficacy of hGH treatment in adults and children with certain medical conditions. There is little evidence to support the claim that hGH promotes muscle growth in healthy adults. This may be in part due to the fact that clinical trials have not tested realistic dosages associated with use in bodybuilding subculture. Side effects associated with high doses of hGH administered to healthy adults include cardiac events, high blood pressure and type 2 diabetes | This review looks at studies which have tested the efficacy of hGH on athletic performance and metabolism in healthy adults, which is under-evidenced | Clearly focused research question, clearly stated results. Selected the right types of papers for the research question. All important outcomes considered. Applicable to the local population | Literature search method not described. No evidence that quality of literature was assessed                                                                                                                                                                                    |
| 3 Botulinum toxin type A injections: Adverse events reported to the US Food and Drug Administration | USA   | 2005 | Cote, T.R., Mohan, A.K., Polder, J.A., Walton, M.K. and Braun, M.M. | This review collates information from 1437 Food & Drug Administration (FDA) Accident and Emergency presentation reports, 1031 from cosmetic use of Botox and the remainder from therapeutic use. From the cosmetic use presentations, no deaths were reported. 36 serious harms were reported including headaches, focal facial paralysis, muscle weakness, dysphagia, flu-like syndromes and allergic reactions                                                                                                                                                                                                                                                     | This review was the first attempt to collate emergency reports to the FDA regarding botox administration                                              | Clear research question, clear overall results. Applicable to the local population                                                                                                             | FDA data only include a small number of all A&E presentations occurring due to botox administration. Incomplete reporting by clinicians may have impacted on accuracy of results, where neglecting to mention underlying disease or where incomplete drug histories were taken |

Table 4 (continued)

| Theme                                                                      | Place | Year | Authors                                                                                                                                           | Results                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Contribution                                                                                                                                                                                                                       | Strengths                                                                                                                                                                                                  | Weaknesses                                                                                                                                                 |
|----------------------------------------------------------------------------|-------|------|---------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4 Growth hormone, IGF-1 and insulin and their abuse                        | UK    | 2008 | Holt, R. and Sonksen, P.H.                                                                                                                        | Human growth hormone (GH) is abused for its reported muscle building and fat burning properties, of which there is little evidence. Due to polypharming with AAS and other PEDS, randomised controlled studies conducted to date have had limitations. Insulin like growth factor (IGF-1) is also used for anabolism. There is considerable potential harm associated with the self-injection of hGH, IGF-1 and other PEDS. Acromegaly, a condition where the sulferer produces an excess of hGH, exemplifies some of the potential side effects of large doses of hGH self-administered. Deletion of hGH and IGF-1 in athletes is difficult but recent developments have made this possible | Reviews literature on the little researched abuse of hGH                                                                                                                                                                           | Clearly focused research question, clear overall results. All important outcomes considered. Applicable to the local population                                                                            | Literature search method not described, quality of papers not described                                                                                    |
| 5 Systematic Review: The Effects of Growth Hormone on Athletic Performance | USA   | 2008 | Liu, H., Bravata, D., Olkin, I., Friedlander, A., Liu, V., Roberts, B., Bendavid, E., Saynina, O., Salpeter, S.R., Garber, A.M. and Hoffman, A.R. | Evidence from the scientific literature does not support the efficacy of human growth hormone on enhancing physical performance or strength. Limited evidence suggests that growth hormone increases lean body mass, and may in fact have a negative impact on exercise capacity and increase the likelihood of adverse events                                                                                                                                                                                                                                                                                                                                                               | The efficacy and safety of human growth hormone in the enhancement of athletic performance is under-evidenced. This review analyses the available evidence of the effects of growth hormone on athleticism in healthy young people | Clearly focused research question, literature search method described. Selected the right types of papers for the research question. All important outcomes considered. Applicable to the local population | Few studies reviewed assessed athletic performance. Growth hormone dosages and contexts in clinical studies may not reflect real-life dosages and regimens |

Table 4 (continued)

| Theme                                                                        | Place | Year | Authors                                                                  | Results                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Contribution                                                                                                                                                                                                       | Strengths                                                                                                                                                                                                                                                                                                                                                                          | Weaknesses                                                              |
|------------------------------------------------------------------------------|-------|------|--------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|
| 6 Anabolic-androgenic steroid dependence: an emerging disorder               | USA   | 2009 | Kanayama, G., Brower, K.J., Wood, R.I., Hudson, J.I. and Pope, H.G., Jr. | 30% of AAS users have dependence symptomatology associated with chronic AAS use despite negative effects on functioning, and physical and psychological well-being. Some features of AAS dependence are similar to other drugs of dependence, e.g. hamsters have been seen to self-administer AAS even until death, and AAS withdrawal syndrome has been evidenced in human and animal studies. AAS dependence has some neurological similarities with opioid dependence. Differences between AAS dependence and classical drugs of abuse include no intoxication syndrome. Standard diagnostic tools for substance dependence need adaptation for AAS which have delayed onset of reward, i.e. muscle development | There has been some disagreement in the literature on the nature and validity of AAS dependence as a syndrome. This review collates the literature on AAS dependence and concludes it is a valid diagnostic entity | Clearly focused issue with clearly stated results using table to illustrate the similarities and differences between AAS dependence and classical drug dependence according to human and animal studies. Methodology described as using a combination of literature search and reports known to the authors. All important outcomes considered. Applicable to the local population | No evidence that quality of papers used were assessed                   |
| 7 "Melanotropic Peptides: More Than Just 'Barbie Drugs' and 'Sun-Tan Jabs'?" | UK    | 2010 | Langan, E.A., Z. Nie and L.E. Rhodes                                     | Awareness of the risks associated with exposure to UV light has led to development of a market for new unregulated tanning injectables melanotan I and/or II, available online or through tanning salons and gyms. Dangers associated with these include injecting risks and impurities in online products. Some symptomatology of melanotan use which dermatologists may look out for in clients include changes in nevi and an unusually dark sun tan. The regulated a-MSH analogue atamelanotide is undergoing phase II and III clinical trials for treatment of photosensitivity disorders                                                                                                                     | This review collates available information on tanning injectables, to inform practitioners on what to recognise in patients using melanotan                                                                        | Clearly focused research question, clearly stated results. All important outcomes considered. Applicable to the local population                                                                                                                                                                                                                                                   | Literature search method not described, quality of papers not described |

Table 4 (continued)

| Theme                                                                                   | Place     | Year | Authors                                                                                   | Results                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Contribution                                                                       | Strengths                                                                                                                                                                                           | Weaknesses                                                                                                                                                                    |
|-----------------------------------------------------------------------------------------|-----------|------|-------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 8 Growth hormone and physical performance                                               | Australia | 2011 | Birzniece, V., Nelson, A.E. and Ho, K.K.                                                  | This review summarises the literature on the efficacy of hGH as a performance-enhancing agent. Findings are that while hGH reduces fat mass and increases lean body mass, this is mainly attributable to fluid retention. No strength increasing effects could be found, and no aerobic exercise capacity increases. However, some studies pointed to increases in anaerobic function                                                                                                           | There is limited research on the physical performance-enhancing effects of hGH     | Addressed a clearly focused question. Selected the right types of paper for the research question. Overall results clear and presented using tables and figures. Applicable to the local population | Literature search methods not described. No evidence that quality of papers used was assessed                                                                                 |
| 9 Cosmetic doping: the problems of intramuscular application of oils                    | Brazil    | 2011 | Figueiredo, V.C., Silva, P.R.P., Trindade, R.S. and Rose, E.D.H.                          | This article collates the available information on injection of oil to enlarge the appearance of muscle, known as syntherol injection or ADE injection in Brazil, in the subculture of bodybuilding. Findings include history of use and collation of clinical case reports to document adverse effects such as inflammatory reaction, paraffinoma and vasculitis. Authors suggest the term cosmetic doping as oil injection is used to increase chances of success in bodybuilding competition | Summarises the available literature on oil injection                               | Clear focused research question. Selected the right type of paper for the research question                                                                                                         | Literature search methods not described. No evidence that quality of papers used were assessed. Some practices described regionally in Brazil may not apply outside this area |
| 10 The diagnostic dilemma of pathological appearance and performance-enhancing drug use | USA       | 2011 | Hildebrandt, T., Lai, J.K., Langenbacher, J.W., Schneider, M., Yehuda, R. and Pfaff, D.W. | Review of published data to include human studies of AAS use. Three features of AAS use identified are: (1) polypharmacy with IPEDs; (2) body image disturbance; and (3) strict training and diet regimes. These indicate pathological use of AAS and are associated with the most health risks                                                                                                                                                                                                 | Highlights gaps in the literature regarding the diagnoses of pathological IPED use | Clearly focused research question. clear overall results. All important outcomes considered. Applicable to the local population                                                                     | Literature search methods not described. No evidence that quality of papers used was assessed                                                                                 |

Table 4 (continued)

| Theme                                                                                                                                                                                     | Place   | Year | Authors                                                                | Results                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Contribution                                                                                                                                                                                                                                               | Strengths                                                                                                                                                                                                                                                           | Weaknesses                                                                     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|------|------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|
| 11<br>Illicit Use of<br>Androgens and<br>Other Hormones:<br>Recent<br>Advances                                                                                                            | USA     | 2012 | Kanayama, G.<br>and Pope,<br>H.G., Jr.                                 | Image and performance-enhancing<br>androgens are widely used worldwide.<br>Recent findings have evidenced<br>extensive polypharmacy with multiple<br>IPEDs and illicit drugs among IPED<br>users. Evidence for long-term<br>psychiatric harm and physiological<br>adverse effects continues to build,<br>particularly in the case of<br>cardiovascular harm and dependency                                                                                                                                                                                                                                                                                                                                                                                                                                             | This review collates<br>recent findings in<br>relation to AAS<br>harm. AAS<br>dependency is<br>understudied as a<br>drug dependence<br>syndrome and this<br>review underscores<br>the increasing public<br>health concern<br>associated with this<br>issue | Clearly focused issue.<br>Literature search<br>method described.<br>Clearly stated results.<br>All important<br>outcomes considered.<br>Applicable to the local<br>population                                                                                       | No evidence that<br>quality of papers used<br>was assessed                     |
| 12<br>Muscle<br>enhancement<br>using<br>intramuscular<br>injections of oil<br>in bodybuilding:<br>review on<br>epidemiology,<br>complications,<br>clinical<br>evaluation and<br>treatment | Denmark | 2012 | Schafer, C.N.,<br>Hvolfis, T.,<br>Karlsmark, T.<br>and<br>Plambeck, M. | This review identified one review and<br>seven case reports. All case reports<br>describe oleomas caused by repeated<br>intramuscular injections of oil. Site<br>enhancement oils (SEO) can be<br>bought online in vials often marked<br>'posing oil'. Contents range from a<br>variety of oils, anabolic steroids and<br>silicone mixed with a painkiller.<br>Adverse effects include infection,<br>swelling, abscess, sclerosing<br>lipogranulomatosis which is a lifelong<br>chronic condition of the muscle and in<br>severe cases, signs and symptoms of<br>an acute thromboembolic event. There<br>is a lack of epidemiological studies on<br>SEO use. Internet searches reveal that<br>there are several underground<br>practices undocumented in the<br>scientific literature such as<br>'homebrewing' of SEOs | Injection of SEOs is<br>underdescribed in<br>the scientific<br>literature. This<br>review attempts to<br>collate extant<br>knowledge on same                                                                                                               | Clearly focused<br>research question,<br>clearly stated results.<br>Selected the right<br>types of papers for<br>the research question.<br>Literature search<br>method described. All<br>important outcomes<br>considered.<br>Applicable to the local<br>population | Limited literature base<br>confined to seven<br>case reports and one<br>review |

Table 4 (continued)

| Theme                                                                                                    | Place   | Year | Authors                                                                     | Results                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Contribution                                                                                                                                                                              | Strengths                                                                                                                                                                                                                                                          | Weaknesses                                                             |
|----------------------------------------------------------------------------------------------------------|---------|------|-----------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|
| 13 Inflammatory, immune-mediated adverse reactions related to soft tissue dermal fillers                 | Spain   | 2013 | Aljolas-Reig, J., Fernandez-Figueras, M.T. and Puig, L.                     | Early and late-onset foreign body reaction to dermal fillers is widespread. Exact prevalence is not known. Late-onset reactions tend to be inflammatory. Most common reactions experienced are oedema, granulomas, sarcoid-like disorders and panniculitis. Systemic reactions are rarer and more serious                                                                                                                                                                                                                                                                                                                                                  | Prevalence of dermal filler injection is not known but would appear to be significant from the high volume of case reports. Treatment of dermal filler reaction has not been studied well | Addressed a clearly focused question. Selected the right types of paper for the research question. Overall results clear and presented using tables and figures. Applicable to the local population                                                                | No evidence that quality of papers used was assessed                   |
| 14 Heuristics of Human Enhancement Risk: A little chemical help?                                         | Ireland | 2013 | Brennan, R., Van Hout, M.C. and Wells, J.S.                                 | This review summarises the literature on PIED injectables including AAS, melatonin, and site enhancement oils and liquids. Findings include the non-identification of PIED users with a drug user profile, motivators for use to include health and appearances and pharmaceutical quick fix mentality                                                                                                                                                                                                                                                                                                                                                     | There is a lack of research into the prevalence of PIED use, and demographics of PIED users                                                                                               | Clear research question, PRISMA methodology described, used the appropriate papers to answer the research question, clear overall results. All important outcomes considered. Applicable to the local population                                                   | No evidence that quality of papers used was assessed                   |
| 15 Adverse Health Consequences of Performance-Enhancing Drugs: An Endocrine Society Scientific Statement | USA     | 2013 | Pope, H.G., Jr., Wood, R., Rogol, A., Nyberg, F., Bowers, L. and Bhasin, S. | Existing literature base on IPEDs is of poor quality, due to reliance on retrospective surveys, case-control studies and case reports. As IPED use did not emerge until the 1980s and 1990s, most IPED users are under 50, which also restricts our knowledge on long-term harm. IPED use is typically covert and does not usually precede a medical emergency. Average age of onset is between 22 and 24 years. Between 2.9 and 4 million Americans have used AAS. IPED users often consume high dosages of IPEDs. In combination with other IPEDs and illicit drugs, IPED use has been linked to a wide range of physiological and psychiatric disorders | This scientific statement aims to collate the extant literature on the consequences of IPED use among recreational weightlifters                                                          | Clearly focused research question. Clearly stated results. Selected the right types of papers for the research question. Literature search method described. Quality of literature assessed. All important outcomes considered. Applicable to the local population | Articles not written in English or translated to English were excluded |



