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Performance and image-enhancing drug use in military veterans

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Foreword

I well recall wandering around a US Forces base exchange (a tented tax-free supermarket) on operations in the Middle East 20 years ago, and being confronted by shelves stacked 10-feet high with performance and image-enhancing products. Not technically drugs perhaps: but as my more savvy friends explained, illegal in the UK. My shopping basket remained empty; some others' did not, in the naïve belief that American standards were stricter than British. Two decades later, and temptation placed before our serving and ex-serving members of the Armed Forces has only grown.

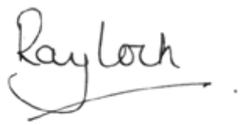
Not that we in the Armed Forces community are alone. In the field of professional sport, some athletes' reputation casts a long shadow brought on by performance enhancing drugs. Nor is this any longer limited to professional sport. Tragically, a 16-year-old at one of my local rugby clubs died having taken illegal substances to 'bulk up'. Naturally sports' governing bodies are trying to protect the men and women from this threat to their health, where they're put at risk by their desire to compete.

It would be fair to ask whether the Ministry of Defence is taking such care of its people, and in particular of those competing to meet the rigorous physical standards during initial training. It is telling how likely it is that the early stage of a military career seems to act as a gateway into more harmful substance misuse.

But that's not all. The report has also found overseas deployments offer a mixture of motive and opportunity – this chimes with my opening remarks.

There is plenty of evidence to suggest that the use of performance and image-enhancing drugs is harmful to physical and mental health, although the report makes clear that the effect of physical exercise can be improved mental wellbeing. Instinctively, and as demonstrated throughout the Covid-19 'lockdown', this feels true.

The challenge, therefore, to the authorities who are responsible for those most vulnerable to succumbing to the temptation of performance and image-enhancing drugs is to prevent gateways from opening up, and to ensure support can be accessed without fear of stigma or career limitation. If this can be underpinned with a more thorough understanding of the threat and how to balance the requirement for physical strength and stamina, as well mental wellbeing, with the risk of substance misuse, then together we will have taken an important and positive step forwards.



Air Vice-Marshal Ray Lock CBE
Chief Executive, Forces in Mind Trust

University foreword

We imagine and – perhaps unthinkingly – expect the brave men and women in our Armed Forces to be just that: fearless, impervious to danger, professional and ready to risk their own lives in response to orders.

Yet serving members of the Armed Forces, as well as veterans, are subject to the complexities of the modern world; fragile political systems; a global population bruised and battered from a ruthless pandemic; and images of perfection plastered over social media – to name but a few contemporary pressures. It is hardly surprising therefore that members of the Armed Forces, like the rest of us, are sometimes hiding vulnerabilities behind a mask of stoicism.

For that reason, I read with great interest this research on the use of performance and image-enhancing drugs by former military personnel, which was carried out by the University of Sunderland's public health research lead, Professor Jonathan Ling, and former staff member, Dr Ian Whyte. The work was done on behalf of the Forces in Mind Trust and in collaboration with the team there. The result is eye-opening.

Some of the military personnel in the studies talked of turning to drugs to modify their appearance to 'look the part' and to build muscle above what is possible in training alone. In response, we have to ask why our military personnel feel the need to subject themselves to risk of harm, through the use of drugs, to reach physical ideals impossible to attain without them? And when we have addressed that and other questions, our attention has to turn to the kinds of interventions that will help service personnel – past and present – protect their health, wellbeing, and military performance.

As a University, we are committed to supporting the Armed Forces, veterans and their families, with our work being recognised with a Gold Armed Forces Covenant Award. That is why it is particularly appropriate for us to be engaged in this study and laudable that the Forces in Mind Trust is asking these difficult questions. I am honoured that the Trust commissioned the University of Sunderland to assist in finding the answers and I commend this work accordingly.

SIR DAVD BELL KCB DL
Vice-Chancellor and Chief Executive
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2 Conflict of Interest

All authors declare that there are no conflicts of interest. The authors alone are responsible for the content and writing of the manuscript.

Contents

3 Abbreviations

APMS	Adult Psychiatric Morbidity Survey
CDT	Compulsory Drug Test
CJS	Criminal Justice System
FiMT	Forces in Mind Trust
GD	General Dimension
hGH	Human Growth Hormone
MOD	Ministry of Defence
MSK	Musculoskeletal Disorder(s)
NHS	National Health Service
PEDs	Performance Enhancing Drugs
PIEDS	Performance and Image-enhancing Drugs and Supplements
PIEDs	Performance and Image-enhancing Drugs
PTSD	Post-Traumatic Stress Disorder
UNESCO	The United Nations Educational, Scientific and Cultural Organisation
WADA	World Anti-Doping Agency

4 Executive Summary

The use of performance and image-enhancing drugs (PIEDs) among active military personnel and veterans presents a public health concern and has a potential impact on combat readiness for those still serving. As PIEDs are becoming more easily accessible through online markets, a deeper understanding of PIEDs use in military personnel and veterans is necessary. Information will help to understand what underpins their use, and interventions that aim to reduce the impact on individuals' health, wellbeing, social circumstances, public perception and, in serving personnel, any wider military performance.

Two studies were conducted for this report: a systematic review of the literature on PIEDs use in current or former personnel, followed by a qualitative study of veterans who were taking PIEDs.

4.1 Study One – Systematic review of literature

Our extensive search of UK and international literature (English language only) found little information regarding ex-Service personnel. However, 20 studies were identified for review, mostly of current Service personnel. Of the 20 papers reviewed, 14 reflected studies of USA personnel, two each from the UK and Australia, and two from Central Europe. Across all the papers, irrespective of country of origin, anabolic steroids, body building products and weight loss supplements were the most used PIEDs. Image enhancement was mentioned in most of the papers, again irrespective of country of origin, as a reason for PIEDs use, followed by keeping up with the physical and emotional demands of active duty. Additionally, young, male, non-commissioned Army personnel were noted in the reviewed literature as most likely to use PIEDs. There are clear gaps in the available literature we reviewed surrounding PIEDs use in veterans and non-active military personnel, as well as knowledge relating to when Service personnel began using PIEDs.

4.2 Study Two – Qualitative research

The second study consisted of semi-structured interviews with 14 former UK military personnel who were taking PIEDs. Following transcription, thematic analysis was conducted. This identified 62 themes, which were merged into 17 categories, and located in five general dimensions: Introduction to use; Knowledge sources; Motivation; Health and fitness; and Risk taking and safety. Key findings were that nutritional supplement (PIEDS) use was the common pre-cursor to PIEDs use, alongside interventions and support from peers and gatekeepers. Ten of the 14 respondents had taken PIEDs while serving. Although such a small sample cannot be viewed as representative of all Service personnel, the number found to have taken PIEDs while serving is proportionally higher than the literature would suggest. Motives for use were varied but getting stronger and bigger were important, as was improved body image, some of which related to perceived work demands. Knowledge was high about PIEDs, methods of administration and risks involved, although the information mostly came from the internet, peers and mentors/gatekeepers. Additionally, few veterans had experience of the Criminal Justice System (CJS) and had no links to the supply of illegal substances prior to joining up or to taking PIEDs. Five out of 14 of the cohort had sought support for mental health issues and all felt that working out in the gym helped their mental health.

4.3 Conclusion

Although further work is needed to establish the generality of these results, our findings provide a rationale for the benefit of developing bespoke interventions that aim to reduce the impact of PIEDs on health, wellbeing, and military performance.

5 Introduction

The use of performance enhancing drugs (PEDs) in sport has caused concerns for many sporting governing bodies (Maughan *et al*, 2018). The use of PEDs in sports typically includes the use of anabolic steroids, human growth hormones, erythropoietin (EPO), stimulants and other similar substances, which are collectively known as performance and image-enhancing drugs (PIEDs) (Maughan *et al*, 2018). In recent decades, PIEDs use has become well-documented within sporting literature, with recreational athletes being the largest users (Parkinson & Evans, 2006). A further study in Denmark highlighted that among recreational athletes it was young men who were most likely to use PIEDs (Bojsen-Møller & Christiansen, 2010). Findings from research conducted in the UK also identify young male gym-goers as the primary users of PIEDs (Bolding, Sherr & Elford, 2002; Santos & Coomber, 2017), though increasing evidence suggests women are more likely to engage in PIEDS use for image enhancement and weight loss (Pillitteri *et al*, 2008).

Current literature suggests that the main motivation for PIEDs use is to modify physical appearance and enhance performance by building muscle beyond what is possible from training alone (Brennan, Wells & Van Hout, 2017; Piacentino *et al*, 2017).

Use of PIEDs is not without risk (Piacentino *et al*, 2017); increasing attention is being paid to reports of negative health consequences, including organ damage, fertility problems, mental health problems and even sudden cardiac death (Darke, Torok & Duflou, 2014; Hope *et al,* 2013; Kao *et al*, 2012; van Amsterdam, Opperhuizen & Hartgens, 2010). In addition to health issues, concerns have been raised about the legality of some substances, as many PIEDs are illegal to sell and to purchase. This results in a risk of users becoming involved with criminality and violence that may accompany both the use and distribution of PIEDs (Gustafsson & Ravelius, 2014). The sale and purchasing behaviour of PIEDs, however, usually follows the model of 'social supply' (Coomber, Moyle & South, 2016). These authors define this as the sale of drugs between friends and associates for little to no profit, often to supplement a person's own use.

Users report severe uneasiness about the quality and safety of the drugs being used (Coomber & Moyle, 2014). Their report of a UK study found that the quality of PIEDs available was of low standard, with nearly all samples tested being poor-quality counterfeits. Little is known about the long-term effects of some of the substances being sold and how these interact with other medications or existing health conditions but, despite the risks, people still take them. Coomber and Moyle (2014) suggested that use is socially situated and influenced by the interaction of multiple factors. These factors override the concerns that individuals may have, using what Monaghan (2002) has referred to as a 'rhetoric of legitimisation', to justify their behaviour. Justifications fall into four categories. First, there is a *rhetoric of competency*, in which users believe that they or those who advise them are knowledgeable and that they know what they are doing (Bloor et al, 1998). Next, there is the *concept of normalised behaviour* in which users view their use as being normal in the environments in which they are operating, such as in gyms, among friends (van Hout & Kean, 2015) or even within occupational roles such as the Armed Forces or security industry (Santos & Coomber, 2017). The third category has been related to *the denial of harm* with users 'picking' drugs that made them feel healthier (Monaghan, 2002). Further, users justify to themselves that they are not drug users and are only taking, for example, sport enhancers (Santos & Coomber, 2017). The final justification comes from users *distinguishing themselves from recreational or other illicit drug users* (Kimergard, 2014), or from other PIEDs users due to being older, and thus more experienced users (Santos & Coomber, 2017).