Table 4 (continued)

| Theme                                                                                                                                    | Place  | Year | Authors                                                                                   | Results                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Contribution                                                                                                        | Strengths                                                                                                                                                                                                                                                                                                     | Weaknesses                                                                                                                                                                                                           |
|------------------------------------------------------------------------------------------------------------------------------------------|--------|------|-------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 16 The aetiology and trajectory of anabolic androgenic steroid use initiation: a systematic review and synthesis of qualitative research | Norway | 2014 | Sagoe, D., Andreassen, C.S. and Pallesen, S.                                              | 44 studies published between 1980 and 2014 and across 11 countries were included for review. Onset of first use was typically before the age of 30. Participation in sports, poor body image and mental disorder predicted AAS use. AAS sourcing occurred through peer networks and the blackmarket. Motivation for use included improved athletic performance, aesthetics and strength and muscle gain                                                                                                                                                                                                                                                                                                                                        | This is the first attempt to collate the qualitative literature on psychosocial influences on initiation of AAS use | Clearly focused research question, clearly stated results. Selected the right types of papers for the research question. Literature search method described. Quality of the literature assessed using inclusion and exclusion criteria. All important outcomes considered. Applicable to the local population | Excluded papers not written in English. Single case reports used in the review may not have been representative of the typical AAS user                                                                              |
| 17 Polypharmacy among anabolic-androgenic steroid users: a descriptive metasynthesis                                                     | UK     | 2015 | Sagoe, D., McVeigh, J., Bjørnebekk, A., Essliffe, M.S., Andreassen, C.S. and Pallesen, S. | AAS use is associated with polypharming with a wide range of substances such as analgesics, opioids anti-oestrogens, recreational drugs such as cocaine and amphetamines, cardiovascular drugs such as beta blockers, additional ergogenic substances such as fat burners and growth hormones, image enhancement drugs such as melanotan, sexual enhancement drugs such as Viagra, depressants such as oxycodone, diuretics and nutritional supplements such as calcium and potassium. Motivations for use of additional substance concomitantly with AAS are grounded in management of side effects from AAS use, enhancing the effects of AAS use, and a variety of overlapping motivators such as enhanced well-being, sleep and appearance | First study to collate data from the qualitative literature on polypharmacy among AAS users                         | Clearly focused research question, clearly stated results. Selected the right types of papers for the research question. Literature search method described. Quality of the literature assessed using inclusion and exclusion criteria. All important outcomes considered. Applicable to the local population | Excluded articles not in English. Case reports included may have been rare events and differ from the experience of the average AAS user. Could not determine causal associations between AAS use and other drug use |

Table 5 Clinical case presentations

| Theme                                                                                       | Year | Place   | Authors                                                                               | Number of patients | Summary of findings                                                                                                                                                                                                                                                                                                 | Strengths                                                                                                                                                                                                                                       | Limitations                                                                                                                                                           |
|---------------------------------------------------------------------------------------------|------|---------|---------------------------------------------------------------------------------------|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 Hodgkin's lymphoma in a cyclist treated with growth hormone                               | 1996 | Italy   | Magnavita, N., Teofili, L. and Leone, G.                                              | 1                  | A 31-year-old male presented with right inguinal lymphadenopathy, later diagnosed as Hodgkin's lymphoma. He reported long-term use of AAS caffeine and amphetamines, in addition to four large doses of human growth hormone during his participation in competitive cycling 4 years prior to onset                 | This single case presentation contributes evidence for Hodgkin's lymphoma in a human growth hormone user and also reports on dosages administered, drug history and motivation for use (competitive cycling)                                    | No information on sourcing of IPEDs, no evidence that the substance administered was human growth hormone                                                             |
| 2 Subcutaneous oleomas induced by self-injection of sesame seed oil for muscle augmentation | 2000 | Germany | Darsow, U., Bruckbauer, H., Worret, W.I., Hofmann, H. and Ring, J.                    | 1                  | Male, 48, AAS user, presented with nodules in the pectoral area where he had injected sesame seed oil purchased in a pharmacist to augment the appearance of his pectoral muscles. Excision revealed an oil filled cyst surrounded by granuloma. The case reported that oil injection was common among bodybuilders | This single case presentation contributes evidence for adverse effects associated with oil injection in bodybuilding culture, of which there is a lack of research. IPED drug history taken from patient, sourcing of sesame seed oil described | Single case study which cannot be generalised. No information regarding sourcing of needles for oil injection                                                         |
| 3 Bodybuilder oleoma                                                                        | 2003 | Berlin  | Georgieva, J., Assaf, C., Steinhoff, M., Treudler, R., Orfanos, C.E. and Geilen, C.C. | 1                  | A 44-year-old male, bodybuilder, presented painful nodules on his arms and pectorals. Disclosed injecting use of sesame oil to augment muscle up to 120 mL week <sup>-1</sup> . Diagnosis was oleoma in the form of chronic foreign body reaction to sesame oil injection                                           | This single case presentation contributes evidence for oil injection in bodybuilding subculture, and the occurrence of adverse effects such as oleoma. Oil dosage information collected                                                         | No information collected on sourcing of injectable oil. No evidence that the oil injected was sesame oil. Incomplete IPED use history                                 |
| 4 Multifactorial hypoglycaemic coma in female bodybuilder                                   | 2005 | Poland  | Sain Anand, J., Chodorowski, Z. and Wisniewski, M.                                    | 1                  | A 31-year-old female bodybuilder presented with deep coma and hypoglycaemia. In preparation for a bodybuilding competition, she had been following a high-protein, low-carbohydrate diet, and also taking a low dose of somatotropin (human growth hormone) daily                                                   | This single case presentation contributes evidence of a female bodybuilder's use of human growth hormone, and also the occurrence of coma and hypoglycaemia in a human growth hormone user. Reports motivation for use (bodybuilding)           | No information on sourcing of human growth hormone, or evidence that the substance administered was human growth hormone. No drug history or exact dosage information |

Table 5 (continued)

| Theme                                                                                                   | Year | Place | Authors                                                   | Number of patients | Summary of findings                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Strengths                                                                                                                                                                                                                  | Limitations                                                                                                                                          |
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| 5 Anabolic steroid related abscess – a risk worth taking?                                               | 2006 | UK    | Marquis, C.P. and Maffulli, N.                            | 1                  | A 36-year-old male body builder presented with very tender bilateral deltoid abscesses with patient disclosing intramuscular steroid use, in a 10-day cycle, which included 100 mg Viramone (testosterone propionate); 300 mg Enanthate (testosterone enanthate); and 300 mg Deca – duarabolin (nandrolone). The patient did not admit to either needle or vial sharing, and intended to continue AAS use                                                                                                                                                                                                                 | This single case presentation contributes evidence for abscess in an AAS user. It also reports on dosages used, some injecting behaviour and intentions to continue use of AAS                                             | No information on sourcing of IPEDs, no evidence that the substance administered was AAS. No drug history taken                                      |
| 6 Near-fatal spontaneous hepatic rupture associated with anabolic androgenic steroid use: a case report | 2007 | UK    | Patil, J.J., O'Donohoe, B., Loyden, C.F. and Shanahan, D. | 1                  | A 43-year-old male bodybuilder presented with collapse after 2 days of stomach pain. Investigation found that he had been taking AAS for 25 years, but had ceased 4 years prior to onset of symptoms. Dosages were perceived as low compared to other bodybuilders. Medical history included Crohn's disease and recurrent deep vein thrombosis. He then had a cardiovascular collapse requiring resuscitation with blood and i.v. fluids. Three litres of blood was taken from his abdomen. A ruptured haematoma of the liver was found to be the cause of the haemorrhage. He made a slow recovery over a 20-day period | This single case presentation contributes evidence for ruptured haematoma of the liver in a long-term user of AAS, 4 years after cessation of use. Some dosage information was taken with motivation for use (bodybuilder) | No information on sourcing of AAS or evidence that product administered was AAS. No drug history taken with additional IPEDs or illicit drugs if any |

Table 5 (continued)

| Theme                                                                             | Year | Place | Authors                                | Number of patients | Summary of findings                                                                                                                                                                                                                                                                                                                                                  | Strengths                                                                                                                                                                                                                                                                                                           | Limitations                                                                                                                                                                                       |
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| 7 Strong diabetes                                                                 | 2007 | UK    | Young, J. and Anwar, A.                | 1                  | A 36-year-old male professional bodybuilder presented to emergency services with right upper quadrant pain. He disclosed a 15-year history of AAS and growth hormone use. Investigations found a 16-cm hepatomegaly with bilaterally mildly enlarged kidneys and he was diagnosed with diabetes                                                                      | This single case presentation contributes evidence for frank diabetes in a long-term AAS and growth hormone user. Due to the insulin resistance associated with growth hormone excess, the development of diabetes was likely to be attributed to the administration of growth hormone. Drug history reported (AAS) | No information on dosages of AAS or IGH administered. No information on sourcing of either drug. No evidence that product administered was AAS or IGH                                             |
| 8 Anabolic and Cardiomyopathy in a Bodybuilder: Case Report and Literature Review | 2009 | USA   | Ahgrim, C. and Guglin, M.              | 1                  | A 41-year-old male patient with past history of AAS and IGF use presented to an emergency room with abdominal pain and nausea, and was later diagnosed with heart failure. The case continued to engage in heavy weightlifting despite a diagnosis of heart problems. This is likely to have exacerbated his condition and contributed to his eventual heart failure | This clinical case report offers further evidence for a link between AAS abuse and heart failure. Complete drug history was taken from patient                                                                                                                                                                      | Single case study limits generalisability                                                                                                                                                         |
| 9 Alpha-Melanocyte-stimulating hormone-induced eruptive nevi                      | 2009 | USA   | Cardones, A., Rand, J. and Richnik, M. | 1                  | A 40-year-old male patient with a history of melanoma and multiple dysplastic nevi presented disclosing melanotan use. He had several newly developed pigmented nevi, many of which had atypical features. The preexisting nevi grew in size and deepened in colour. After he stopped using melanotan, the nevi lightened and did not grow any larger                | This single case report adds to the evidence base linking eruptive nevi and darkening of existing nevi to melanotan use                                                                                                                                                                                             | Single case study limits generalisability. Incomplete drug history reported. No information on whether solarium use. No information on melanotan sourcing, or evidence that product was melanotan |
| 10 Eruptive melanocytic nevi following melanotan injection                        | 2009 | UK    | Cousen, P., Colver, G. and Hebling, I. | 1                  | 19-year-old female. Presented with 60 new eruptive nevi after four injections of melanotan II. Described darkening of pre-existing larger moles. Heavy sunbed use was reported                                                                                                                                                                                       | This single case report adds to the evidence base linking eruptive nevi and darkening of existing nevi to melanotan use                                                                                                                                                                                             | No information on additional IPED or illicit drug use. No information on melanotan sourcing, or evidence that product was melanotan.                                                              |

Table 5 (continued)

| Theme                                                                                                      | Year | Place  | Authors                                                        | Number of patients | Summary of findings                                                                                                                                                                                                                                                                                                                                                                             | Strengths                                                                                                                                                                                                                                                        | Limitations                                                                                                                                                                                                                                                                                                                   |
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| 11 Malignant melanoma in a user of melanotan I                                                             | 2009 | USA    | Ellis, R., Kirkham, N. and Seukeran, D.                        | 1                  | A 23-year-old male with 4 weeks melanotan I use presented with enlarged and darkened pigmented lesion. Heavy sunbed use was reported. Biopsy showed the lesion to be a melanoma<br>A 39-year-old male presented with pain and unable to move his right shoulder after injecting stanazolol, an AAS into his right deltoid muscle that day. Medical examination confirmed massive rhabdomyolysis | This single case presentation contributes evidence for changes in new in melanotan users. Use of solariums was accounted for in report<br>This single case presentation contributes evidence for AAS-associated rhabdomyolysis. AAS dosage information collected | No information on additional IPED or illicit drug use. No information on melanotan sourcing, or evidence that product was melanotan<br>No information collected on sourcing of AAS. Incomplete IPED drug use history taken. No evidence that the product injected was AAS                                                     |
| 12 Rhabdomyolysis of the Deltoid Muscle in a Bodybuilder Using Anabolic-Androgenic Steroids: A Case Report | 2009 | Israel | Farkash, U., Shabshin, N. and Pritsch, M.                      | 1                  | Case 1: A 42-year-old female had two moles on her sole which had enlarged and darkened. They were benign.<br>Case 2: A 30-year-old female reported recent darkening of several moles on her back. Both had been injecting melanotan I and II sourced online. Both reported sunbed use                                                                                                           | This case series contributes evidence for changes in new in two melanotan users. It also reports sourcing route (online) and reports use of artificial UV light                                                                                                  | It is unclear whether both patients had injected both melanotan I and II concurrently, and if not, which patient had injected melanotan I or II. No information on dosages or length of cycles of melanotan administered. No information on other IPEDs or illicit drugs used if any. No evidence that product was melanotan. |
| 13 Change in moles linked to use of unlicensed 'sun tan jab'                                               | 2009 | UK     | Langan, E.A., Ramlogan, D., Jamieson, L. A. and Rhodes, L.E.   | 2                  | Collation of data from 15 patients – 1 male, 14 females – presenting with swelling on average 7 years post injection of cosmetic fillers, which ranged in composition: silicone ( $n = 9$ ), hyaluronic acid ( $n = 2$ ), collagen ( $n = 2$ ), methacrylate ( $n = 1$ ), polyalkylimide ( $n = 1$ )                                                                                            | This case series presentation contributes evidence for the occurrence of pain and swelling in users of dermal fillers several years after injection                                                                                                              | No information on sourcing of cosmetic filler                                                                                                                                                                                                                                                                                 |
| 14 Foreign body granulomatous reactions to cosmetic fillers: a clinical study of 15 cases                  | 2009 | Spain  | Sanchis-Bielsa, J.M., Bagán, J.V., Poveda, R. and Salvador, I. | 15                 |                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                               |

Table 5 (continued)

| Theme                                                                                                                                             | Year | Place  | Authors                                   | Number of patients | Summary of findings                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Strengths                                                                                                                                                                                                                                    | Limitations                                                                                                                                   |
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| 15 Sudden unexpected death in a female fitness athlete, with a possible connection to the use of anabolic androgenic steroids (AAS) and ephedrine | 2009 | Sweden | Thiblin, I., Mobini-Far, H. and Frisk, M. | 1                  | A 29-year-old female was found deceased at her home. She had a past history of alcohol abuse and disorderly conduct, but none recently. No evidence of illicit drug abuse or psychiatric illness. She was known to police for trading in IPEDs and also prostitution. Nine separate IPEDs were documented as part of her drug regimen in a diary found at her home. Clenbuterol, ephedrine, tadalafil, metandienon, mestanolon and stanozolol were all found at her home also. Cause of death was most likely to be sudden cardiac arrhythmia caused by an underlying inflammatory process in the heart and the effects of AAS and ephedrine | This single case presentation of the death of a female fitness athlete contributes evidence for fatal cardiac arrhythmia in an AAS user. Evidence that the substances ingested were AAS and other IPEDs is documented. Drug history reported | No information on sourcing of IPEDs                                                                                                           |
| 16 Foreign body granulomatous reaction of the temporal region following dermal filler administration                                              | 2010 | UK     | Avery, C. and Clifford, N.                | 1                  | A 46-year-old female presented with an increasing mass in her right temple which upon excision proved to be dermal filler foreign body reaction                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | This clinical case report offers further evidence for inflammatory reaction caused by dermal filler injection                                                                                                                                | Sourcing of dermal filler injection was not described                                                                                         |
| 17 Anabolic steroid use, dilated cardiomyopathy and compartment syndrome                                                                          | 2010 | UK     | Joynes, E.                                | 1                  | A young male reported to the emergency services with heart failure and was diagnosed with dilated cardiomyopathy attributable to recreational steroid use. At 3 month follow-up, he had no symptoms and his condition had reversed. Two weeks after admission, an above knee amputation had to be performed after compartment syndrome set in after minor trauma to the leg, which occurred during admission                                                                                                                                                                                                                                 | This single case presentation contributes evidence for heart failure, and compartment syndrome in an AAS user                                                                                                                                | No information on sourcing. No evidence that the substance used was AAS. No information on polypharming with other IPED or illicit substances |

Table 5 (continued)

| Theme                                                                                      | Year | Place   | Authors                                                  | Number of patients | Summary of findings                                                                                                                                                                                                                                                                                                                                                                                                                      | Strengths                                                                                                                                                                                                                  | Limitations                                                                                                                                                                                                                                                                                |
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| 18 Melanotan – a skin-tanning product with potentially harmful effects. A case series      | 2010 | Denmark | Kjergaard, C.T. and Dalhoff, K.                          | 3                  | Case 1: A 23-year-old female developed a haematoma after injecting melanotan.<br>Case 2: An 18-year-old female with a history of alcohol abuse and hyperventilation had hyperventilation and palpitations of the heart after taking melanotan. Nausea and abdominal pain also described.<br>Case 3: A 22-year-old male presented with difficulty in breathing, dizziness and a tingling sensation in both arms after injecting melanotan | This case series contributes evidence for a range of adverse effects in three melanotan users. Reports drug history (alcohol use)                                                                                          | No information on additional IPED use if any. No information on whether products were melanotan I or II. No information on dosages or length of cycles administered. No information on source of melanotan product, no evidence that product injected was melanotan                        |
| 19 Melatonin used for tanning induces and augments lentiginos and naevi                    | 2010 | Denmark | Thestrup-Pedersen, K., and Sondergaard, K.               | 1                  | A 25-year-old male presented with brown markings all over his body, particularly penis, having injected approx. 150 injections of melanotan. Two naevi were excised but found to be benign                                                                                                                                                                                                                                               | This single case presentation contributes evidence for changes in skin pigmentation in a melanotan user and reports dosages administered                                                                                   | No information given on whether product administered was melanotan I or II. No other IPED use history or illicit drug use history given. No information on source of melanotan given. No evidence that product injected was melanotan. No information regarding use of artificial UV light |
| 20 Pseudoleuco-derma after injections of afamelanotide in a patient with atopic dermatitis | 2011 | Germany | Von Bartenwerffer, W., Siebenhaar, G. and Hunzelmann, N. | 1                  | A 30-year-old male presented with patchy pigmentation of skin on his torso. Disclosed use of afamelanotide (melanotan I) after several visits, a total dosage of 50 mg administered over 2 months. Additional side effects he experienced included headache, nausea and fatigue. Eight weeks after cessation of melanotan use, the patchy pigmentation had resolved                                                                      | This single case presentation contributes evidence for patchy pigmentation, headache, nausea and fatigue in a melanotan user, and also reports dosages administered and whether product was disclosed to be melanotan I/II | No other IPED use history or illicit drug history given. No information on source of melanotan I. No evidence that product injected was melanotan I. No information regarding use of sunbeds                                                                                               |
| 21 Melanotan II: An unusual cause of drug-induced priapism                                 | 2012 | USA     | Devlin, J.J. and Pomerleau, A.C.                         | 1                  | A 60-year-old male with refractory priapism and a sympathomimetic toxidrome after self-injecting an unknown dose of melanotan II, sourced on the internet. Developed tachycardia, diaphoresis, hypertension and back-arching                                                                                                                                                                                                             | This single case presentation contributes evidence for priapism and systemic toxidrome associated with melanotan use                                                                                                       | Dosage of melanotan administered was unknown. No information on other drug use. No evidence that the product self-injected was melanotan                                                                                                                                                   |

Table 5 (continued)

| Theme                                                                                                                     | Year | Place     | Authors                                                                         | Number of patients | Summary of findings                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Strengths                                                                                                                                                                                                        | Limitations                                                                                                                         |
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| 22 Eruptive dysplastic nevi following melanotan use                                                                       | 2012 | Spain     | Hueso-Gabriel, L., Maticues Santos, L., Terrádez Más, L. and Santonja López, N. | 1                  | A 25-year-old male presented with sudden eruption of multiple melanocytic nevi and changes in pre-existing nevi. Use of melanotan II was reported. Histopathology revealed dysplastic melanocytic nevi, which carry a high risk of developing into melanoma, with severe dysplasia. One carcinoma was also removed. Use of artificial UV light was confirmed                                                                                                                                                                                                                      | This single case presentation contributes evidence of melanoma in a melanotan user. Use of solariums confirmed                                                                                                   | No information on additional IPED or illicit drug use. No information on melanotan sourcing, or evidence that product was melanotan |
| 23 Changes in melanocytic lesions induced by melanotan injections and sunbed use in a teenage patient with FAMMM syndrome | 2012 | Australia | Smyer, G.W.                                                                     | 1                  | A 16-year-old female presented multiple dark melanocytic naevi and an enlarging nevus in her left groin following self-administration of melanotan II. Product was sourced online. Use of artificial UV light disclosed. Three months later the patient was reviewed. She had ceased using melanotan II but still used artificial UV light frequently. Her skin and moles appeared much lighter on examination                                                                                                                                                                    | This single case presentation contributes evidence for changes in nevi in a melanotan user. It also reports whether product was disclosed to be melanotan I/II and reports sourcing route                        | No other IPED use history or illicit drug history given. No evidence that product injected was melanotan II                         |
| 24 Melanotan II injection resulting in systemic toxicity and rhabdomyolysis                                               | 2012 | USA       | Nelson, M.E., Bryant, S.M. and Aks, S.E.                                        | 1                  | A 39-year-old male injected 6 mg (six times the recommended starting dose) of melanotan II purchased online in an attempt to tan during winter. Symptoms 2 hours post injection included diffuse body aches, sweating, anxiety, mydriasis, diaphoresis, tachycardia and diffuse muscle tremors. Diagnosis of systemic toxicity with sympathomimetic excess, rhabdomyolysis and renal dysfunction. Product administered was sourced online and was tested and found to be melanotan II. Opiates were found in patient's system and patient disclosed taking an unnamed 'pain pill' | This single case presentation contributes evidence for systemic toxicity in a melanotan user. Also reports whether product was disclosed to be melanotan I/II, dosages administered, and sourcing route (online) | No information on additional IPEDs used if any                                                                                      |



Table 5 (continued)

| Theme                                                                                                                             | Year | Place | Authors                                                                                            | Number of patients | Summary of findings                                                                                                                                                                                                                                                                                                                                                                                                                                 | Strengths                                                                                                                                                                                     | Limitations                                                                                                                                                                                   |
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| 25 Anabolic androgenic steroids abuse and cardiac death in athletes: morphological and toxicological findings in four fatal cases | 2012 | Italy | Montisci, M., Mazloum, R.E., Cecchetto, G., Terranova, C., Ferrara, S.D., Thiene, G. and Basso, C. | 4                  | Using a necroscopic methodology, three cases of sudden cardiac death and one case of congestive heart failure in previously healthy athletes who used AAS are reported in this observational case series. Data confirm the most common cardiac event in AAS abusers is left ventricular hypertrophy, associated with fibrosis and myocytolysis. There was no evidence of any consumption of illicit drugs that may have contributed to these events | This case series investigation of the deaths of previously healthy athletes contributes evidence for fatal cardiac events in four users of AAS                                                | Extensive polypharmacy among AAS users makes interpretation of pathologic causes of myocardial hypertrophy may have been present, e.g. exercise itself can cause left ventricular hypertrophy |
| 26 Cerebral infarction in a young man using high-dose anabolic steroids                                                           | 2012 | Japan | Shimada, Y., Yoritaka, A., Tanaka, Y., Miyamoto, N., Ueno, Y., Hattori, N. and Takao, U.           | 1                  | A 27-year old male who had paralysis of the right side of his body, partial blindness, motor speech disturbance and double vision in the middle of weight lifting. Final diagnosis of cardioembolic stroke. He reported taking various AASs (methasterone and prostanazol) for the previous 6 months. He had no history of smoking or alcohol abuse. Routine blood studies were normal                                                              | This single case presentation contributes evidence for cardioembolic stroke in an AAS user. Some drug history taken (none)                                                                    | No information on dosages of AAS administered. No information on sourcing of AAS. No evidence that the product administered was AAS                                                           |
| 27 Melanotan and the posterior reversible encephalopathy syndrome                                                                 | 2013 | UK    | Kaski, D., Stafford, N., Mehta, A., Jenkins, I.H. and Malhotra, P.                                 | 1                  | A 20-year-old woman had a single generalised tonic-clonic seizure while boarding an airplane to return from holidays. Six days later on examination in the United Kingdom, she reported weakness of the right arm, reduced concentration and difficulties with word-finding. Two days after admission, she disclosed her melanotan II use while on holiday. Symptoms resolved over a period of 2 weeks. Some illicit drug use history disclosed     | This single case presentation provides evidence for clonic seizure in a melanotan user. It also reports drug history (illicit) and reports whether product was disclosed to be melanotan I/II | No evidence that the product injected on holiday was melanotan II, no information on source                                                                                                   |