Due to the above risks and issues, governments across the globe are concerned about the trafficking, use and misuse of PIEDs. A UNESCO-funded study found that countries have varying levels of importance attached to legislation that surrounds PIEDs use (Houlihan & Garcia, 2012). These authors categorised nations' responses into four categories:

- Category A: PIEDs-specific legislation
- Category B: General sports legislation (e.g. including violence, corruption in sport as well as doping)
- Category C: General drugs legislation (indicating where coverage of World Anti-Doping Agency [WADA] PIEDs is especially limited)
- Category D: Other legislation (medicines legislation, customs legislation, public health legislation, food, and drugs legislation).

All the countries that responded to the UNESCO survey fitted into one of those categories as they all adhered to WADA principles. Most also had legislation that related to controlling the production, movement, importation, distribution, and supply of performance enhancing drugs.

Although some research has examined PIEDs use in serving military personnel, less is known about the use of PIEDs following retirement from the Armed Forces. With the use of drugs of varying types being linked more generally to increased criminal behaviour in veteran communities (Schultz *et al,* 2015), and with negative physical, mental, and legal outcomes of PIEDs use being identified within the wider population, it is necessary to gain further knowledge surrounding the prevalence, motivations, and wider impact of PIEDs use in current and ex-Service men and women. In particular, there is a need to identify the point at which military personnel and veterans begin to use PIEDs. Do they become users in Service, after leaving the Service, or do they begin using PIEDs prior to enlisting?

There are two workstreams to this report. First, a systematic review of the literature was undertaken (Study One). This reviewed the literature on the prevalence and motivations for using PIEDs in serving military personnel and veterans. The second workstream (Study Two) was a qualitative investigation, using semi-structured interviews to gather data from former Service personnel who are current PIEDs users.

6 Research Aims

The two studies had the following aims:

1. To conduct a contemporary systematic review of the literature that exists on PIEDs use among serving military personnel and veterans.
2. To identify issues related to PIEDs use among a sample of UK ex-Service personnel.

7
Study One - Systematic Review of Literature

There is a growing concern about PIEDs use in military service personnel and veterans. A veteran is defined by the Ministry of Defence (MOD) as a person who has served at least one day in the Armed Forces - Royal Navy, British Army, Royal Air Force, Royal Marines (Ministry of Defence, 2020a). Although there are anecdotal reports of increasing availability and use of PIEDs in the Armed Forces, there is sparse evidence of this issue in a UK context. However, in the USA, a Department of Defense survey reported a 4% increase in the use of anabolic steroids between 2002 and 2011 (Barlas *et al,* 2013), with the issue being given further emphasis in a USA health and military performance symposium that was held to raise awareness of PIEDs use (Gibbens, Deuster & Kupchak, 2016).

7.1
Research aim: Study One

A greater understanding of the current literature is necessary to underpin further research specific to both the active military and veteran communities. To meet this, Study One aimed to conduct a contemporary systematic review of the literature that exists on PIEDs use among serving military personnel and veterans.

7.2
Research questions: Study One

A review of the literature was conducted to provide answers to the following research questions:

1. What are the current trends for PIEDs use in serving military personnel and veterans (including the type of PIEDs being used)?
2. What are the motivations and experiences surrounding the use of PIEDs amongst serving military personnel and veterans?
3. What are the effects of PIEDs use on mental and physical health in military personnel?
4. How are serving military personnel and veterans introduced to PIEDs (including whether their introduction was pre-, during-, or post-Service)?

8 Method

This systematic review followed the PRISMA guidelines (Moher *et al,* 2015).

8.1 Searches

In February 2019, systematic searches were conducted in the following databases: Ovid Medline, Embase, PsycINFO, PubMed and CINAHL. The databases were selected by four experienced post-doctoral researchers based on topic area, type of likely publications and the target participants. Additionally, 10 military-specific journals were hand-searched for appropriate articles. A total of 172 search terms (including wildcards) were used in the database search (see Appendix 1). Fifty-two search terms were used to identify military personnel, such as veteran, soldier, army, war-fighter and marine. One hundred and twenty search terms were used to identify performance and image-enhancing drugs, such as PEDs, PIEDs, performance enhancers, anabolic agents, and steroids. Search terms were selected through an iterative process. Initial search terms were refined by the research group and further refined as the search progressed. In addition, reference lists of identified studies were searched for 'non-database' published studies. In some cases, authors were contacted to obtain further information and for copies of articles that were not available via open access.

8.2 Inclusion and exclusion criteria

All search results were screened for inclusion by two members of the research team: details of inclusion and exclusion criteria are noted in Table 1. Any differences were resolved through consensus and consultation between the researchers and a third member of the research team. Articles were initially screened by reading the title and abstract to determine if the articles met the inclusion criteria. Full texts were screened for those articles that satisfied abstract screening or where it was unclear from the abstract if the paper involved PIEDs.

8.3 Quality assessment

All papers included were assessed for quality, although due to the lack of research studies, identified quality was not used for inclusion or exclusion. The critical appraisal skills programme checklist was used to assess the quality, and studies were assessed for bias by checking results and funders (Critical Assessment Skills Programme [CASP], 2019).

8.4 Data extraction

The data extracted from studies that satisfied the inclusion and exclusion criteria were entered into evidence tables by two researchers. The following information was extracted from each study: authors' names, year of publication, methodological approach, main findings, participant population (active/veteran, service type, and country), type of drug, adverse effects, reasons for use, and when use started.

8.5 Synthesis

Due to the variety of study methodologies and outcome measures this review did not explicitly extract and analyse numerical data. In lieu of this, the current review used a narrative synthesis approach to compare and contrast the study outcomes.

Table 1: Inclusion/Exclusion Criteria

	Inclusion criteria	Exclusion criteria
Study type	Published from 2000 to March 2019. Available in English language. Reporting original findings.	Published prior to 2000. Not available in English language. Non-original findings e.g. reviews, editorials.
Participants	Current or ex-military personnel participant sample. Navy, Army, Air-Force, Marines [although Marines form part of the Naval forces in the UK, Marines are considered a separate population in other countries, notably the USA, which identifies Marines as a separate combat force], and Military Police. Veterans were defined as persons who had served at least one day in the Armed Forces.	Non-military participant sample. Military sample was not distinguishable from other samples.
Drug type	Clear reference to performance and/or image-enhancing drugs by brand or ingredients e.g. anabolic steroids. Reference to 'bodybuilding supplements' and/or 'weight-loss supplements'.	Herbal or natural dietary supplements that had no performance or image-enhancing properties. PIEDs findings were indistinguishable from other drugs.

9
Results

9.1
Search results

Database, citation, and hand searching yielded an initial sample of 1,557 papers. After duplicate papers and papers that did not satisfy the inclusion and exclusion criteria were screened out, 43 papers were identified as relevant and full-text screening of those papers was undertaken. Of these, 20 papers met the inclusion and exclusion criteria (see Appendix 2 for a detailed PRISMA flowchart and Appendix 3 for a summary of the 20 papers).

9.2
Demographic characteristics of the relevant studies

Only one paper identified during the search was conducted using a purely veteran population. That paper pertained to a case study reporting PIEDs use of a single veteran. Two other papers included ex-Service personnel within a wider participant sample and 17 papers used a sample of active Service personnel. The Army (N=13) was the most researched branch of the military, followed by Air Force (N=6), Navy (N=5) and Marines (N=3). Five studies did not specify the Service and six studies used a sample from more than one Service. No studies reported having a specific sample of Military Police. The majority of studies reviewed were conducted with USA Armed Forces (N=14), followed by UK (N=2), Australia (N=2), Hungary (N=1) and Finland (N=1). Of the 20 papers included in the review, only one was published prior to 2010. Most studies included in the review were quantitative and utilised questionnaires (N=12). The remaining eight were qualitative, of which the majority (N=7) were case studies of individuals.

9.3
What are the current trends for PIEDs use in serving military personnel and veterans (including the type of PIEDs being used)?

There were a variety of PIEDs mentioned in the studies included in this review, with most studies investigating more than one PIED. Anabolic steroids (N=10) and weight loss supplements (N=10) were the most mentioned PIEDs and PIEDS (respectively), followed by bodybuilding supplements (N=7) and hormone boosters (N=3) (a term employed generically to describe androgenic drugs). The finding might be skewed by the fact that most of the studies were from the USA and bodybuilding (in which the reported PIEDs are employed) is common in the US Armed Forces (Jacobson *et al,* 2012).

Five studies compared the frequency of PIEDs use before, during and/or after deployment. To avoid any confusion, post-deployment refers to active service following a deployment and veteran refers to service personnel who have left the Armed Forces. The literature suggests that PIEDs are used before, during and after deployment, with the majority of the literature suggesting PIEDs use increases significantly during deployment when compared to prior or post-deployment (Lui *et al,* 2018; Paisley, 2015; Varney *et al,* 2017). This might be tied to the nature of deployment and the state of logistics support; for example, a well-supplied main base location on deployment will enable this far more than an infrequently supplied outstation.