Table 5 (continued)

| Theme                                                                                                                                  | Year | Place   | Authors                                                                                                       | Number of patients | Summary of findings                                                                                                                                                                                                                                                                                                                                                                                           | Strengths                                                                                                                                                                                                                                       | Limitations                                                                                                                                                                 |
|----------------------------------------------------------------------------------------------------------------------------------------|------|---------|---------------------------------------------------------------------------------------------------------------|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 28 Atypical melanocytic nevi following melanotan injection                                                                             | 2013 | Ireland | Reid, C., Fitzgerald, T., Fabre, A. and Kirby, B.                                                             | 1                  | A 33-year-old female presented with changes in moles after having melanotan injected on two occasions by a beautician. Use of artificial UV light was disclosed. In particular, one naevi was enlarged and darkened. Upon excision, it was found to be benign.                                                                                                                                                | This single case presentation contributes evidence for changes in nevi in a melanotan user. It also reports sourcing route (beautician) and reports use of artificial UV light                                                                  | No information on whether the product injected was melanotan I or II. No information on additional IPED or drug use if any. No evidence that product injected was melanotan |
| 29 Melanotan-associated transverse melanonychia                                                                                        | 2013 | Belgium | Paurobally, D., El Hayderi, L., Richert, B., Andre, J. and Nikkels, A.F.                                      | 1                  | A 54-year-old female presented to the dermatology department for treatment of transverse pigmented streaks on her fingernails. She disclosed use of melanotan I 4 months previously. She had sourced the product from a 'cosmetic physician'. She injected 0.4 mL once a day for 5 days. The hyperpigmentation began about 1.5 months after the injections. Patient reported not taking any other medications | This single case presentation contributes evidence for changes in pigmentation in the nails in a melanotan user. Also reports sourcing route (cosmetic physician), dosages administered, and whether product was disclosed to be melanotan I/II | No evidence that the product was melanotan I. No information on use of artificial UV light                                                                                  |
| 30 Delayed adverse effects related to hyaluronic acid dermal filler (restylane): clinical findings and treatment of oral manifestation | 2014 | Brazil  | Curi, M.M., Koga, D.H., Zardetto, C., Cardoso, C.L. and Araujo, S.R.                                          | 1                  | 65 year old female. Presented with developed oral lesions, facial swelling and nodules 12 years after hyaluronic acid dermal filler injections                                                                                                                                                                                                                                                                | This single case report adds to the evidence base on delayed dermal filler reaction                                                                                                                                                             | No information regarding sourcing of dermal filler injectable and who administered the injection to the patient                                                             |
| 31 Delayed intraoral foreign body reaction to polymethylmethacrylate                                                                   | 2014 | Brazil  | De Almeida, S., Carvalho, F.S.R., Chaves, F.N., Turatti, E., Ribeiro, T.R., Pereira, K.M.A. and Costa, F.W.G. | 1                  | 57 year old female presented with facial swelling and non-movable nodules. Silicone dermal filler injection (polymethylmethacrylate) was reported by the patient to have been administered 9 years earlier                                                                                                                                                                                                    | This single case report adds to the evidence base on delayed dermal filler reaction                                                                                                                                                             | No information regarding sourcing of dermal filler injectable and who administered the injection to the patient                                                             |

Table 5 (continued)

| Theme                                                                                                             | Year | Place     | Authors                                                                                         | Number of patients | Summary of findings                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Strengths                                                                                                                                                                                                                                                                                                        | Limitations                                                                                                                                                                                                                                                                         |
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| 32 Sudden or unnatural deaths involving anabolic androgenic steroids                                              | 2014 | Australia | Darke, S., Torok, M. and Duffou, J.                                                             | 24                 | 24 AAS-positive autopsy reports from the New South Wales Department of Forensic Medicine were analysed to determine causes of death, characteristics, toxicology and pathology. All were male, and the mean age was 31.7 years. Cause of death was largely accidental drug toxicity (62.5%), suicide (16.7%) and homicide (12.5%). Nandrolone (58.3%), stanozolol (33.3%), and methandienone (20.8%) were detected in cases. Other drugs such as psychoactives were detected in the majority of cases (66.7%). Testicular atrophy, testicular fibrosis and spermatogenesis were noted in half of all cases. Left ventricular hypertrophy was seen in 30.4% of cases and narrowing of the arteries in 26.1%. | Clearly focused research question, with appropriate method utilised                                                                                                                                                                                                                                              | Findings limited to cases that were screened for AAS. Additional cases are likely to have gone undetected. New designer AAS were not accounted for in tests. Drug histories and length and severity of AAS use could not be determined in this clinical study of case presentations |
| 33 Eruptive naevi and darkening of pre-existing naevi 24 hours after a single mono-dose injection of melanotan II | 2014 | Germany   | Schulze, F., Erdmann, H., Hardkop, L.H., Anemüller, W., Rose C., Zillikens, D. and Fischer T.W. | 1                  | A 24-year-old male bodybuilder, presented with eruption of multiple new moles and darkening of pre-existing naevi 24 hours after one single injection of melanotan II. Regular use of artificial UV light. No signs of malignancy and naevi were found to be benign                                                                                                                                                                                                                                                                                                                                                                                                                                         | This single case presentation contributes evidence for eruption of new naevi and changes in existing naevi in a melanotan user. It also reports motivation for use (bodybuilding), reports dosage administered reports use of artificial UV light and reports whether product was disclosed to be melanotan I/II | Reports that melanotan II was illegally acquired but no information on whether this was through online sources or peer selling. No evidence that product injected was melanotan II. No other IPED use history or illicit drug history given                                         |

Table 5 (continued)

| Theme                                                                                                                                        | Year | Place | Authors                                                                   | Number of patients | Summary of findings                                                                                                                                                                                                                                                                                                                                          | Strengths                                                                                                                                                                        | Limitations                                                          |
|----------------------------------------------------------------------------------------------------------------------------------------------|------|-------|---------------------------------------------------------------------------|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|
| 34 Hurdles in the pursuit of youth. A case series investigating adverse reactions associated with dermal fillers: where is the onus of care? | 2014 | UK    | Sampson, A., Cymerran, J., Kumar, M. and Messiha, A.                      | 3                  | Three patients presented with facial pain, swelling and granulomatous lesions following injections of hyaluronic acid dermal fillers. Profound psychological impact was noted in patients during the process of treatment.                                                                                                                                   | This case series presentation contributes evidence for the occurrence of pain, swelling and granulomatous lesions in users of dermal fillers.                                    | No information on sourcing of product, dosages or injecting practice |
| 35 Granulomatous foreign body reaction to dermal cosmetic fillers with intraoral migration                                                   | 2014 | USA   | Shahrabi-Farahani, S., Lerman, M.A., Noonan, V., Kabani, S. and Woo, S.B. | 25                 | Collation of data from 25 patients – female, aged 35–78 years, after dermal filler injection, either calcium hydroxyapatite (CHA) or poly-L-lactic acid (PLA). Two experienced cutaneous nodules at injection sites, whereas the remainder experienced nodules distant from injection site, signifying migration of the filler material. Five cases had pain | This case series presentation contributed evidence of nodules experienced by 25 patients after dermal filler injection and pain in 5 patients. Type of product used was reported | No information on sourcing of dermal filler                          |

Table 6 Clinical trials

| Theme                                                                                                                     | Place     | Year | Authors                                                                                                 | Methods                                                                                                                                                                                                                                                                                                                                                                                                                     | Results                                                                                                                                                                                                                                                                                                                                                                                                                 | Identified gaps in research                                                                                                                                                                                                                                                                | Strengths                                                                                                                                                              | Limitations                                                                                               |
|---------------------------------------------------------------------------------------------------------------------------|-----------|------|---------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|
| 1 Online marketing of synthetic peptide hormones: poor manufacturing, user safety and challenges to public health         | UK        | 2014 | Kimergard, A., McVeigh, J., Knutsson, S., Breindahl, T., & Stensballe, A                                | Analysis of a vial purchase online and labelled human growth hormone using a reference standard and liquid chromatographic-tandem mass spectrometry (LC-MS/MS)                                                                                                                                                                                                                                                              | Despite being labelled and sold as GHRP-2, the vials contents were found to be melanotan II                                                                                                                                                                                                                                                                                                                             | This study highlighted the potential for contamination, mislabelling and misrepresentation of compounds in the unregulated IPED market                                                                                                                                                     | Addressed a clearly focused issue. All important clinical outcomes considered. Precise results. Findings applicable to the local population                            | Findings are limited to one vial purchased from one online vendor                                         |
| 2 The effects of growth hormone on body composition and physical performance in recreational athletes: a randomised trial | Australia | 2010 | Meinhardt, U., Nelson, A.E., Hansen, J.L., Bizzi, V., Clifford, D., Leung, K.C., Graham, K and Ho, K.K. | Randomised, placebo-controlled, blinded study of 96 recreational athletes (63 male, 33 female) over 8 weeks of treatment followed by a 6-week washout period. Male volunteers were randomly administered growth hormone (2 mg day <sup>-1</sup> ) testosterone (250 mg day <sup>-1</sup> ) or a placebo, and female volunteers were randomly assigned to receive either placebo or growth hormone (2 mg day <sup>-1</sup> ) | Growth hormone had reducing effects on fat mass, and through increasing extracellular water increased lean body mass. When combined with testosterone, increases in body cell mass in men were observed. Growth hormone also improved sprint capacity in men and women but did not significantly improve athletic performance otherwise. Six weeks after cessation of the drug sprint capacity increases had diminished | Growth hormone is commonly abused by athletes in combination with AAS. Its performance-enhancing effects are as yet unidentifiable. This study aimed to determine the effects of growth hormone in isolation and in combination with testosterone on the body and its athletic performance | Addressed a clearly focused issue. Double blind, randomised control trial. Computer-generated randomization with hidden allocation. Applicable to the local population | Trial used lower dosages of growth hormone than may be typically used in reality by recreational athletes |

Table 6 (continued)

| Theme                                                                                                                         | Place | Year | Authors                                                                                               | Methods                                                                                                                                                                      | Results                                                                                                                                                                                                                                     | Identified gaps in research                                                                                                                                                                                                             | Strengths                                                                                                                                                                                                                                | Limitations                                                                                                                                                                                                                                       |
|-------------------------------------------------------------------------------------------------------------------------------|-------|------|-------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3 Identification and characterization by LC-UVMS/2014 MS of melanotan II skin-tanning products sold illegally on the internet | UK    | 2014 | Breindahl, T., Evans-Brown, M., Hindersson, P., McVeigh, J., Bellis, M., Stensballe, A., Kimergard, a | Samples of melanotan products were purchased from three online shops. Newly developed methods of liquid chromatography were used to identify the contents of vials purchased | Melanotan II was identified in all vials purchased. Varying levels of unidentified impurities were also found. Melanotan vials were sold as containing 10 mg of melanotan but vials were understrength, containing between 4.32 and 8.84 mg | New analytical methods to clearly identify melanotan II, determine contents of vials and measure levels of impurities were developed and validated. This study also provides evidence that melanotan is available on the illicit market | Addressed a clearly focused issue. First quantitative report on analysis of melanotan products sourced online. Precise results. All important outcomes considered. Methods of testing well described. Applicable to the local population | Products were sourced from three websites. Results cannot be generalised to all melanotan products for sale from these vendors nor to any other vendors online. Levels of impurities in vials were measured but impurities were not characterised |

2004). Similarly, no empirical studies could be identified on use of unregulated Botox and dermal filler online despite editorials and reports indicating high prevalence (Pickett & Mewies 2008, Pickett 2011, Coleman & Zilinskas 2013).

*Appearance of health*

The pursuit of health has also been reported as a motivator for IPED use (Cohen *et al.* 2007, Van Hout 2014). Studies have described how in order to achieve their body ideal and strength goals, recreational weightlifters commonly adhere to a strict dietary and training regime, into which IPED use is woven (Cohen *et al.* 2007, Vest Christiansen & Bojsen-Møller 2012).

Adaptation of practices which are clearly detrimental to health as part of a health conscious lifestyle is a contradiction of IPED use. This is evidenced in the clinical case report literature where users of melanotan who claim to pursue that 'healthy glow' (Van Hout 2014) are seen to have concurrent use of carcinogenic sunbeds.

Associations with AAS use and behaviours with a high risk of health harms have been found in the literature, to include illicit drug use (Pipet *et al.* 2014) including heroin abuse (Pettersson *et al.* 2010). However, there is little explanation as to why a correlation between illicit drug use and use of AAS exists. Use of AAS in current and past heroin users was found in one study in masking the physical signs of heroin addiction (Cornford *et al.* 2014). Unsafe sexual behaviours have also been found in AAS users (Hope *et al.* 2013). Use of AAS in prison residents (Cornford *et al.* 2014) and arrestees (Lood *et al.* 2012) has been described in the literature. One study also found drink driving to be a predictor for AAS use (Noone & Blanchette, 2013). There is little research to investigate perceptions of health in IPED users, where the visual representation of health is favoured over actual health.

*Body image disturbance*

Negative body image, 'muscle dysmorphia' (where the individual feels insufficiently muscular despite increasing size) and psychological traits such as depression were found in several IPED field studies (Ip *et al.* 2010, Sagoe *et al.* 2014a), suggesting body image disturbance as a motivator for use. However, one large study indicated that body image disturbance may be only present in a minority of users (Hildebrandt *et al.* 2010).

With the newly emergent tanning peptide melanotan, the issue of body dysmorphia as a motivator was raised in a letter to the *British Journal of Dermatology* by Affleck (2010), who commented on the likelihood of bodybuilders, who may also suffer from

Table 7 Editorials/reports/articles

| Theme                                                                                             | Place | Year | Authors                                                                  | Type of report | Summary                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|---------------------------------------------------------------------------------------------------|-------|------|--------------------------------------------------------------------------|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 Inappropriate Advertising of Dietary Supplements                                                | USA   | 2003 | Drazen, J.M.                                                             | Editorial      | Statement from the editors of the <i>New England Journal of Medicine</i> about advertisements regarding the sale of human growth hormone, or substances claiming to stimulate production of human growth hormone, as a well-being or anti-ageing supplement. The editors state that there is a lack of research to support the efficacy of using human growth hormone in this manner, and also that adverse effects of this practice are largely unknown                                                                                                                                                                                                                                                                         |
| 2 New developments in the illegal provision of growth hormone for 'anti-ageing and bodybuilding   | USA   | 2008 | Oshansky, S.J. and Peris, T.T.                                           | Commentary     | This commentary focuses on the illicit hGH market for anti-ageing and bodybuilding purposes. Although hGH has been scientifically proved to have benefit in children and adults with specific medical conditions, there is no evidence to suggest it will improve the health or longevity of normal individuals. A number of anti-ageing clinics and pharmacies are now operating in the business of selling hGH for unregulated purposes. It is impossible to track adverse health consequences in consumers of online hGH products. Adverse effects documented in the scientific literature include soft tissue oedema, carpal tunnel syndrome and insulin resistance                                                          |
| 3 Counterfeit botulinum toxins—a serious risk to patient safety                                   | UK    | 2008 | Pickett, A. and Mewies, M.                                               | Report         | This article reports on studies on counterfeit Dysport which has appeared in several countries. In most cases, potency of samples was mislabelled. Some samples were not tested due to poor quality of contents. Despite appearing similar to legitimate Botox, vial contents were likely to be toxic                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 4 Use of melanotan I and II in the general population                                             | UK    | 2009 | Evans-Brown, M., Dawson, R.T., Chandler, M. and McVeigh, J.              | Editorial      | This editorial discussed melanotan I and II as one of many new popular PIEDs of which prevalence is unknown. In 2008 Needle exchange services in Liverpool reported increasing numbers of melanotan users presenting for services. Melanotan is easily purchased online and has a large online community. Melanotan I (afmelanotide) is still currently undergoing trials for treatment of various skin conditions such as vitiligo. Bremelanotide is also still undergoing trials for treatment of haemorrhagic shock. Melanotan I and II are injected subcutaneously. Contaminated and mislabelled melanotan products being sold online are of public health concern. Known adverse effects include nausea and facial flushing |
| 5 Issues for DSM-V: Clarifying the Diagnostic Criteria For Anabolic-Androgenic Steroid Dependence | USA   | 2009 | Kanayama, G., Brower, K.J., Wood, R.I., Hudson, J.I. and Pope, H.G., Jr. | Report         | This report presents a commentary on the similarities and differences between later stage AAS dependence and classical drug dependence. Based on these, the report recommends adjustment be made to the existing DSM-IV to accommodate AAS dependence as a disorder                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

Table 7 (continued)

| Theme                                                                                              | Place | Year | Authors                                        | Type of report         | Summary                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|----------------------------------------------------------------------------------------------------|-------|------|------------------------------------------------|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 6 Consideration of the Anabolic Steroids                                                           | UK    | 2010 | Advisory Council on the Misuse of Drugs (ACMD) | Government publication | This report made recommendations for further research to determine prevalence of use of AAS, and also to identify demographics of users. The ACMD found that prevalence of non-medical use of AAS is difficult to determine. A range of potential harms including harms posed by counterfeit and contaminated products were identified. This report makes recommendations regarding harm reduction, legislation and future research. The report focuses on young people's use of AAS. Continuation of legislative control of AAS under the Misuse of Drugs Act 1971 was recommended                                                                                                                                                                                                                                                                                                                                                                                               |
| 7 Consider underlying body dysmorphia in users of melanotan                                        | UK    | 2010 | Afleck, A.                                     | Letter to the Editor   | This letter discusses 'anorexia' as a disorder and the link between pathological tanning and body dysmorphic disorder (BDD). The author discusses a possible link between BDD and some users of melanotan, underscoring use of melanotan by bodybuilders who may be already experiencing muscle dysmorphia, a form of BDD. A cultural emphasis on physical perfection has led to marketing of potentially harmful image enhancement drugs and practices. The desire for a year-round tan, which is heralded as a hallmark of beauty, has led to opportunistic development of tanning injectables melanotan I and II                                                                                                                                                                                                                                                                                                                                                               |
| 8 Cult of the Body Beautiful. At What Cost?                                                        | Spain | 2010 | Mataix, J                                      | Opinion piece          | Consumer demand for cosmetic injectables has fuelled a counterfeit botox market. Twenty counterfeit Botox vendors were identified and found to be located in China. Availability of fake botox, which is a potential biological weapons agent, may potentiate terrorist threats                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 9 Fake botox, real threat                                                                          | USA   | 2010 | Coleman, K.D. and Zilinskas, R.A.              | Editorial              | This report focuses on the counterfeit Botox (BoNT) market as a potential terrorist threat. In doing so, it details legitimate manufacturers of botox across the globe, and also illegitimate producers of Botox, largely based in China. These businesses sell botox through internet sites, claiming to be high quality, although it is highly unlikely that they meet the stringent safety protocols required for safe botox production. One such product name is 'beauteous'. These businesses regularly disappear from online and reappear under another name. Many of them are likely to be distributors rather than manufacturers, sourcing their products elsewhere. Many borrow product names from reputable manufacturers such as Allergan, and also deal in human growth hormone and other IPEDs. The vials sold may not contain botox at all, or understrength, overstrength or impure contents. In the case of overstrength botox this can be particularly dangerous |
| 10 Security Threat from Producers of Counterfeit Botulinum Toxin, Phase 1: Scoping out the Problem | USA   | 2011 | Zilinskas, R.A. and Coleman, K.D.              | Report                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |



Table 7 (continued)

| Theme                                                                                                                         | Place | Year  | Authors                                                      | Type of report       | Summary                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-------------------------------------------------------------------------------------------------------------------------------|-------|-------|--------------------------------------------------------------|----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 11<br>Serious issues relating to counterfeit dermal fillers available from internet sources                                   | UK    | 2011  | Pickett, A.                                                  | Letter to the editor | This letter describes an apparently counterfeit dermal filler, for self-administration, sourced online. Availability is extensive, yet there is little available information on these types of products. The dermal filler product arrived in 'sterile' pouches. The product appeared to be labelled as though it was manufactured by a company which had gone out of business. Chinese characters appeared on the labelling and the contents of one syringe had evaporated                                                                                                                                                                                                                                                                                                                                                                                               |
| 12<br>Human Enhancement Drugs: The Emerging Challenges to Public Health                                                       | UK    | 2012  | Evans-Brown, M.J., McVeigh, J., Perkins, C. and Bellis, M.A. | Report               | This report reviews what is currently known on PIEDs. It discussed the culture which supports the popularity of these drugs to include societal obsession with appearances, the adverse health outcomes such as toxicity and contamination risk and issues with legislating for the online marketing of counterfeit and mislabelled PIEDs                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 13<br>Melanotan                                                                                                               | 2012  | Spain | Mahiques-Santos, L                                           | Opinion piece        | Melanotan is an injectable peptide hormone with tanning, anorectic and libido-enhancing effects. Developed to stimulate a proprotective effect, a blackmarket has now emerged. It is popular in fitness centres and beauty salons and with people suffering from body dysmorphia. Products can be sourced online and have several potential harms including eruptive naevi, melanoma, hypertension, all of which are underresearched                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 14<br>Synthetic growth hormone releasers detected in seized drugs: new trends in the use of drugs for performance enhancement | 2015  | UK    | Stensbelle, A., McVeigh, J., Breindani, T. and Kimergard, A. | Letter to the Editor | New synthetic peptide hormones are emerging on the illicit drug market for muscle enhancement. These include growth hormone releasers CJC-1295, GHRP-2 and GHRP-6. Danish customs officers intercepted a package coming from China which contained 10 clear glass vials with no identifying labels or accompanying information. Analysis of the vial contents revealed that they contained CJC-1295, which also contained marmitol, and GHRP-2                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 15<br>Culture, Psychosomatics and Substance Abuse: The Example of Body Image Drugs                                            | USA   | 2012  | Kanayama, G., Hudson, J.I. and Pope, H.G., Jr.               | Editorial            | This editorial looks at use of drugs such as AAS to enhance the body. AAS use has transcended subcultural use by competitive athletes to mainstream society. Now millions of AAS users source the drug to enhance their appearance. This kind of drug use is largely a Western phenomenon and this editorial links psychosomatics such as the depiction of musculature in the Bible and ancient Roman literature and paintings. Whereas in the Far East, there is no such cultural history of muscle worship. It seems unlikely AAS use will infiltrate the Far East, as chemical enhancement of the body is at odds with Japanese emphasis on discipline over mind and body. However, increases in body image concerns in Asian countries, alongside the widespread use of such substances online, may lend itself to adaptation of body image drug use in these regions |

Table 7 (continued)

| Theme                                                                                       | Place | Year   | Authors                          | Type of report    | Summary                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|---------------------------------------------------------------------------------------------|-------|--------|----------------------------------|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 16 Abuse of Performance Enhancing Drugs                                                     | USA   | 2013   | Hildebrandt, T.                  | Book chapter      | This chapter focuses on AAS and their increasing use. It summarises documented psychiatric effects and discusses AAS dependence. Recommendations are made for future research to include neuroimaging in humans to investigate whether findings in rat studies can be duplicated in humans, and further research to investigate the effects of exercise in AAS users. Future work also recommended to determine what clinical intervention is most effective in AAS users                                                                                                                                               |
| 17 The Fitness Revolution: Historical Transformations in the Global Gym and Fitness Culture | 2014  | Sweden | Andreasson, J. and Johansson, T. | Theoretical paper | Since the 1970s, the fitness industry has evolved in many forms. An initial breakthrough for females in weightlifting was perhaps the 1985 film 'Pumping Iron' during the decade where general interest in fitness and working out exploded. During the 1990s, bodybuilding became a subversive to the mainstream trend through its association with drug use. Today it is still regarded as subcultural, but mainstream fitness has taken inspiration from it through the popularity of weighttraining in the general population. In the 1990s, female weightlifting grew in popularity to achieve the hard body ideal |

muscle dysmorphia, sourcing melanotan to alter their appearance. However, there is a lack of published research on body dysmorphia in melanotan users.

User sourcing

Through analysis of internet material, previous studies have found availability of AAS online to be extensive, with thousands of sites dedicated to promoting their use (Clement *et al.* 2012, Brennan *et al.* 2013a). One limitation of these studies is that vendor sites were not identified by name or URL. Identification of vendor sites may allow for monitoring and policing of the online sale of IPED.

AAS products for sale on such websites are well described in the literature and are sourced for different functions (see Table 10).

A previous study which did identify the names of 30 sites selling AAS, hGH and ancillary agents, and also purchased sample products for analysis, was published in 2010 (Cordaro *et al.* 2011). However, this study did not include melanotan products or oil injectables in their search, which have also been found in AAS user's drug regimens (Chandler & McVeigh 2013, Hope *et al.* 2013).

In the case of cosmetic injectables, Pickett's (2011) letter to the editor of the *Journal of the American Academy of Dermatology* describes a dermal filler product which he had purchased online. The product was mislabelled and appeared to be counterfeit, the contents of the enclosed syringe having evaporated in transit. However, this is the only study this review could identify which has investigated unregulated dermal filler injectables sourced online. It is difficult to ascertain whether the presentation of the injectable in this study is representative of other dermal filler injectables available in the online market. Also, as the contents of the syringe had evaporated, it was not possible to determine the composition of the product and whether it contained impurities or contaminants.

Coleman and Zilinskas (2010) also published a report on counterfeit Botox, identifying by name several online businesses which claimed to be legitimate manufacturers and suppliers of Botox, but were suspected of selling counterfeit products. This review was unable to identify any studies which purchased Botox injectables from the websites described in Coleman and Zilinskas's (2010) report.