Males were more likely to use performance-enhancing PIEDs such as anabolic steroids and body building supplements, whereas women were more likely to use more image-focused PIEDS such as weight loss supplements (Boos *et al*, 2010; Campagna & Bowsher, 2016; van der Pols *et al,* 2017; Lukács, Murányi, & Tury, 2007). Age was also highlighted as a predictive factor for PIEDs use, with younger military personnel being more likely to use PIEDs than older personnel (Boos *et al*, 2010; Casey *et al,* 2014). In addition, lower rank was also associated with higher likelihood of PIEDs use (van der Pols *et al,* 2017; Casey *et al,* 2014). Army personnel were the most likely to use PIEDs when compared to other military personnel (Lui *et al,* 2018; van der Pols *et al,* 2017). Additional factors such as excessive alcohol consumption, cigarette smoking, lower educational level, deployment experience and higher levels of physical activity were associated with PIEDs use (Boos *et al*, 2010; Jacobson *et al,* 2012; Mattila *et al,* 2010). It can therefore reasonably be surmised that, based on the literature reviewed, young, male, non-commissioned Army personnel are the most likely to use PIEDs for performance gains, albeit that serving women also use PIEDS but for differing reasons (weight loss and body image).

9.4
What are the motivations and experiences surrounding the use of PIEDs amongst serving military personnel and veterans?

The review highlighted six motivations for PIEDs use. The most cited motivation for PIEDs use was image enhancement (N=7) followed by keeping up with the physical demands of service (N=5), performance enhancement (N=2), coping with the demands of combat (N=2), keeping up with the performance of others (N=1), and peer pressure or the influence of others (N=1).

Image enhancement was reported as the most prevalent reason for PIEDs use in military personnel; this was related to weight loss, muscle growth, body dysmorphic disorder and distorted self-image (Campagna & Bowsher, 2016; Mattila *et al,* 2010; Carol, 2013). Keeping up with the physical demands of service was linked with the demands of physical expectations and the strength-based nature of military service (Boos *et al,* 2010; Jacobson *et al,* 2012; Herbst, McAslin & Kalapatapu, 2017). A qualitative study reported service personnel using PIEDs during deployment to cope with the physical demands of long patrols and also to help cope with the psychological demands of engaging in combat, holding their nerve and potentially taking another person's life (Bucher, 2012). In Bucher's study, one participant specifically detailed his struggle with deployment and the reservations he had about firing his weapon and of how PIEDs helped him to feel more aggressive and able to engage in combat. This aspect of aggression and combativity is supported by Austin, McGraw & Lieberman's (2014) quantitative study of USA Army and Air Force personnel. Additionally, participants mentioned the influence of others both from a performance comparison perspective, as well as peer pressure (Austin *et al,* 2016). Some participants specifically mentioned using PIEDs as they were promoted by Service medical personnel (Bucher, 2012).

9.5
What are the effects of PIEDs use on mental and physical health in military personnel?

Across the 20 studies involved in the review, several adverse effects of PIEDs use on physical and mental health were mentioned. The literature presented cases of physical health concerns such as haemorrhagic stroke, severe liver injury, rhabdomyolysis, pancreatitis, insomnia, headaches and muscle spasms (Mattila *et al,* 2010; Brazeau *et al,* 2015; Harris, Winn & Ableman, 2017; Lianne & Magee, 2016; Magee *et al,* 2016; Young *et al,* 2012). Mental health concerns such as panic attacks, extreme aggression, negative self-image, disturbing thoughts and behavioural change were reported following PIEDs use (Paisley, 2015; Varney *et al,* 2017; Boos *et al,* 2010; Herbst, McCaslin & Kalapatapu, 2017; Bucher, 2012; Young *et al,* 2012; Austin, McGraw & Lieberman, 2014).

9.6
How are serving military personnel and veterans introduced to PIEDs (including was their introduction pre-, during-, or post-Service)?

Of the papers included in the review, only four studies alluded to how users were first exposed to PIEDs. The small amount of data available suggests that PIEDs use often begins with combat deployment, and one participant also mentioned beginning PIEDs use in basic training (Lui *et al,* 2018; Bucher, 2012). This contrasts with other studies that suggested PIEDs use may have begun following a break from Armed Forces training due to leave or injury (Carol, 2013; Herbst, McCaslin & Kalapatapu, 2017). However, the body of research investigating when PIEDs use began in Armed Forces users is limited, so any generalisation must be treated with caution.

Although many studies did not investigate when Service personnel began using PIEDs, some studies did question how they acquired or purchased PIEDs. The literature included in the current review suggests that Service personnel either purchased PIEDs online, from other countries when visiting or from fellow members of the Armed Forces (Boos *et al,* 2010; Herbst, McCaslin & Kalapatapu, 2017; Bucher, 2012). For example, in a qualitative study, participants mentioned travelling to Mexico when stationed in southern USA to purchase anabolic steroids in pill form or to receive anabolic steroid injections (Bucher, 2012). In addition, other participants in Bucher's study mentioned purchasing anabolic steroids from other members of the Armed Forces, including Army medical staff. This was corroborated by the testimony of an Army medical officer who stated that he started using PIEDs himself after supplying others

with anabolic steroids (Bucher, 2012). Less is known about purchasing PIEDs amongst the UK military, albeit one study of a British military sample suggested that 43% of PIEDs and supplements (PIEDS) purchased by their sample of Service personnel were purchased whilst on deployment and sourced locally on base in Basra or Kuwait. Others purchased their PIEDs in the UK or Germany (13.8%) and online (10.8%) (Boos *et al,* 2010).

9.7
Methodological flaws in the current literature

Of the studies included in the current review there were different methodologies: qualitative (N=8) and quantitative (N=12). The majority of the qualitative studies used a case study approach (N=7). To better understand details of the motivations and experiences of a PIEDs user, a qualitative methodology would seem most appropriate due to the depth of detail that can be gathered about the lived experiences of users. Thus, the lack of qualitative research makes it difficult to gain a deeper understanding of the personal motivations and experiences of PIEDs users in the military. Also, due to the ethical implications involved in conducting randomised control trials with drugs that are not for the the purpose of improving health, most findings that are related to health impact, and the side effects of PIEDs use come from clinical case studies. Only one case study included in the current review focused entirely on PIEDs use in veterans, and even then, only presented the case of a single veteran (Herbst, McCaslin & Kalapatapu, 2017). Another study included both serving personnel and veterans but did not separate the groups, so did not allow for analysis of PIEDs use in veterans only (Lui *et al,* 2018).

All 20 of the studies used versions of self-report measures (including the case-studies), thus reports of PIEDs use were reliant on military personnel's accurate and truthful disclosure of their PIEDs use. As PIEDs use could potentially affect an active service person's fitness for duty (e.g. health consequences such as haemorrhagic incidents) or even lead to reprimand and disciplinary sanction (Ministry of Defence, 2013), many military personnel involved in the studies may not have been honest about their PIEDs use. Additionally, there is concern about memory decay that is inherent in self-reported historical accounts of experiences (e.g. Cansino, 2009). Due to the reliance on self-report measurements, it is possible that PIEDs use has been underestimated, as this is the case in many studies using self-reporting to measure drug use (Hunt *et al,* 2019). Additional confusion relating to the use of self-report measures will be caused in cases where personnel may be taking certain supplements but may be unclear as to what type of PIEDs are included and in what concentrations. There was a large variety of different PIEDS and PIEDs identified during the current review, and many of the PIEDS branded as weight loss supplements or body building supplements had a variety of different PIEDs ingredients. Many supplements mentioned in the clinical case studies, such as proprietary 'fat burners' (Carol, 2013), pre-workout formulas (Harris, Winn & Ableman, 2017), and protein shakes (Young *et al,* 2012) were bought without clear knowledge or labelling relating to their performance-enhancing ingredients.

10 Discussion

This literature review aimed to collate and critically review existing literature of PIEDs use among serving military personnel and veterans in the UK and abroad. Further, this review aimed to highlight any gaps in the literature to act as a base for future studies. The findings of the current review highlight that PIEDs use is reported in the active military across all Armed Forces, albeit that the studies found were predominantly of USA origins. The scarcity of appropriate literature, along with the reliance on self-reporting of PIEDs use, makes it difficult to relate these trends to the wider population of Armed Forces personnel in the UK or beyond. Moreover, the confusion over the definition of PIEDs and the debate over the inclusion or exclusion of more general bodybuilding supplements caused further disparity in the research. Furthermore, the general accessibility bordering on acceptability of PIEDs use in the military (and in the general population) compounds the issue (Brenan, Wells & Van Hout, 2017; Van den Ken & Koenraadt, 2017). This perceived degree of 'acceptability' removes many barriers that may discourage the use of PIEDs (Bandura, 2002; Boardley, Grix & Dewar, 2014), and to some extent, it could be argued that use is condoned in certain circumstances.

PIEDs are potentially harmful to the health and service readiness of military personnel. The literature presents damaging attitudes towards PIEDs use in military personnel (e.g. Bucher, 2012, Paisley, 2015), with studies suggesting some personnel consider PIEDs use as acceptable and necessary to meet the physical and psychological demands of their job (Austin *et al,* 2016; Boos *et al,* 2010). Some of the reasons surrounding the use of PIEDs in the military could be deemed an understandable response, albeit perhaps misplaced, specifically the qualitative findings in which participants mentioned needing to use PIEDs to feel able to cope with the demands of training, physical testing, and to cope with the physical and psychological burdens of combat deployment (Bucher, 2012). As there was only one qualitative study included in the current review that did not use a small sample, it is apparent that further qualitative research using a larger cohort is necessary to obtain more robust and generalisable findings, and a stronger and broader understanding of the attitudes and perceptions of PIEDs use in military personnel and veterans.

One thing that is apparent from the findings of many of the studies included in this review is that PIEDs use is resulting in potentially dangerous physical and behavioural changes in Service personnel, such as increased risks of haemorrhagic stroke, liver damage, and severe behaviour change (Boos *et al,* 2010; Brazeau *et al,* 2015; Magee *et al,* 2016). These findings mirror the scientific statement that Pope *et al* (2014) presented to the Endocrine Society. Potential harm is recognised, such that throughout the UK needle exchanges and other support structures are offering specialised services (e.g. for anabolic steroid users) and have seen markedly higher attendances from PIEDs users compared with other drug users (Kimergård, & McVeigh, 2014).