A single study could be identified describing the sourcing of oil or Synthol injection for the purposes of muscle enhancement (Schafer *et al.* 2012). This study mentions the practice of 'homebrewing, where users follow instructions posted online to mix together their own oils for self-injection' (Schafer *et al.*

**Table 8** Quantitative studies reviewed

| Quantitative studies ( <i>n</i> = 46) |                                                                                                                                                             | Year | Country   | Authors                                                                                                                                                       |
|---------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|------|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Theme                                 |                                                                                                                                                             |      |           |                                                                                                                                                               |
| 1                                     | Gym and tonic: A profile of 100 male steroid users                                                                                                          | 1987 | UK        | Evans, N.A.                                                                                                                                                   |
| 2                                     | A preliminary investigation into the relationship between anabolic-androgenic steroid use and the symptoms of reverse anorexia in both current and ex-users | 2003 | UK        | Cole, J.C., Smith, R., Halford, J.C and Wegstaff, G.F.                                                                                                        |
| 3                                     | New challenges for agency based syringe exchange schemes: analysis of 11 years of data (1991–2001) in Merseyside and Cheshire, UK                           | 2003 | UK        | McVeigh, J., Beynon, C. and Bellis, M.A.                                                                                                                      |
| 4                                     | Anabolic steroid users' attitudes towards physicians                                                                                                        | 2004 | USA       | Pope, H.G., Jr., Kanayama, G., Ionescu-Pioggia, M. and Hudson, J.J.                                                                                           |
| 5                                     | Anabolic steroid use in weightlifters and bodybuilders: an internet survey of drug utilization                                                              | 2005 | USA       | Perry, P.J., Lund, B.C., Deninger, M.J., Kutscher, E.C. and Schneider, J.                                                                                     |
| 6                                     | UV light tanning as a type of substance-related disorder                                                                                                    | 2005 | USA       | Warhan, M.W., Uchida, T. and Wagner, R.F., Jr.                                                                                                                |
| 7                                     | Steroid and prescription medicine abuse in the health and fitness community: a regional study                                                               | 2006 | Wales     | Baker, J.S., Graham, M.R. and Davies, B.                                                                                                                      |
| 8                                     | Psychiatric side effects induced by supraphysiological doses of combinations of anabolic steroids correlate to the severity of abuse                        | 2006 | Greece    | Pagonis, T.A., Angelopoulos, N.V., Koukoulis, G.N. and Hadjichristodoulou, C.S.                                                                               |
| 9                                     | Anabolic androgenic steroids: a survey of 500 users                                                                                                         | 2006 | USA       | Parkinson, A.B. and Evans, N.A.                                                                                                                               |
| 10                                    | Tanning in body dysmorphic disorder                                                                                                                         | 2006 | USA       | Phillips, K.A., Conroy, M., Dufresne, R.G., Menard, W., DiDile, E.R., Hunter-Yates, A., Fay, C. and Pagano, M.                                                |
| 11                                    | Anabolic ergogenic substance users in fitness-sports: a distinct group supported by the health care system                                                  | 2006 | Germany   | Striegel, H., Perikles, S., Frisch, S., Roecker, K., Dietz, K., Diekhuth, H.H. and Ulrich, R.                                                                 |
| 12                                    | A league of their own: demographics, motivations and patterns of use of 1,955 male adult non-medical anabolic steroid users in the United States            | 2007 | USA       | Cohen, J., Collins, R., Darkes, J. and Gwartzney, D.                                                                                                          |
| 13                                    | Anabolic Steroid Abuse among Teenage Girls: An Illusory Problem?                                                                                            | 2007 | USA       | Kanayama, G., Boynes, M., Hudson, J.J., Field, A.E. and Pope, H.G., Jr.                                                                                       |
| 14                                    | Left ventricular early myocardial dysfunction after chronic misuse of anabolic androgenic steroids: a Doppler myocardial and strain imaging analysis        | 2007 | Italy     | D'Andrea, A., Caso, P., Salerno, G., Scarafie, R., De Corato, G., Mita, C., Di Salvo, G., Severino, S., Cuomo, S., Liccardo, B., Esposito, N. and Calabro, R. |
| 15                                    | Injecting risk behaviour and related harm among men who use performance- and image-enhancing drugs                                                          | 2008 | Australia | Larance, B., Degenhardt, L., Copeland, J. and Dillon, P.                                                                                                      |
| 16                                    | Prevalence and risk factors for anabolic-androgenic steroid abuse among Jordanian collegiate students and athletes                                          | 2008 | Jordan    | Tahtamouni, L.H., Mustafa, N.H., Alfaouri, A.A., Hassan, I.M., Abdalla, M.Y. and Yasin, S.F.                                                                  |
| 17                                    | Doping and effects of anabolic androgenic steroids on the heart: histological, ultrastructural, and echocardiographic assessment in strength athletes       | 2009 | Egypt     | Hassan, N.A., Salem, M.F. and Sayed, M.A.                                                                                                                     |
| 18                                    | Oils of local application inside of the muscle: epidemiology of the use in bodybuilding                                                                     | 2009 | Brazil    | Azevedo, M. P.A., Ferreira, A.C.D. and Ferreira, U.M.G.                                                                                                       |
| 19                                    | Human Growth Hormone Abuse in Male Weightlifters                                                                                                            | 2010 | USA       | Brennan, B.P., Kanayama, G., Hudson, J.J. and Harrison, G.P.                                                                                                  |

**Table 8** (continued)  
Quantitative studies (*n* = 46)

| Theme                                                                                                                                                                    | Year | Country         | Authors                                                                                                                                                    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 20 Body image disturbance in 1000 male appearance and performance enhancing drug users                                                                                   | 2010 | USA             | Hildebrandt, T., Alfano, L. and Langenbucher, J.W.                                                                                                         |
| 21 Women and anabolic steroids: an analysis of a dozen users                                                                                                             | 2010 | USA             | Ip, E.J., Barnett, M.J., Tenerowicz, M.J. and Perry, P.J.                                                                                                  |
| 22 Use of dietary supplements and anabolic-androgenic steroids among Finnish adolescents in 1991–2005.                                                                   | 2010 | Finland         | Mattila, V.M., Parkkari, J., Laakso, L., Pihlajamäki, H. and Rimpela, A.                                                                                   |
| 23 Substance abusers' motives for using anabolic androgenic steroids                                                                                                     | 2010 | Sweden          | Petersson, A., Bengtsson, J., Voltaire-Carlsson, A. and Thiblin, I.                                                                                        |
| 24 Sport, and use of anabolic androgenic steroids among Icelandic high school students: a critical test of three perspectives                                            | 2010 | Iceland         | Thorlindsson, T. and Halldorsson, V.                                                                                                                       |
| 25 The epidemiology of anabolic-androgenic steroid use among Australian secondary school students                                                                        | 2011 | Australia       | Dunn, M. and White, V.                                                                                                                                     |
| 26 The Anabolic 500 survey: characteristics of male users versus nonusers of anabolic-androgenic steroids for strength training                                          | 2011 | USA             | Ip, E.J., Barnett, M.J., Tenerowicz, M.J. and Perry, P.J.                                                                                                  |
| 27 Anabolic androgenic steroids in the general population: user characteristics and associations with substance use                                                      | 2012 | Sweden          | Hakansson, A., Mickelsson, K., Wallin, C. and Berglund, M.                                                                                                 |
| 28 Evaluating a measure of fanning abuse and dependence                                                                                                                  | 2012 | USA             | Hillhouse, J.J., Baker, M., Turrisi, R., Shield, A., Stapleton, J., Jain, S. and Longacre, I.                                                              |
| 29 Are people who inject performance and image-enhancing drugs an increasing population of Needle and Syringe Program attendees?                                         | 2012 | Denmark         | Iversen, J., Topp, L., Wand, H. and Maher, L.                                                                                                              |
| 30 Anabolic androgenic steroids in police cases in Sweden 1999–2009                                                                                                      | 2012 | Sweden          | Lood, Y., Eklund, A., Garle, M. and Ahlner, J.                                                                                                             |
| 31 Steroids and Image Enhancing Drugs 2013 Survey Results                                                                                                                | 2013 | UK & Ireland    | Chandler, M. and McVeigh, J.                                                                                                                               |
| 32 Prevalence of, and risk factors for, HIV, hepatitis B and C infections among men who inject image and performance enhancing drugs: a cross-sectional study            | 2013 | UK              | Hope, V.D., McVeigh, J., Marongiu, A., Evans-Brown, M., Smith, J., Kimergard, A., Parry, J.V. and Ncube, F.                                                |
| 3 Monitoring the Future national results on drug use: 2012 Overview, Key Findings on Adolescent Drug Use.                                                                | 2013 | USA             | Johnston, L.D., O'Malley, P.M., Bachman, J.G. and Schulenberg, J.E.                                                                                        |
| 34 A retrospective 30-year follow-up study of former Swedish-elite male athletes in power sports with a past anabolic androgenic steroids use: a focus on mental health. | 2013 | Sweden          | Lindqvist, A.S., Moberg, T., Eriksson, B.O., Ehrnberg, C., Rosén, T. and Fahlke, C.                                                                        |
| 35 Anabolic androgenic steroid use is associated with ventricular dysfunction on cardiac MRI in strength trained athletes                                                | 2013 | The Netherlands | Luijckx, T., Velthuis, B.K., Backx, F.G.J., Buckens, C., Prakken, N., Rietiks, R., Mali, W. and Cramer, M.J.                                               |
| 36 Predictors of Anabolic-Androgenic Steroid Usage                                                                                                                       | 2013 | USA             | Noone, J. and Blanchette, C.M.                                                                                                                             |
| 37 Long-Term Anabolic Androgenic Steroid Use is Associated with Increased Atrial Electromechanical Delay in Male Bodybuilders                                            | 2014 | Turkey          | Akçakoyun, M., Alizade, E., Gündo, R., Bulut, M., Mustafa Tabak, M., Acar, G., Avci, A., Zeki, S., Fidan, S., Demir, S., Kargın, R. and Yunus Emiroglu, M. |
| 38 Examining the Profile and Perspectives of Individuals Attending Harm Reduction Services who are Users of Performance and Image enhancing Drugs                        | 2014 | Ireland         | Merchants Quay Ireland, Homeless & Drugs Service                                                                                                           |
| 39 Characteristics and Behaviors of Older Male Anabolic Steroid Users                                                                                                    | 2014 | USA             | Ip, E.J., Barnett, M.J., Tenerowicz, M.J. and Perry, P.J.                                                                                                  |
| 40 Melanotan Injecting Survey Results                                                                                                                                    | 2014 | Ireland         | Irish Needle Exchange Forum                                                                                                                                |

Table 8 (continued)

| Quantitative studies ( <i>n</i> = 46) |                                                                                                                 |         |         |                                                                                  |         |
|---------------------------------------|-----------------------------------------------------------------------------------------------------------------|---------|---------|----------------------------------------------------------------------------------|---------|
| Theme                                 | Year                                                                                                            | Country | Authors | Year                                                                             | Country |
| 41                                    | Anabolic-androgenic steroid use among Brazilian bodybuilders                                                    | 2014    | Brazil  | Nequeira, F.R., Brito Ade, F., Oliveira, C.V., Vieira, T.I. and Gouveia, R.L.    |         |
| 42                                    | Association between AAS use, muscle dysmorphia and illicit drug use among gym frequenters                       | 2014    | Brazil  | Pipet, S., Halpern, R., Woody, G.E. and Szobot, C.                               |         |
| 43                                    | The lifetime prevalence of anabolic-androgenic steroid use and dependence in Americans: current best estimates. | 2014    | USA     | Pope, H.G., Jr., Kanayama, G., Athey, A., Ryan, E., Hudson, J.I. and Baggish, A. |         |
| 44                                    | The global epidemiology of anabolic-androgenic steroid use: A meta-analysis and meta-regression analysis        | 2014    | Norway  | Sagoe, D., Molde, H., Andreassen, C.S., Torsheim, T., and Pallesen, S.           |         |
| 45                                    | Attitudes towards use of anabolic-androgenic steroids among Ghanaian high school students                       | 2015    | Norway  | Sagoe, D., Torsheim, T., Molde, H., Andreassen, C.S. and Pallesen, S.            |         |
| 46                                    | Anabolic-Androgenic Steroid Use in the Nordic Countries: A Meta-Analysis and Meta-Regression Analysis           | 2015    | Norway  | Sagoe, D., Torsheim, T., Molde, H., Schou, C., Andreassen, C.S. and Pallesen, S. |         |

2012). However, practices such as these are not well described in the literature, with a lack of data on what products are used in homebrews.

No studies to identify vendor websites have been conducted for melanotan, synthol or dermal fillers, although the existence of such websites, and the presentation of products sold, has been discussed in previous studies (Pickett & Mewies 2008, Pickett 2011, Schafer *et al.* 2012, Breindahl *et al.* 2014, Kimergard *et al.* 2014, Van Hout 2014) to include identification of melanotan product endorsement (Van Hout 2014) (see Table 11).

Emerging drugs such as growth hormone releasers, CJC-1295, GHRP-2 and GHRP-6 (Stensbelle *et al.* 2015) and SARMS – non-steroidal selective androgen modulators (Evans-Brown *et al.* 2012) are being sold online for muscle gain despite being as yet unapproved for clinical use. There is little research into the products endorsed by users, patterns of use or outcomes of SARM use.

#### Patterns of use

In order to examine and describe patterns of IPED use in mainstream population groups, this section will group findings from the literature under themes which were present in multiple studies reviewed. The recurrence of themes in multiple studies may strengthen the validity of the theme (Marshall *et al.* 2012). These themes as found in the IPED literature are as follows: 'Moderated Use', 'Polypharmacy', 'Dosages' and 'Injecting Practice'.

#### Moderated use

It can be seen from descriptions of IPED use in surveys and internet studies that many IPED users seek to practise moderated use, utilising recommended cycling and 'safe' dosages (Cohen *et al.* 2007, Kanayama *et al.* 2009a, Chandler & McVeigh 2013, Van Hout 2014). Disassociation by this cohort from perceived problematic injecting use is evidenced in studies where participants have condemned subsets of IPED user engaging in excessive dosing and lengthy cycling (Chandler & McVeigh 2013).