The impact of PIEDs use on the physical health of active military personnel and veterans is much more clearly presented than the impact on their mental health. Many of the studies presenting scientific findings related to the health impact of PIEDs use in military personnel and used a case study methodology. Using such a methodology is relevant and appropriate for investigation into the health impact of drug use, but does not allow for suitable generalisation to the wider military population. This is due in part to the small numbers that formed those studies (five of the reviewed papers were case studies of single participants), and in part to the nature of those studies in which serious and potentially life-threatening cases were being presented. Thus, there is a problem with the reliability (the replicability) of the findings to larger populations. The quantitative studies included in this review had larger participant sample sizes but presented several other methodological issues. Little research addressed the attitudes and influences surrounding the initial use of PIEDs by Service personnel, with only two studies mentioning this in some capacity when Service personnel began taking PIEDs (Lui *et al,* 2018; Bucher, 2012). The information presented was limited and did not present a suitable level of clarity on how active military personnel and veterans were introduced to PIEDs. Moreover, notwithstanding that some studies in this review mixed active with non-active personnel, there was a dearth of literature relating specifically to veterans' use of PIEDs. Given the concerns about veterans' health, including mental health, further empirical research is needed with this group.

In summary, there are clear gaps in the current literature surrounding PIEDs use in military personnel, and even more so of PIEDs use in military veterans. Further research is necessary to gain a deeper understanding of how active military personnel and veterans are introduced to and begin taking PIEDs, and what motivations underpin PIEDs use in these populations.

10.1 Implications

This review presents the currently available and relevant literature about PIEDs use in active military personnel and in veterans. However, the review is limited by the small number of studies available on the subject matter, restrictive methods of data collection employed within those studies and an over-reliance on self-report measures of PIEDs use. In addition, this review only considered studies written in English, which may present a further limitation to the number of papers included. From the literature presented herein, there are clear health concerns related to PIEDs use in military personnel and a potential impact on combat readiness. In addition, the research presented seems to suggest certain groups of military personnel feel that PIEDs use is necessary to keep up with the physical and psychological requirements of their post, which could present a cause for concern within the Armed Forces and the wider community. The current review has underscored the need for further and more detailed research into the experiences and perceptions of PIEDs users among serving personnel and veterans, and how this drug use affects their short-, medium- and long-term lives.

10.2
Summary – Study One

SUMMARY – STUDY ONE	
Aims	The aim was to conduct a systematic review of the literature on PIEDs use among serving military personnel and veterans to answer the following research questions: • What are the current trends for PIEDs use in serving military personnel and veterans (including the type of PIEDs being used)? • What are the motivations and experiences surrounding the use of PIEDs amongst serving military personnel and veterans? • What are the effects of PIEDs use on mental and physical health in military personnel? • How are serving military personnel and veterans introduced to PIEDs (including was their introduction pre-, during-, or post-Service)?
Current trends identified in the literature	• Anabolic steroids (PIEDs) as well as weight loss and body building PIEDS are the most prevalent forms of supplements used by this population. • PIEDs use starts or increases during deployment. • Males tend to use muscle and body-building drugs and supplements, with females more likely to use weight loss supplementation. • Most PIEDs users in the military are younger, male, lower ranked Army personnel. • Links were identified to other substance misuse, with excessive alcohol and cigarette use reported.
Motives for PIEDS use	• Improved image and coping with physical and psychological demands of the job were cited as main motives for PIEDs use.
Physical and mental health impacts of PIEDS use	• Multiple physical impacts were reported in the literature, from relatively minor headaches and muscle spasms to haemorrhagic stroke and ultimately death. • Impact on mental health included panic attacks, extreme aggression, and negative self-image.
Introduction to PIEDS use	• Users were commonly introduced to PIEDs during deployment or during/following a break from training (e.g. leave or injury). • PIEDs were acquired in other countries when on deployment. • Peers were noted as gatekeepers or suppliers.
Limitations of study one	• Most studies were of US Forces, which are culturally and operationally different to the UK Armed Forces. • Three studies included veterans; all others were of serving personnel. • Many of the studies were single person case-studies of clinical incidents. • Inclusion criteria stated that papers had to be published in English language, which might have reduced input.

11
Study Two – Qualitative Research

11.1
Introduction

There are multiple concerns about the purchase and use of non-prescribed drugs, including the quality of the drugs being taken, the dosages taken by users, the cleanliness of the injection methods (e.g. dirty, shared needles) and the effects of the drugs, especially but not exclusively when taken in combination with other drugs. UK media picked up on the issue of PIEDs use in Forces personnel (e.g. Shute, 2013), highlighting concerns that Service men and women were involved in PIEDs use and identifying the same potential health risks. Alongside these health-related issues are concerns about the illegality of the sale of PIEDs, the 'underworld' from which they emanate, users potentially becoming part of the 'sales team' (see van de Ven & Mulrooney, 2017; Coomber *et al*, 2014) and the general criminality and violence that often accompanies the use and distribution of PIEDs. Following our systematic review (Study One), it was apparent that little work had been undertaken with ex-military personnel, though some work had been undertaken with Service personnel and had identified some issues around PIEDs use. Therefore, while the former has been quantified, little is known about use of PIEDs on leaving the Armed Forces. With negative physical, mental, and social outcomes being identified, it is necessary to investigate the uptake of PIEDs by ex-Service men and women.

Study Two was therefore envisaged as an exploratory study, using qualitative data collection. As it would be the first study of its type specifically looking at PIEDs use in this target group, the results are important in their own right. However, we also believe that the study could provide a strong foundation from which a larger quantitative study could be designed.

Study Two was developed to be robust in terms of its aims, methodology and methods, while also providing data for subsequent analysis and potential future use. It is important to identify a range of issues related to PIEDs use, including what is being used and how it is being accessed, and to understand the motivations and mental health status of users to identify why they became users. Previous work has identified that the majority of PIEDs users are introduced through circumstances and environment (gateways) or by key people (gatekeepers) with whom they were in contact (Coomber *et al*, 2014; van de Vens & Mulrooney, 2017). We believe that this is an important aspect on which to focus.

In addition to the above, there is little known about the histories of those who use PIEDs. As part of this study, we identified whether ex-Service personnel who are now users became users in-Service or whether they used PIEDs prior to enlisting. Given that age on enlistment might be thought to mitigate against this, it is worth noting that there is increasing prevalence of PIEDs use among school students and other adolescents (Harris, Dunn & Alwyn, 2016; Till *et al*, 2015; Zahnow *et* al, 2018). Moreover, given that the sale of proscribed PIEDs is illegal and that links are being identified with criminal activity, we also wished to investigate previous or current history of PIEDs users with the Criminal Justice System, as well as how PIEDs have been and are being accessed. Finally, given the potential for negative consequences of PIEDs use, we also sought to understand what experiences and awareness users have of the negative consequences of taking PIEDs to inform the development of interventions and education programmes.

11.2
Research aim: Study Two

Study Two aimed to identify issues related to PIEDs use among a sample of UK ex-Service personnel.

11.3
Research questions: Study Two

Five research questions were developed to ensure that the aim was met:

1. What are the underlying motives for the use of PIEDs amongst ex-Service personnel in our sample?
2. How are ex-Service personnel introduced to PIEDs (including whether their introduction was pre-, during-, or post-Service) in our sample?
3. What are the histories of ex-Service PIEDs users with the Criminal Justice System (CJS) in our sample?
4. What knowledge do ex-Service PIEDs users have of the consequences of drug and supplement use in our sample?
5. What was the reported mental health status of ex-Service personnel who used PIEDs at the outset, and subsequently in our sample?

12 Method

This study follows what is known as an interpretivist/constructivist paradigm (Cresswell, 2003). This is where the researcher relies upon the participants' descriptions and perceptions of their experiences and beliefs (through interviewing or observation, for example) to understand the world as it is from the subjective experiences of those individuals, in this case concerning PIEDs use (Mertens, 2005). This method also recognises that researchers bring their own background and experiences to the interpretation of their research, and as such, meaning is derived from the subjective relationship between the researcher and participants. Theory or patterns of meaning are then generated from the data through a process of inductive analysis, i.e. a systematic procedure for analysing qualitative data where the **analysis** is guided by specific objectives (Cresswell, 2003; Thomas, 2006).

Corresponding with the interpretivist approach, a qualitative method was employed, using semi-structured interviews to gather data.

Further, enumeration was employed to highlight numbers of participants who subscribed to a particular view or theme; this provided an indication of weight for any given theme, albeit that singular accounts of any issue were still dealt with as important data.

12.1 Recruitment and ethics

Two gatekeepers were approached to assist the recruitment process. As the project developed, the second gatekeeper withdrew due to personal family issues.

Following initial contact from one of the gatekeepers, the study was outlined to our participants, including the confidentiality of the process. An information sheet was then sent or given by hand to all possible participants, providing them with full information. Subsequently, provided they agreed to the details laid out in the information sheet, each participant was then asked to complete an Informed Consent form. Ethical approval was granted by the University of Sunderland Research Ethics Sub-Committee (approval number 004364).

Sampling

Purposive sampling was employed using the method of 'snowballing' for recruitment. Purposive sampling involves identifying and selecting individuals with knowledge or experience in the area or topic of your interest, in this case PIEDs use (Cresswell & Plano Clark, 2011; Palinkas *et al,* 2013). Snowballing, also known as 'chain referral', occurs when one participant nominates another potential participant(s) to be used in the research (Naderifar, Goli. & Ghaljaei, 2017). It was intended that approximately 15 former tri-Service participants would be interviewed. The literature suggests that this number is likely to provide sufficient data until a point of theoretical saturation is reached where nothing new of relevance is found amongst the interview data (Fusch & Ness, 2015).

12.2 Participants

To ensure that the study was as accurate, representative, credible, and consistent as possible, consideration was given to the requirements that would be needed for participants in terms of inclusion and exclusion criteria.

12.3 Inclusion criteria

- Participants needed to be ex-Service personnel, of any rank, who were current users of PIEDs.
- Participants needed to be aged 18 or above.
- Both male and female sexes were included.

12.4 Exclusion criteria

- Populations defined as 'sports athletes', unless being an athlete was secondary to their role in the Armed Forces.

These exclusions allowed for focus on participants who are users of PIEDs for both physical and body image development, but while increased strength or endurance may be an outcome of training with those, they are not taken with a view to enhance competitive sport performance.

12.5 Data collection

After a pilot, confidential semi-structured interviews took place and were recorded. These were guided by a topic guide developed from information elicited from the review of literature (Study One): issues deemed important by the team, and specific areas highlighted in the project aims, such as questions around any previous use of PIEDs or other substances, and/or experience of the CJS. As is normal in qualitative interview studies, the topic guide was flexible to encompass issues that surfaced from previous interviews.

Demographic data were also captured, as well as responses to questions that were more directly related to PIEDs use and issues surrounding such behaviour.

12.6 Procedure

Interviewees were sent a WAV file copy of their interview by email. They were asked to listen to it and inform the interviewer within seven days of any issues or concerns they had and any changes that they would like to have made to the recordings prior to transcription. There were no requested changes from participants.

12.7 Analysis

Following transcription of 14 interviews that lasted a total of eight hours 12 minutes, 184 pages of A4, 1.5 spaced, 11-point text, with 44,360 words were available for analysis.

The analysis commenced with uploading the transcripts into NVivo 12 Software (QSR International, Australia: https://www.qsrinternational.com/nvivo/nvivo-products/nvivo-12-plus). Next, following Mayring's (2000) guidelines, transcribed texts were tagged for meaning units (i.e. a word, phrase, sentence, or a bigger chunk of text, such as a paragraph that describes or 'means' something). Each meaning unit was apportioned to a theme in NVivo through an approach in which meaning units were initially given descriptors (i.e. embryonic themes); the descriptor headings were then used as an umbrella under which other similar meaning units could be catalogued. The iterative nature of this meant that themes developed organically from the text, with new ones being added where meaning units were unable to be placed under an existing theme. Meaning units and relative groupings were consistently scrutinised and amended if deemed appropriate, as analysis progressed.

On completion of the analyses of all transcripts, the draft themes were considered to look for overlaps and inappropriate interpretation. Once done, a meeting of the research group was held to review the analysis and suggest amendment if this was thought appropriate.

These procedures ensured that any outputs would not only help to build a framework for understanding the topic, but would also inform further research (Thomas, 2006).

"You know, you take two or three 'products' at the same time or in a cycle to get max benefits. One will build lean muscle, the other will rip you out, while the other helps recovery. It all makes sense when you are doing it."

13 Results

The results are presented in two parts: participant information using relatively 'simple' data that describes mainly historical personal events (e.g. when enlisted, CJS contact, when participants started taking PIEDs and mental health issues); and secondly, the results of the thematic analysis showing themes identified from the data.

13.1 Participant information

Despite efforts to recruit males and females from across the three Services, most of the participants were male and from an Army background. Only two (both males) were ex-Navy, and the one female who was identified for interviewing also came from an Army background- (Appendix 4). We were unable to recruit former RAF personnel who met the inclusion criteria.

The bulk of the interviewees were late 20s to early 30s years of age (mean age = 32.14 years; range 26 to 44 years of age). All respondents had served in either Iraq or Afghanistan and one respondent had also been deployed to Bosnia. The Naval veterans had worked specifically on base and on active duty off the shore of Iraq during that operation.

Half of the participants exited at the rank in which they had been recruited, with the remainder having gained some form of promotion. This is by itself an interesting finding as, with a mean Service history of 7.3 years, there would be the expectation that more than 50% of personnel would have been promoted. Given the small sample size, too much cannot be made of this, but it might be a variable that is considered in future studies. Although the female respondent wished to be designated as a nurse, she noted that she was a corporal.

Their military experiences varied, with most signing up at 18 years of age (Mean = 18.6 years, range 18-20) and having between six and 10 years of service (Mean = 7.3 years). Participants had been retired from their respective Service between one and 17 years (Mean = 6.28 years – this was skewed by two participants who exited 14 and 17 years ago respectively). If the two outliers were excluded, the mean average of time retired from Service now becomes 5.18 years, which sits comfortably with the median value of 5.5 years out of Service.

One key finding related to the mean time veterans reported taking PIEDs (Mean = 7.93 years, median 6.5 years). However, the range was large, with one respondent reporting being a user for one year (M4), but others reporting 12 to 22 years of use (M1; M17; M13). As can be seen in Appendix 4, 10 of the users reported taking PIEDs while in-Service.

All but three of the participants were now in full-time employment, undertaking a wide variety of roles from car mechanic to social care work. Three of the participants classed themselves as unemployed. However, through the course of the interviews it was ascertained that they also undertook part-time security work. Thus, they were included in the total of six participants who were involved in what they termed security work (that included being a doorman or 'bouncer').

Gym training began prior to joining up for all participants, saying that they needed to make sure that they could pass the physical:

> *I'd always thought of myself as fit but when I saw what I needed to do for the physical, I knew that I had some work. Luckily, my old PE teacher and school helped me ... stopped me slacking off but made sure I was doing the right things in the right way and not wasting time* (M10)

This work continued through basic training (see below) and for the majority, was maintained through their time in the Armed Forces (the exception being Seaman-M6).

All respondents were current users of PIEDs, and all injected them. Of the 14 users, 11 had also taken oral PIEDs, and all took supplements which were mainly nutritionally-based such as amino acids. The range of drugs taken was extensive, with all having used testosterone or other anabolic agents (Figure 1). Participants reported that they used (variously) nandrolone, stanozolol, oxandrolone, trenbolone and anadrol, or noted some of the product names (Winstrol; Testoris; Virormone; Oxandrin). Eleven of the participants, all male, also took human growth hormone (hGH), naming products including somatripinine, norditropin, salzen and genotropin. A further 10 interviewees spoke of taking insulin. Those 10 considered themselves as 'stackers', whereby they took multiple pharmacological products to enhance effects. One 'stacker' said:

> *The team [other gym users] stack, well most of us do in here [the gym]. You know, you take two or three 'products' at the same time or in a cycle to get max benefits. One will build lean muscle, the other will rip you out, while the other helps recovery. It all makes sense when you are doing it* (M10)

Five participants used amphetamines with the reasons varying from being down (depressed) to losing weight:

> *I was feeling far from happy, so I got a script [prescription] from the doctor for them* (F8)

> *I use them to lose weight as [it] suppresses my appetite. It's a fine line but, as you can lose body muscle and tone if you go too far (*M11)

Seven of the interviewees also used diuretics to 'cut'[1] for body building competitions (four respondents), or for projecting an image; *...to look good on the beach* (M4). Finally, nine of the participants took HCG (Human Chorionic Gonadotrophins) such as Tamoxifen. Those nine veterans had a chronic history of use as this drug is employed by what might be considered sophisticated users; it helps manage side effects of PIEDs or helps get back to normal functioning at the termination of PIEDs use, as it stimulates the testes to produce testosterone.

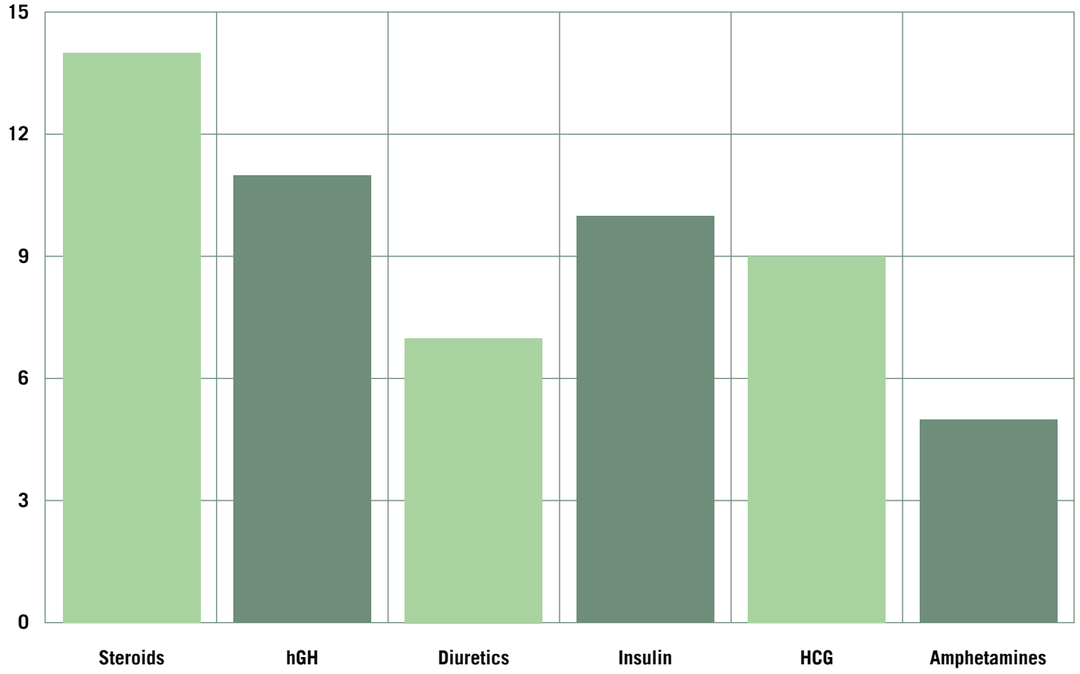


Figure 1: Substances taken by veterans

[1] Cutting is a term used in bodybuilding to reduce body fat percentages to look more 'ripped', or muscularly defined. In this context it is about cutting or reducing the amounts of fluids to make the body look leaner.

13.2 Criminal Justice System

There was a specific question in the topic guide to identify to what level the people in this study had experience of the Criminal Justice System. Only three of the participants had any experience of the CJS - two for disorderly behaviour as 16-year-olds, and one for being drunk and disorderly at 18. The first two had been admonished (given a verbal warning or a caution) on appearance at court, while the third had appeared in the Magistrates Court for Breach of the Peace. Breach of the Peace is not a criminal offence in the UK so not punishable in court; however, this third participant said that he was bound over to keep the peace in future. On questioning, none of the participants reported any links to taking or selling illegal drugs or substances prior to enlisting. However, this contrasts with later statements made in the flow of conversation in which sniffing glue and under-age drinking were divulged as 'youthful activities', and taking ecstasy at music festivals, smoking cannabis and 'scoring' lines of cocaine were part of social lives prior to and during Service.