#### Poly pharmacy

Drug use patterns observed in published field studies suggest extensive polypharming (use of multiple substances or agents in a complex drug regimen) among IPED users (Perry *et al.* 2005, Baker *et al.* 2006, Chandler & McVeigh 2013, Jennings *et al.* 2014). In AAS users, this polypharming typically presents as a range of 'ancillary' substances designed to complement the effects of and combat the unwanted side effects of AAS (Kanayama & Pope 2012).

Table 9 Qualitative studies reviewed

| Qualitative studies ( <i>n</i> = 15)                                                                                                                               |      |           |                                                                               |  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|-----------|-------------------------------------------------------------------------------|--|
| Theme                                                                                                                                                              | Year | Country   | Authors                                                                       |  |
| 1 Social capital: implications from an investigation of illegal anabolic steroid networks                                                                          | 2007 | Australia | Maycock, B.R. and Howat, P.                                                   |  |
| 2 Getting huge, getting ripped: a qualitative exploration of recreational steroid use                                                                              | 2008 | USA       | Petrocelli, M., Oberweis, T. and Petrocelli, J.                               |  |
| 3 Performance-enhancing drugs on the web: a growing public-health issue                                                                                            | 2010 | USA       | Brennan, B.F., Kanayama, G. and Pope, H.G.                                    |  |
| 4 Confidence by injection: male users of anabolic steroids speak of increases in perceived confidence through anabolic steroid use                                 | 2010 | USA       | Vassallo, M.J. and Orllich, T.W.                                              |  |
| 5 Selling androgenic anabolic steroids by the pound: identification and analysis of popular websites on the internet                                               | 2011 | Italy     | Cordaro, F.G., Lombardo, S. and Cosentino, M.                                 |  |
| 6 Nonprescription steroids on the internet                                                                                                                         | 2012 | USA       | Clement, C.L., Marlowe, D.B., Patapis, N.S., Festinger, D.S. and Forman, R.F. |  |
| 7 "Definitely not for women": an online community's reflections on women's use of performance enhancing drugs in recreational sports                               | 2012 | Denmark   | Jespersen, M.R.                                                               |  |
| 8 Body conceptions and virtual ethnopharmacology in an online bodybuilding community                                                                               | 2012 | Australia | Smith, A.C.T. and Stewart, B.                                                 |  |
| 9 "Will steroids kill me if I use them once?" A qualitative analysis of inquiries submitted to the Danish anti-doping authorities                                  | 2012 | Denmark   | Vest Christiansen, A. and Bojsen-Møller, J.                                   |  |
| 10 An in-depth case examination of an exotic dancer's experience of melanotan                                                                                      | 2013 | Ireland   | Van Hout, M.C. & Brennan, R.                                                  |  |
| 11 Anabolic-androgenic steroids and heroin use: a qualitative study exploring the connection                                                                       | 2014 | UK        | Cornford, C.S., Kean, J. and Nash, A.                                         |  |
| 12 An internet study of users experiences of synthetic tanning                                                                                                     | 2014 | Ireland   | Van Hout, M.C.                                                                |  |
| 13 Variability and dilemmas in harm reduction for anabolic steroid users in the UK: a multi-area interview study                                                   | 2014 | UK        | Kimergard, A. & McVeigh, J.                                                   |  |
| 14 Environments, risk and health harms: a qualitative investigation into the illicit use of anabolic steroids among people using harm reduction services in the UK | 2014 | UK        | Kimergard, A. & McVeigh, J.                                                   |  |
| 15 Qualitative study of anabolic steroids amongst gym users in the U.K.: motives beliefs, and experiences                                                          | 2015 | UK        | Kimergard, A.                                                                 |  |

**Table 10** Injectable AAS product names

| Injectable AAS product                                                                                                                                                                                                                                                                                                                 | Key features                                                                                                                                                                                                                                                                    |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Boldenone Undecylenate, e.g. Equipoise, Ganabol, Equigan and Ultragan, Boldebal<br>Dromostanolone Dipropionate, e.g. Masteron                                                                                                                                                                                                          | Stimulates red blood cell production, diverted from veterinary use                                                                                                                                                                                                              |
| Formebolone, e.g. Esiclene                                                                                                                                                                                                                                                                                                             | Anti-oestrogen effects. Recommend for use in the weeks before bodybuilding competitions. Synthetic derivative of DHT<br>Causes temporary inflammation of the muscles, creating an increase in size                                                                              |
| Methandrostenolone, e.g. Averbol, Dianabol, Danabol<br>Methenolone Enantate, e.g. Primobolan Depot<br>Methyltestosterone, e.g. Android, Testred, Virilon<br>Nandrolone Decanoate, e.g. Deca-Durabolin, Extrabolone<br>Nandrolone Laurate, e.g. Laurabolin<br>Nandrolone Undecanoate, e.g. Dynabolon<br>Stanozolol, e.g. Winstrol Depot | Useful in 'bulking up' phase where muscle is built<br>Recommended for beginners cycles, less side effects<br>Older AAS, strength-enhancing effects<br>Popular, less side effects<br>Intended for veterinary use, promotes lean mass<br>Fast acting<br>Strongest agent available |
| Testosterone Esters, Suspension and Blends, e.g. Testa C, Testoviron, Sustanol, Andriol<br>Testosterone hexahydrobencylcarbonate, e.g. Parabolan<br>Trenbolone Acetate, e.g. Trenbolone, Finaplix                                                                                                                                      | Useful in 'bulking phase'<br>No oestrogenic activity, useful in cutting phase<br>Much more effective than testosterone esters, less risk of side effects                                                                                                                        |

**Table 11** Injectable tanning peptide product names

| Injectable tanning peptide product | Key features                                                           |
|------------------------------------|------------------------------------------------------------------------|
| Melanotan I                        | More expensive, produces a more natural result which some users prefer |
| Melanotan II                       | Less expensive, produces a deep tan, anorectic                         |
| Bremelanotide                      | Lesser used, libido-boosting effects                                   |

A recent meta-analysis of the qualitative literature on polysubstance use among AAS users found that AAS use was associated with use of alcohol, opioids, analgesics, illicit stimulants and prescription depressants, diuretics, fatburners, sexual enhancement drugs and others (Sagoe *et al.* 2015c). The consumption of illicit psychoactive drugs among AAS users, which has also been described in field studies (Lood *et al.* 2012, Pipet *et al.* 2014, Sagoe *et al.* 2014d) and autopsy reports (Darke *et al.* 2014) is associated primarily with pathological AAS users, e.g. those who also engage in excessively long cycling.

Management of side effects through the use of other substances can be seen in studies of melanotan users also. A single case study of an exotic dancer using melanotan found that the case used benzodiazepines to induce sleep once she had taken melanotan, in order to avoid experiencing the nauseous feeling that followed injection (Van Hout & Brennan 2013). In Van Hout's (2014) internet study, melanotan users also disclosed smoking marijuana to combat feelings of nausea. It is of note that this internet study was limited to one melanotan-specific forum with

bodybuilding forums excluded from the study. This isolates a large body of melanotan users who polypharm with other IPEDs. There is a lack of research into the use of melanotan by users of IPEDs such as AAS, despite extensive evidence in online discussion forums of this type of use.

#### *Injecting practice*

Injection techniques of AAS users are well described in the literature, with AAS users typically injecting intramuscularly (Cohen *et al.* 2007, Larance *et al.* 2008, Pope *et al.* 2014b). Melanotan injection technique is described in Van Hout's (2014) study of the internet forum <http://melanotanforum.org>, with details of high-level harm reduction awareness among users to include sterile needle use and correct storage of product. However, this study sampled one website and isolated bodybuilding fora where varying techniques may be described.

Use of synthol is described online and in the clinical case report literature as being administered to enlarge 'lagging' muscle groups. Oil is injected directly into the muscle, sometimes in large amounts (Schafer *et al.* 2012, Brennan *et al.* 2013a). There is a lack of data in the scientific literature on the injecting practices of users of do it your self (DIY) Botox/dermal filler kits sourced online (Pickett 2011).

#### *Dosages*

Existing studies have found variability in the dosages and length of AAS cycles undertaken by users (Perry *et al.* 2005, Cohen *et al.* 2007, Chandler & McVeigh 2013). Indications are that the average cycle may have increased in duration since early recommendations of

10–12 weeks made in Llewellyn's 'Anabolics', a publication known in bodybuilding subculture as the user handbook (Chandler & McVeigh 2013). A recent report by Hildebrant (2013) describes the average cycle as between 12 and 16 weeks with dosages at 1250–1500 mg week<sup>-1</sup>.

However, cycles are dynamic, with recent studies describing a practice known as 'blast and cruise', a technique of alternating low and high dosages which results in continuous use of AAS (Chandler & McVeigh 2013, Sagoe *et al.* 2014d).

Information on dosages and cycles of melanotan use are limited to one study and describe loading and maintenance phases of dosages of 1 mg daily of tanning peptide (Van Hout 2014). Information on dosages of synthol administered can be extrapolated from the clinical case report literature which details injections of up to 1 L of oil per arm (Georgieva *et al.* 2003, Iversen *et al.* 2009, Henriksen *et al.* 2010) with dosage calculation grounded in self-experimentation and anecdotal advice (Schafer *et al.* 2012). There is a dearth of evidence on the regimens employed by users of hGH or testosterone sourced as an 'anti-ageing therapy' or 'well-being' supplement. There is online evidence to suggest that many IPED practices are not documented in the scientific literature, and are detailed in discussion forums in conversation between users. However, few studies have accessed these forums to collect such information.

#### Health risks and consequences

Prevalence of adverse effects among IPED users, and the likelihood of suffering any of the negative health consequences described in the literature is unknown. This is partially due to the poor quality of the available literature, and also due to the extensive polypharmacy among IPED users which hinders determination of causality.

Fear of disclosure of use may also lead to underestimates of adverse effect prevalence in users, as patients have been described as denying their IPED use in the clinical outcome literature (Weinreb *et al.* 2010). Previous studies have indicated a mistrust of physicians (Pope *et al.* 2004) which may lead to internet fora being the sole source of information regarding IPED use. Long-term health consequences of IPED use remain understudied. This is in part due to the relatively recent emergence of IPED use in the 1980s and 1990s, and the lack of longitudinal and observational studies to track health outcomes in users.

It would appear from the literature reviewed for this paper that there is a growing number of studies linking AAS use with cardiotoxic events and distur-

bances (Ahlgrim & Guglin 2009, Thiblin *et al.* 2009, Joynes 2010, Montisci *et al.* 2012, Akçakoyun *et al.* 2014). Significantly, multiple recent controlled studies which used cardiac magnetic resonance imaging (Luijckx *et al.* 2013) or cardiography (Hassan *et al.* 2009, Montisci *et al.* 2012) have found cardiomyopathy in AAS users. In addition to the widespread incidence of cardiac effect, the literature also reports instances of cerebral stroke (Shimada *et al.* 2012), hepatic rupture (Patil *et al.* 2007) and psychiatric symptoms, such as aggression, recklessness and depression (Pagonis *et al.* 2006, Lindqvist *et al.* 2013, Cole *et al.* 2003). Less critical side effects have also been evidenced to include rhabdomyolysis (Farkash *et al.* 2009), lipogranulomatous reaction (Weinreb *et al.* 2010), compartment syndrome and wound dehiscence (Joynes 2010), and abscess (Advisory Council for the Misuse of Drugs (ACMD) 2010, Marquis & Maffulli 2006).

Use of hGH has been associated with hypoglycaemia (Sein Anand *et al.* 2005), Hodgkin's lymphoma (Magnavita *et al.* 1996) and diabetes (Young & Anwar 2007). Liu *et al.* (2008) summarised the randomised control trial literature and reported soft tissue oedema, joint pain, carpal tunnel syndrome and fatigue in participants. However, the studies chosen for this review did not use the supraphysiological dosages which are typical in GH user regimens, and are likely to have less serious outcomes than in reality, where some users are consuming large doses for lengthy periods of time as part of an AAS cycle (Chandler & McVeigh 2013).

Projections have also been made in the literature about GH side effects from studying patients with acromegaly, a form of GH excess (Holt & Sonksen 2008). Acromegaly symptoms include cardiovascular, metabolic and respiratory effects, as well as increased cancer risk. These estimations may be more applicable than the findings of studies using much smaller dosages of hGH than is realistic. Of additional concern is the availability online of cadaveric GH from Eastern Europe, which carries the risk of potentially fatal Creutzfeldt–Jakob disease (Jenkins 2001, Rennie 2003).

Serious health outcomes found in melanotan users include melanoma (Ellis *et al.* 2009, Ong & Bowling 2012, Hjulter & Lorentzen, 2013). Causality in this regard is particularly difficult to determine as tanning beds are often used concurrently with melanotan injections (Ong & Bowling 2012, Hjulter & Lorentzen 2013), and carcinogenic potential of melanotan has not been found in clinical trials (Langan *et al.* 2010). Other serious events described in case reports include clonic seizure (Kaski *et al.* 2013) and systemic toxicity (Nelson *et al.* 2012). Less serious side effects associ-



ated with the use of melanotan include eruptive naevi or darkening/enlargement of existing naevi (Reid *et al.* 2013, Schulze *et al.* 2014, Cousen *et al.* 2009, Langan *et al.* 2009, Thestrup-Pedersen & Søndergaard 2010, Hueso-Gabriel *et al.* 2012, Reid 2012, Sivyer 2012, Schulze *et al.* 2013), and refractory priapism (Devlin & Pomerleau 2012).