13.3 Thematic analysis

Thematic analysis of the transcripts resulted in the identification of 778 meaning units. They were ascribed to 62 themes, before being reduced to 17 categories such as fitness, size gains, work demands, and body image, which were located into one of five general dimensions (Appendix 5). The general dimensions were ascribed as: *INTRODUCTION TO USE OF PIEDS; MOTIVATION FOR USE OF PIEDS; KNOWLEDGE SOURCES ABOUT PIEDS AND RELATED ASPECTS; HEALTH AND FITNESS CONSEQUENCES; RISK TAKING AND SAFETY*. The results will be presented under each of the general dimensions.

13.3.1 General dimension No 1 - Introduction to use of PIEDs

This general dimension (GD) consisted of responses from three categories, totalling 12 themes. The data were in response to key questions about the timings of when users started to take PIEDs and what roles other people played in their decision. This also covered aspects of their personal histories of taking other substances, including supplements. The categories reflected how the participants felt they had been introduced to PIEDs (Figure 2).

The three categories identified under this GD were: *Cultural Aspects of Service*, *Gatekeepers* and *Previous History of Substance Abuse*.

Cultural Aspects of Service

The first named category was so titled as it reflected comments about needs and practices that seemed to be culturally accepted, even if not promoted in the Services. These included issues related to level of fitness required to be successfully recruited into the Armed Forces, and once recruited, the fitness level required to handle the demand of 'basics' (i.e. basic training). One veteran noted that he started training and using supplements prior to his military career:

> *It pretty much started in the recruiting office when I sussed that I wasn't fit enough to make the cut to get in. I started on a training plan with [legal] supplements* (M2)

This was echoed by others in the sample. Comments were also made about the need to appear 'macho' in the Armed Forces, and this encouraged several of the interviewees (six out of 14) to highlight this situation:

> *There was this constant demand to be a man, to show to everyone that you were a real man and that involved being fit and showing that you could take it* (M12)

A more worrying factor voiced by the majority of ex-Service personnel (12 of 14) was the concept of 'beasting' and the role that played in taking supplements to cope, and in a few cases, instigated PIEDs use. Veterans reported that 'beasting' involved repetitive, punishing physical drills and training in an effort to get personnel fit and [they felt] to 'weed out' those who may not suit the Armed Forces. A former infantry private commented:

> *We were 'beasted' at various times in my career for the sake of it...the only way to get through it was to take stuff* (M2)

Another said:

> *Beasting was the hardest part of it. I've no idea why it needed to be done as most of us were seriously motivated to do well anyway, or at least as well as we could and that's all that should be asked for. There were grown men in tears at times. That starts a culture of doing whatever you need to get through and for me that meant taking supplements and some pills* (M9)

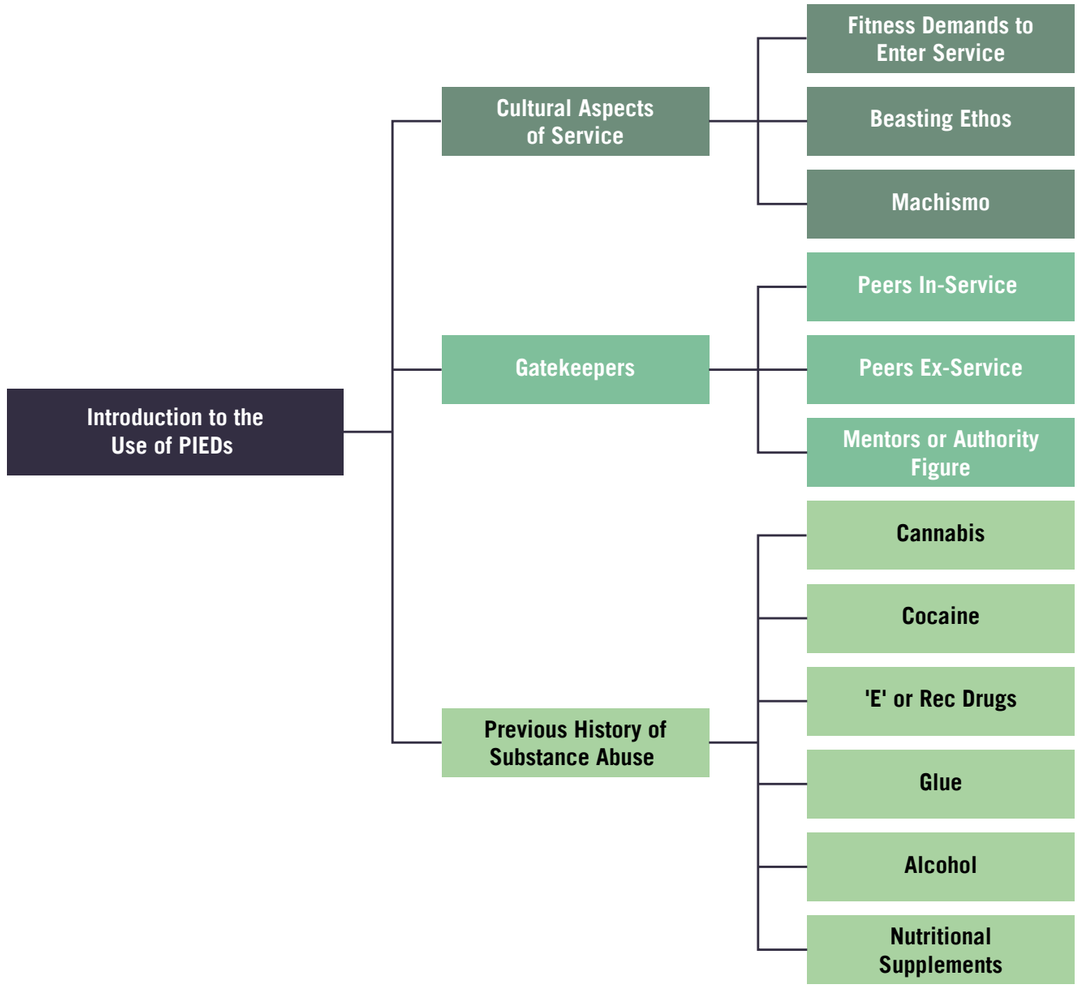


Figure 2: General dimension entitled *Introduction to the use of PIEDs,* consisting of three categories from twelve themes

Gatekeepers

The second category reflected the role of others in the users' introduction to PIEDs. All 14 respondents took PIEDS (supplements) while serving, although only 10 admitted to taking PIEDs while still serving in the Armed Forces. Those 10 were encouraged to take PIEDs by peers. In response to a question about how they found out about PIEDs in the Armed Forces, one respondent said: *Just talking to others, like, they would say, if you want to get there fast then you need some gear* [drugs] (M11). This aspect of peer support was even more important for users who began taking PIEDs on leaving the Armed Forces. As with users in the general population (Andreasson & Johansson, 2014), our veterans all reported peer influences who were mainly other gym users who took PIEDs. One interviewee responded to a question about the physical task of injecting PIEDs: *Mates in the gym, or from the job, told me what to take, and when and how to do it. He then showed me [how to inject the] first time to prove it wasn't sore* (M13). Another simply noted: *My mates tell me what I need, how much, what it cost, and who to buy from* (M9). Mentors or people in leadership roles similarly played a big part in introducing users, some of whom had no previous history or desire to take PIEDs:

> *People I looked up to and asked for help, you know, supporting and shadowing [helping to lift] and technical stuff, started to say that they knew how to get stronger faster* (M4)

> "Who is taking them? Who isn't?! Everyone takes them that is working out properly, serious like. You can't do without them. Natural diets don't get you bigger."

This highlights that, despite the small sample size, 10 of the interviewees who had started taking PIEDs while in the Armed Forces had sought or were offered help – a point that can be linked to findings in the literature (e.g. Coomber *et al,* 2014; van de Ven, 2017).

Previous History of Substance Abuse

The final category in this GD reflected whether our veterans had previously taken illegal substances. None of those who administered PIEDs saw themselves as heavy users of other drugs, recreational or otherwise. Most of them had 'dabbled' in taking cannabis, sniffing glue and underage drinking and all knew that there were risks in so doing. One male said:

> *Like loads of the lads back home we took anything we could to get a buzz, glue, lighter fuel, anything. We knew it could kill but it was never going to happen to you* **(M10)**

They were also aware of the illegality of buying and selling drugs or taking alcohol as a minor, but this made no difference, as the (only) female interviewee noted:

> *I never took anything much, not even drinking. I looked young and didn't want to get done for under-age drinking or something. I had some Es [MDMA/Ecstasy] at a music festival; everyone was at it there, so it seemed OK, part of the experience, the culture. We knew there was dodgy stuff about, but you still took it* (F8).

This may provide some indication as to why taking PIEDs was not viewed as morally problematic by most of the users, and links partly with Bandura's Theory of Moral Disengagement (Bandura, 2002; Boardley, Grix & Dewar, 2014). This theory proposes that individuals rationalise unethical or unjust actions to justify their behaviours as being appropriate. For example, a steroids user might justify taking steroids 'because everyone else is taking them.' Despite there being little evidence of a current harmful drinking or recreational drug-taking culture amongst the veterans in this study, one agent that was used by all users, and which they all felt preceded their access to PIEDs, was the use of various nutritional supplements (PIEDS). One question around supplements use received this reply:

> *Who is taking them? Who isn't?! Everyone takes them that is working out properly, serious like. You can't do without them. Natural diets don't get you bigger* (M1)

Another responded:

> *I never injected before but have took supplements for years...creatine, amino acids, recovery powders...* (M12)

Thus, there seems to be a firmly established link between taking dietary supplements to enhance training effects with onward progression to PIEDs. That is not to say that all supplement users will take PIEDs, but that legal nutritional supplement use, when accompanied by other factors, may escalate to illegal supplement use (Yager & O'Dea, 2014). The fact that ex-Service personnel reported that they were encouraged (or certainly not discouraged) from taking nutritional supplements while serving, is an issue that needs consideration.

13.3.2
General dimension No 2 - Motivations for using PIEDs

This dimension had four key categories aligned with it. The first three were personal and related to what might be considered as intrinsic reasons, while the other was more externally motivated through meeting perceived work demands (Figure 3).

Fitness (gains*)*, *Size* (gains*)* (or hypertrophy) *Body Image* (improvements*)* and *Work Demands* were all reported as motives by the majority of interviewees, with between 10 and 14 of the respondents responding in these categories. All participants had multiple motives.

Motivation - Fitness

Strength improvements were motives cited by many of the respondents, with a former lance corporal stating:

> *I wanted to look good – not enormous just buff – to be strong and fast. I was doing Taikwondo and wanted to be powerful. So, ... we worked on strength first but then on power to do things quicker, better for a quick jab when it might be needed ... I got much better and [my] body looked ace too* (M1).

Another interviewee sought strength gains while also noting that the visible benefits to body image and strength provided further incentive to continue:

> *My main thing was to improve strength and the improvements were unbelievable... taking Winstrol [a steroid], I was a different man in three to four weeks nearly. It was scary... didn't double in strength but felt like it. It means, you just, like want to keep going, or in my case take more* (M5)

For most users improved endurance was not a key motive, but for some stamina did have a motivational role:

> *I felt I wanted to do more and more and once I was taking the gear was able to go on for ever. [In] fact I increased my time in the gym from about 70 mins a night to near three hours, but it allowed me to use my time and keep lifting* (M9).

Motivation - Size

Size gain played its part in motivating users with a considerable majority denoting this as a factor, often linked to looking good:

> *I just wanted bigger guns [biceps] and pecs, the lasses liked them where I'm from* (M13)

> *One day, walking past some girls I heard one of them say, 'Look at the size of his guns.' That did it for me, it was always about getting bigger after that* (M2)

Motivation - Body Image

While fitness and size improvements were often linked with body image, there were those that cited body image

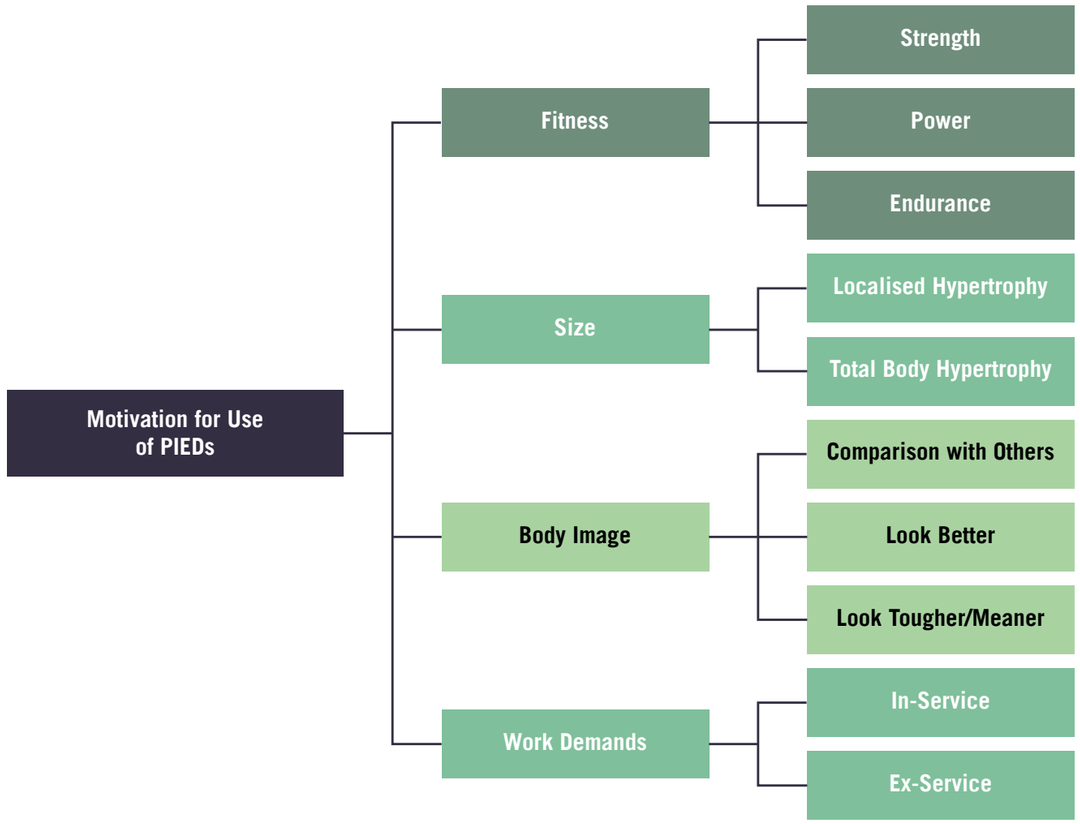


Figure 3: General dimension entitled *Motivations for use of PIEDs,* consisting of four categories from ten themes

"We were working and walking among locals not knowing whether you would be attacked by a hostile, so the bigger and meaner and tougher you looked the better it made you feel. Wouldn't have stopped an IED but made me and some of the lads feel better, adding by way of further justification: ...and anyhow, if not out on patrol, camp was boring, so you are actively encouraged to keep fit and the Yanks [American troops] showed us what to take and where they got it."

specifically as a key motive. For example, the only female interviewee had started body-building training and said:

> *I found myself in a culture where I wanted to look as good as others, and especially the lads. I wanted to feel respected by the guys and how I looked formed a big part of the respect chain ... along with how I lifted* (F8)

Respondent M11 said that he, *... just wanted to look less weedy* while 'looking good' was of significance for a former seaman:

> *There are mirrors everywhere. I just wanted to look good in them and as I got bigger, I always glanced at them and loved the way I looked... in windows, passing cars. It made me feel great* (M4)

Motivation - Work Demands

Alongside looking better for personal reasons, 10 of the respondents wanted to look tougher or meaner. At first analysis it was thought that this was related to the security industry in which some users worked following their time in the Armed Forces. An interviewee provided support for this assumption:

> *The job I do can be dangerous, drunks and drugged punters trying to get in the premises. I need to be able to stop them if necessary and preferably without trouble. I just needed to look like I could do the business* (M3)

This view was confirmed by another user:

> *The job is tough, and I need to look tough and like I can handle myself. It stops bother before it starts. Looking big is part of it and being able to push naughty lads around is too* (M13)

However, further analysis found that most of those who identified with this motive started PIEDs use while in the Armed Forces; the work demands that they spoke of were those of conducting patrols in enemy territories:

> *We were working and walking among locals not knowing whether you would be attacked by a hostile, so the bigger and meaner and tougher you looked the better it made you feel. Wouldn't have stopped an IED but made me and some of the lads feel better (M7), adding by way of further justification: ...and anyhow, if not out on patrol, camp was boring, so you are actively encouraged to keep fit and the Yanks [American troops] showed us what to take and where they got it.*

13.3.3
General dimension No 3 - Knowledge sources about PIEDs and related issues

Given that significant health risks are associated with PIEDs use (e.g. hepatitis, Brazeau *et al,* 2015; exertional rhabdomyolysis – serious kidney failure, Carol, 2013; haemorrhagic stroke, Harris *et al,* 2017; HIV, Hope *et al,* 2013; death, Darke *et al*, 2014), it was felt that this was an important area to be probed in this project. Questions had two key foci. Firstly, what do the respondents know about fitness training in general, about PIEDs use and about health implications associated with taking PIEDs? Secondly, where do they get their information for those issues? This dimension was constructed with three categories and a total of 13 themes (Figure 4).

The categories were identified as knowledge around *Fitness and Training*, knowledge about *PIEDs Use and Mode of Administration* and knowledge of *Medical Issues*. While it was important to find out what the users knew about the above, we felt that given the potential gravity of use, it was important to identify from where users got their knowledge, information, and support or assistance.

Knowledge Sources - Fitness and Training

Even though all participants reported gatekeepers who helped them to start taking PIEDs, either by offering advice or in practical terms of telling them what to get and from whom, once using PIEDs they continually updated their knowledge. The internet was the most used method of seeking information, with all 14 respondents reporting this across both fitness-related and PIEDs-related knowledge. One respondent said:

> *I use the body building sites a lot, there're masses of tips and knowledge there. Masses of programmes to follow for best results* (M9)

Alongside the internet, literature from either books or magazines, especially specialist 'strength' magazines, still accounted for a substantial area of knowledge and