Additional clinical outcomes include patchy skin (Von Bartenwerffer *et al.* 2011), haematoma, hyperventilation and palpitations (Kjærgaard & Dalhoff 2010), pigmented marks on fingernails (Paurobally *et al.* 2013), nausea and fatigue (Von Bartenwerffer *et al.* 2011) and yawning and stretching (Devlin & Pomerleau 2012).

Much of the clinical case reporting on dermal filler injectables describes inflammatory reactions, e.g. oedema, granulomas, swelling, foreign body reaction (Sampson *et al.* 2014, Shahrabi-Farahani *et al.* 2014) or rarely, systemic reactions (Alijotas-Reig *et al.* 2013). In some case reports, an inflammatory reaction is documented many years after the dermal filler has been administered (Sanchis-Bielsa *et al.* 2009, Curi *et al.* 2014, De Almeida *et al.* 2014). This may hinder proper diagnosis of the adverse event and impact on prevalence estimates of negative outcome. Synthol injection has been reported in cases of ulcerated wounds (Figueiredo *et al.* (2011), Iversen *et al.* 2009), lesions, myalgia, purpura, vasculitis (Koopman *et al.* 2005) and distortions of the muscle (Darsow *et al.* 2000, Georgieva *et al.* 2003).

#### *Injecting risks*

Traditionally, IPED injectors were seen as a group less likely to share needles, and to be less susceptible to bloodborne viruses (BBV). However, poor injecting practice among IPED users has been indicated in data from surveys (Larance *et al.* 2008, Chandler & McVeigh 2013). These found low-level needle and equipment sharing taking place. Of public health concern is a recent study which found HIV prevalence among IPED injectors to be equivalent to that found among opiate and psychoactive stimulant injectors (Hope *et al.* 2013). This is the first unequivocal evidence of BBV within IPED injectors. Findings from one study indicate a correlate between risky injecting practice and users of AAS who engage in other reckless drug use behaviours (Larance *et al.* 2008).

Analysis of the clinical case report literature on Botox injection indicates that the majority of adverse outcomes are due to inept injection technique (Cote *et al.* 2005, Avery & Clifford 2010). Users of DIY dermal filler kits purchased online (Pickett 2011) and users of synthol, who self-administer injectables, are therefore at high risk of injury and infection.

#### *Counterfeit products online*

Previous studies have evidenced instances of mislabelling, understrength vial contents and presence of contaminants in IPED products purchased from websites (Breindahl *et al.* 2014, Kimergard *et al.* 2014). One study identified over 40 sources for buying counterfeit lookalike Botox online (Pickett & Mewies 2008). Products purchased and examined from these sites had a range of presenting issues including toxins within the product, mislabelling and over and understrength contents (Pickett & Mewies 2008, Pickett 2011). In the case of Botox, overstrength product is potentially fatal (Coleman & Zilinskas 2010).

#### *Dosages*

One identified concern is the online availability of a 'peptide calculator' for melanotan users (Van Hout 2014) where the user calculates their own doses. The potential for overdose has been indicated in a single clinical case report of systemic toxicity where the user self-administered six times the recommended dose (Nelson *et al.* 2012).

#### *Dependence*

Dependence is discussed in the IPED literature largely in relation to AAS (Kanayama *et al.* 2009a, Hildebrandt *et al.* 2011). The majority of studies have used modified Diagnostic and Statistical Manual of Mental Disorders, 4th Edition (DSM-IV) criteria to assess participants for AAS dependence (Perry *et al.* 2005, Ip *et al.* 2014). However, as recently researchers have called into question the suitability of the DSM-IV as diagnostic tool for AAS dependence due to lack of traditional substance dependence symptomatology, e.g. intoxication syndrome and physiological withdrawal (Kanayama *et al.* 2009a, Hildebrandt *et al.* 2011), existing prevalence estimates of AAS dependence may be flawed.

Participant disclosures which indicate possible dependence have been reported in melanotan users (Van Hout & Brennan 2013, Van Hout 2014). Purposeful tanning behaviour has previously been indicated as high risk for dependence symptomatology in the literature (Warthan, Uchida & Wagner, 2005). However, prevalence and presentation of melanotan dependence is under-researched.

#### **Perceptions of health risk in IPED users**

Evidence of risk perceptions among users can be seen in recent studies utilising online IPED discussion forums (Jespersen 2012, Smith & Stewart 2012, Van Hout 2014). These online communities act as support systems, information points, advisors and sourcing

routes for users, and the majority take a pro-IPED use position (Brennan *et al.* 2013a).

The above studies have found that many users perceive their use as safe with manageable side effects. This management of side effects is grounded in further polypharming, often on the recommendations of other forum members (Smith & Stewart 2012, Van Hout 2014). Discussion forums can present as tight knit groups, with long-term forum members acting as 'gurus', dispatching trusted advice to include directions for injecting use of IPED.

The information that is exchanged is a mixture of scientific research and lay epidemiology. However, studies utilising internet discussion fora are limited and to date have focused on one forum per study. This potentially isolates groups of IPED users who polypharm with multiple IPEDs and may have differing risk perceptions.

User attitudes towards the risks associated with purchasing potentially contaminated products online have seldom been studied. In one single case study, the case reported no concerns about potential contamination despite having some knowledge of the dangers (Van Hout & Brennan 2013). Forum posts analysed by Van Hout (2014) indicated that melanotan users largely trusted their sources, and that this trust is built through recommendation swapping in discussion forums. This 'source checking' as a risk navigation technique is also practised in bodybuilding forums, where forum members warn each other of sellers who tout fakes (Brennan *et al.* 2013a).

#### *Methodological flaws in the IPED literature*

Of the studies reviewed, varying methodological weaknesses were noted, of which the most common is the use of self-report measures. Findings from self-report measures are reliant on the participant's disclosure of their use, and reticence to disclose use has been found among IPED users (Pope *et al.* 2004). Data from needle exchange are also restricted to service users, with some IPED users reporting sourcing needles online (Chandler & McVeigh 2013, Van Hout & Brennan 2013). Due to such methodological weaknesses in the studies reviewed, it seems likely that the prevalence of IPED use has been underestimated. This may be particularly in the case of lesser studied IPEDs such as hGH, melanotan peptides and oil and cosmetic injectables. Due to the ethical concerns associated with conducting randomised control trials with these types of drugs, the majority of the evidence for IPED health consequences is taken from clinical case reports (Iversen *et al.* 2009, Schulze *et al.* 2013, Shahrabi-Farahani *et al.* 2014) and case-control studies, which

may be subject to selection bias (D'Andrea *et al.* 2007); and retrospective self report surveys, which are subject to information bias (Pagonis *et al.* 2006, Lindqvist *et al.* 2013).

#### **Discussion**

This review aimed to collate extant literature on injecting IPED use in the general population, and to present a detailed and up-to-date analysis of findings on user profiling, motivators for IPED use in a unique injecting drug user group, patterns of use and associated risk. An additional aim was to highlight gaps in the literature base to direct future work in exploring this emergent public health issue.

Findings of global high prevalence of AAS use indicate that it is no longer confined to groups of elite competitive bodybuilders and athletes. The extent of IPED use may be larger than what is documented given the low quality of available studies. This semi-norming of injecting IPED use as a part of beauty consumerism in mainstream society has been supported by a cultural emphasis on physical appearance (Mataix 2012, Brennan *et al.* 2013b). This is compounded by a highly accessible online IPED market (Brennan *et al.* 2013a).

IPED user groups present as a new injecting drug user collective, with little scientific data available on the details of their dynamic drug use pathways and trajectories. It can be seen that where users perceive their own use to be moderated, 'acceptable' and necessary in the pursuit of health and appearance ideals, they may disassociate from potential harms. This may result in ignorance of safe injecting practice and isolation from harm reduction advice disseminated by needle exchange and drug services. New evidence which points to the presence of HIV antibodies in injecting IPED users as being equivalent to that of injecting psychoactive drug users (Hope *et al.* 2013) highlights the potential for harm among this group. Targeted harm reduction interventions designed to safeguard the health of moderated and high risk users are needed.

Mistrust of medical professionals among AAS users has been found in previous studies (Pope *et al.* 2004, Chandler & McVeigh 2013). This mistrust may contribute to reliance on forum 'gurus' for medical advice. As many forums have been found to take a pro-drug use position (Brennan *et al.* 2013a), exposure to advice given on discussion forums may escalate or complicate existing drug use patterns. A reliance on internet fora for medical advice also means there is a lack of engagement with healthcare professionals, and limited practitioner knowledge regarding these patterns of use. A non-judgemental approach needs to be adapted by health service providers engaging

with IPED users, with awareness of the existence of potentially complex IPED regimens undocumented in the scientific literature and disseminated within IPED user groups. Though the literature is expanding on IPED, some areas of IPED use remain significantly understudied.

#### *Suggested research agenda*

There is notable contrast between what is documented on IPED use in the scientific literature and what information is available online in discussion forums and internet sites dedicated to IPED use. Examples include 'homebrewing' by synthol users (Schafer *et al.* 2012), female use of synthol and use of melanotan by weighttraining subsets (Affleck 2010). Widespread availability of counterfeit Botox and dermal filler DIY kits online has been reported (Pickett & Mewies 2008, Pickett 2011); however, cosmetic injectables sourced online are underresearched, with little knowledge on the contents of kits.

Extant studies of IPED user groups which analysed discussion forum posts restricted their sampling to one forum. There is a need for larger sampling from several forums to analyse the use of IPED in a variety of subgroups – male and female recreational weightlifters, fitness enthusiasts, persistent tanners, body dysmorphics, younger and older users. In the case of a melanotan study (Van Hout 2014), the exclusion of bodybuilding fora isolated a large body of melanotan users who polydrug use with other IPED.

Overlapping of IPED from one user group to another is likely to be initiated through differing motivators. Future work is needed in examining online dialogue in order to collect information on the extensive polypharming in IPED use, and on the adaptation of high-risk practices associated with pathological use. Studies of IPED users that analyse discussion forum posts are also limited to AAS and melanotan (Smith & Stewart 2012, Van Hout 2014) with no previous studies analysing forum posts on oil and cosmetic injectables. Future online ethnographical work is needed to examine the prevalence of site enhancement oil injection, and use of cosmetic injectables sourced from the internet.

Historically, use of AAS in females has been found to be low (Kanayama *et al.* 2007). However, it is likely that the use of muscle-enhancing IPED among women has risen in recent years considering the current cultural climate which favours female weight-training (Andreasson & Johansson 2014). Some evidence of this trend of IPED use in weight training females can be seen from analysis of online forum posts (Jespersen 2012). Further research is needed into the use of AAS and other IPED by this cohort. Body

dysmorphics have also been indicated as at risk for pathological use. There is a lack of research into body image disorder in melanotan users and users of oil and cosmetic injectables.

There is limited evidence on user sourcing of IPED online and existing studies are confined to AAS. No studies to identify vendor websites have been conducted for melanotan, synthol or dermal fillers, although the existence of such websites, and the presentation of products sold, has been remarked upon in previous studies (Pickett 2011, Schafer *et al.* 2012, Van Hout 2014).

Engagement in practices which contradict a health conscious lifestyle championed by many IPED users, e.g. AAS users who follow strict diet and training schedules, and melanotan users who seek that 'healthy glow' is a conflict which needs further investigation. Future work is needed to examine what perceptions of health inform the taxonomy of beliefs fuelling IPED use.

The literature on adverse health effects in IPED users is largely confined to clinical case reports, and exact harms have never been quantified (Pope *et al.* 2014a,b). Little is known about the combined health consequences of consuming a drug regimen typical of IPED users. Granted that randomised trials are unethical, observational studies to track health outcomes in IPED users are needed.

There are no epidemiological studies investigating use of hGH as a well-being or anti-ageing drug, and research is needed into the drug regimens, motivators for use and adverse effects suffered by users of hGH in this context. New products known as SARMs – nonsteroidal selective androgen modulators – and growth hormone releasers, e.g. CJC-1295, GHRP-2 and GHRP-6, are being sold online, yet there are little data on products endorsed by users, patterns of use or drug use outcomes. Future research is needed to investigate the use of newly emergent IPED such as these, and track health consequences in users.

#### *Limitations of this review*

This review is a timely and comprehensive collation of the extant literature on injecting IPED, to summarise what is currently known on prevalence, user profiling, patterns of use and adverse health consequences. However, the review is limited by the various methodological flaws of the extant studies. An additional limitation which must be noted is the exclusion of studies not written in English.

#### **Conclusion**

The IPED literature base is compiled largely from studies with varying methodological flaws, such as

the use of self-report measures and access to users being restricted to needle exchange services. From the literature reviewed, public health concerns include injecting practice and the transmission of BBV, and the potential harms associated with the use of contaminated and counterfeit products from the unregulated online market. Some information on user profiling and patterns of use which are anecdotally described online are not as yet scientifically documented, and investigation of the unknown trajectories and pathways of injecting IPED use is warranted. This paper has underscored the need for future research to include IPED-specific internet discussion forums as an underutilised research setting, to investigate user profiling and patterns of injecting IPED use among the general population, and longitudinal studies to track health outcomes in users in consideration of the ethical concern associated with conducting randomised control trials with this cohort.

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