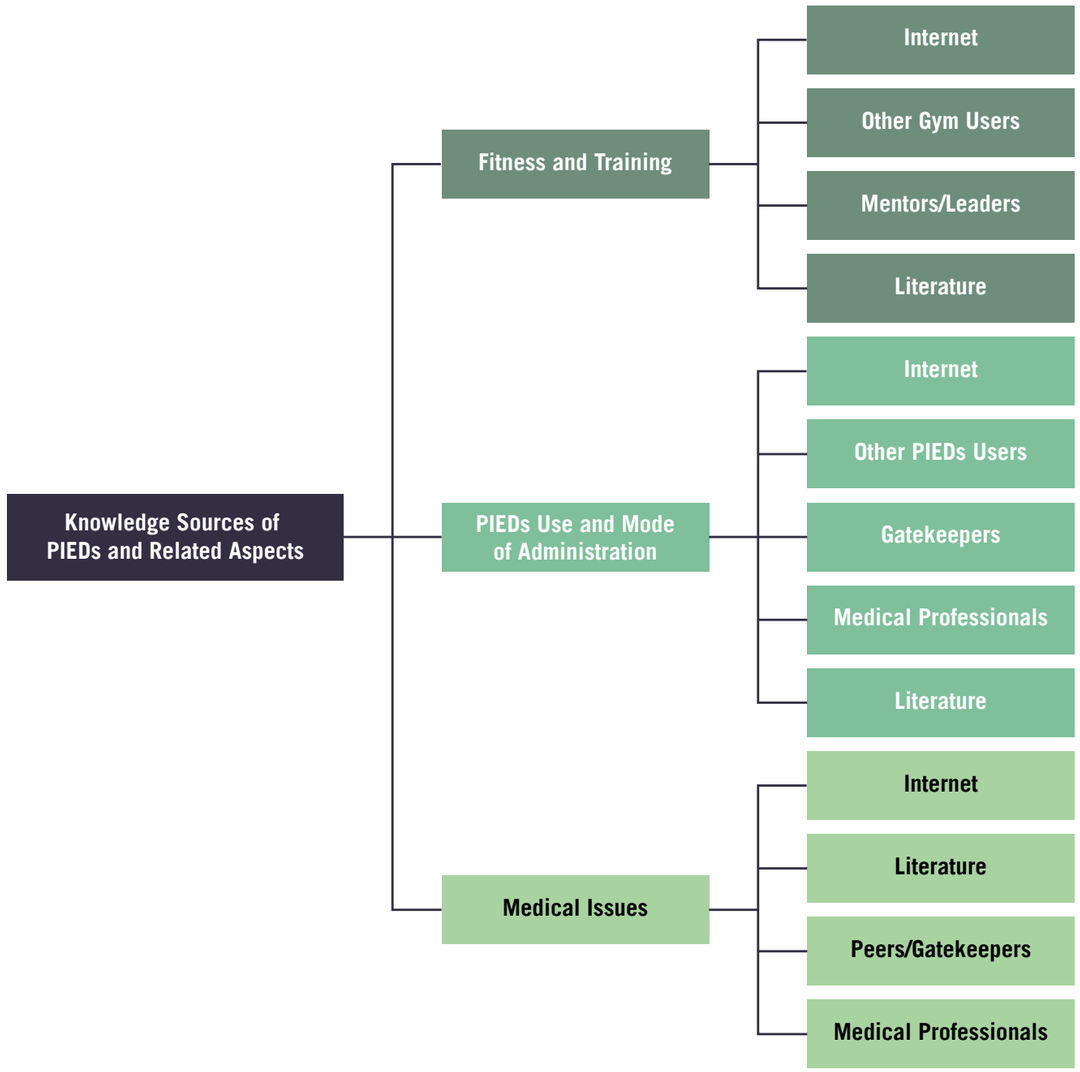


Figure 4: General dimension entitled: *Knowledge Sources of PIEDs and Related Aspects,* consisting of three categories from thirteen themes

information. In addition to the resources mentioned, 'significant others' played a considerable knowledge source role in identifying fitness or PIEDs-related information. In this context, significant others were peers, gym users and PIEDs users, all of whom the participants turned to for advice and assistance regarding training and/or PIEDs use. All 14 participants shared these views, exemplified below:

> *That first three or four months was like a rocket journey. I picked up loads about my body and the right training, how to plan and load ... mostly from mates or others in the gym* (M4)

While peers or other gym users can be considered as significant others when seeking information, other groups of people were of importance too; namely mentors or leaders in the fitness arena. In this research, mentors or leaders are considered as fitness leaders or instructors. Most of the respondents identified mentors or advisors as key knowledge sources, a point supported by one particular interviewee:

> *We have two guys at our gym, and they give plans and advice, and help out spotting. Fonts of knowledge they are* (F8)

Knowledge Sources - PIEDs Use and Mode of Administration

When it came to PIEDs information, the internet was again used to develop knowledge about PIEDs. One user highlighted the importance of this source:

> *You get everything you need on the web now. Forums for taking drugs, what's best [and] for what reason. You can get pics of how to inject and clean up etc.* (M13)

With respect to seeking information about PIEDs, every respondent also said that they gained support from other users:

> *We all talk to each other and when anything new is around, we always ask around... other users, in the gym and outside. A real network of knowledge, like a tree with branches everywhere [laughs]* (M1)

These sources are often used on a confirmatory basis with the internet and significant others being used almost interchangeably:

> *Other lads tell you what they know but you start to learn to get it confirmed on the web... on forums. Loads of great info out there* (M14)

Gatekeepers were considered by all 14 of the interviewees as being key to their access, use, and information sources. In this context, gatekeepers are those gym users who introduce and then support PIEDs users, especially in their embryonic stages as users. One veteran noted this importance of the multiple roles of his gatekeeper:

> *My main man is the guy that I knew in the Forces who was able to get gear from his mates in Liverpool. Anything that I need to know, I go to him. If he doesn't know, he finds out* (M7)

> *This was the case, even when it was acknowledged that those self-same gatekeepers may have vested interests: A bit stupid but the people I listened to most were the lads I was buying from, or people they knew* (M3)

Knowledge Sources - Medical Issues

Notwithstanding the inherent dangers of seeking knowledge from unqualified sources, there is one other thematic area which was identified during data analysis; that of *Medical Issues*. A similar story to those of *fitness knowledge* and *PIEDs knowledge* exists for areas connected with *medical issues*.

Many of the respondents noted health issues or potential health issues linked to PIEDs use, yet when seeking health-related information and advice for medical issues, they turned to the internet, literature, peers, and gatekeepers, rather than seeking medical advice from a practitioner. For example, injecting is not taught by a qualified person but often by a gatekeeper or a friend: *My first injections were from one of the other lads... took it in the ass... no, I've never asked a doctor* (M5). Another interviewee indicated a similar approach as highlighted by their comment:

> *I've tended to ask the guy that I get my supplies from as he has been there, seen it, done it, got the t-shirt. Like [for instance], when I was on nandrolone [steroid] I was beginning to look fat and didn't know why or what to do. He told me to change [drugs] as it was water retention* (M14)

This mode of information gathering appears to be the norm; but that said, when full clinical intervention (as opposed to mere information or advice) is required, participants did state that they sought assistance from the medical authorities:

> *Only when there is no other option do I go to the doctors. I usually ask my mates and try to deal with it myself. I went to find out if there was anything I could do for plooks [acne] on my back but was basically told [to] stop using. [It], defeats the purpose really* (M6)

Another felt he had to go to his GP when he noticed that his libido had reduced after years of taking PIEDs:

> *My ability to 'perform' [have intercourse] was not improving after I came off testosterone for a few months. I knew about the sex stuff, but, I mean, I had to go and talk to my GP. Embarrassing it was but I had no option. Stopping injecting hadn't helped and I needed to know what to do or if I had done any damage to myself* (M7)

Despite some interviewees (N=5) accessing medical staff, based on responses, the action of avoiding medical opinion unless absolutely necessary seemed normal for this group:

> *After asking about, I eventually asked the medics about it [safe doses], not about me, you know, always looking for information for 'someone else', but really, I was looking for info or assurance* (M5)

It is felt that this might indicate a wider cultural problem related to trust and the perception of military medical staff as being part of the upper echelons of the military hierarchy. This view was affirmed by one veteran who, in response to a question as to why he did not access medical staff, replied: *Well you can't really, can you? They're part of the 'brass'. They'll shop [inform on] you!* (M9)

13.3.4
General dimension No 4 - Health and fitness consequences

This general dimension was developed from responses to questions around the experiences of users regarding perceptions of changes when taking PIEDs. This included perceptions of changes to users' bodies, as well other changes (e.g. emotional) (Figure 5).

Nineteen themes were identified during analysis, which were encapsulated within four categories. These categories covered two key domains of P*hysical Health* and M*ental Health* and consisted of the perceptions of benefits (positive and negative consequences) perceived by PIEDs users.

Health and Fitness Consequences - Physical Benefits

The bulk of the respondents identified that they got stronger, commenting:

> *I was lifting bigger weights within 10 days. Six to eight weeks after starting 'oxes' [oxandrolone] I was lifting like three men... half as much as before; and I mean, I wasn't a weakling then [prior to starting oxandrolone]* (M9)

They also experienced hypertrophic adaptations (muscle size increase):

> *They [drugs] did everything I wanted. I could look at the mirror and see the difference in my size. Pecs, biceps, delts [deltoids), lats [latissimus dorsi], quads [quadriceps], even my ass; everything looked bigger* (M1)

A substantial number felt that they had developed more endurance, despite not having this as an aim at the outset:

> *It didn't start with this in mind, I just wanted to get bigger and stronger, but I was able to train longer and more often; my recovery was much better I suppose and that let me do more reps and sets* (M13)

Many of the sample identified with two or all three: *Massive differences... muscle bulk seemed twice as big, lifting twice as heavy and could do it more often* (M2)

Body fat loss was a side effect for many of the respondents or was part of a demand to 'cut' for body building competitions that started on leaving the Armed Forces. 'Cutting' is a term used by bodybuilders for fat and/or water reduction prior to competition to accentuate muscle tone and definition. In this case, fat reduction was the issue. For some, fat loss was an introduction to the weights gym and its regimen:

> *My main aim was to get trimmer and cut [reduce fat] and I was able to do that, training hard and eventually using trenz [trenbolone]. Lost my period too but wasn't too fussed about that anyway* (F8)

Health and Fitness Consequences - Perceived Mental Health Benefits

The physical outcomes noted above seemed to stoke perceived positive changes in outlook and mental health - nearly all the respondents reported an improved body image, raised self-esteem and increased confidence. The female respondent quoted above who wanted to get trimmer also reported:

> *My appearance, my strength, my looks, the way I feel my muscles working, all make me feel good about myself, give me confidence. I think that I can handle most situations now where before I might not have been as confident, especially when someone tries it on* (F8)

This feel-good factor, illustrating the perceived psychological benefits of such physical changes, was echoed by others, for example:

> *The stronger and bigger I got the better I felt... I was like strutting about showing off... proud of me and my body* (M10)

> *I love the way I look. Some people think that I'm too big, but I don't care, I like the way I look, tight white t-shirt, tight jeans... nothing to beat that look even at my age* (M44)

Contrary to much of the literature around taking steroids, in which low mood, depression, and anger are cited as negative consequences among PIEDs users, several interviewees felt that their moods had improved. They did not attribute enhanced moods to PIEDs use but to undertaking gym activities:

> *The gym makes me happy. Working out makes me happy. Don't get me wrong, it's tough but a good tough if you know what I mean. But after a workout I am just an easier-going more relaxed person* (M7)

Health and Fitness Consequences - Negative Physical

Despite the benefits that were reported, the interviewees all identified that they had experienced physical problems of varying kinds, with musculoskeletal disorders (MSK) being the most prevalent - all 14 participants had experienced MSKs. This finding was not a surprise as training tends to have a risk of MSKs for

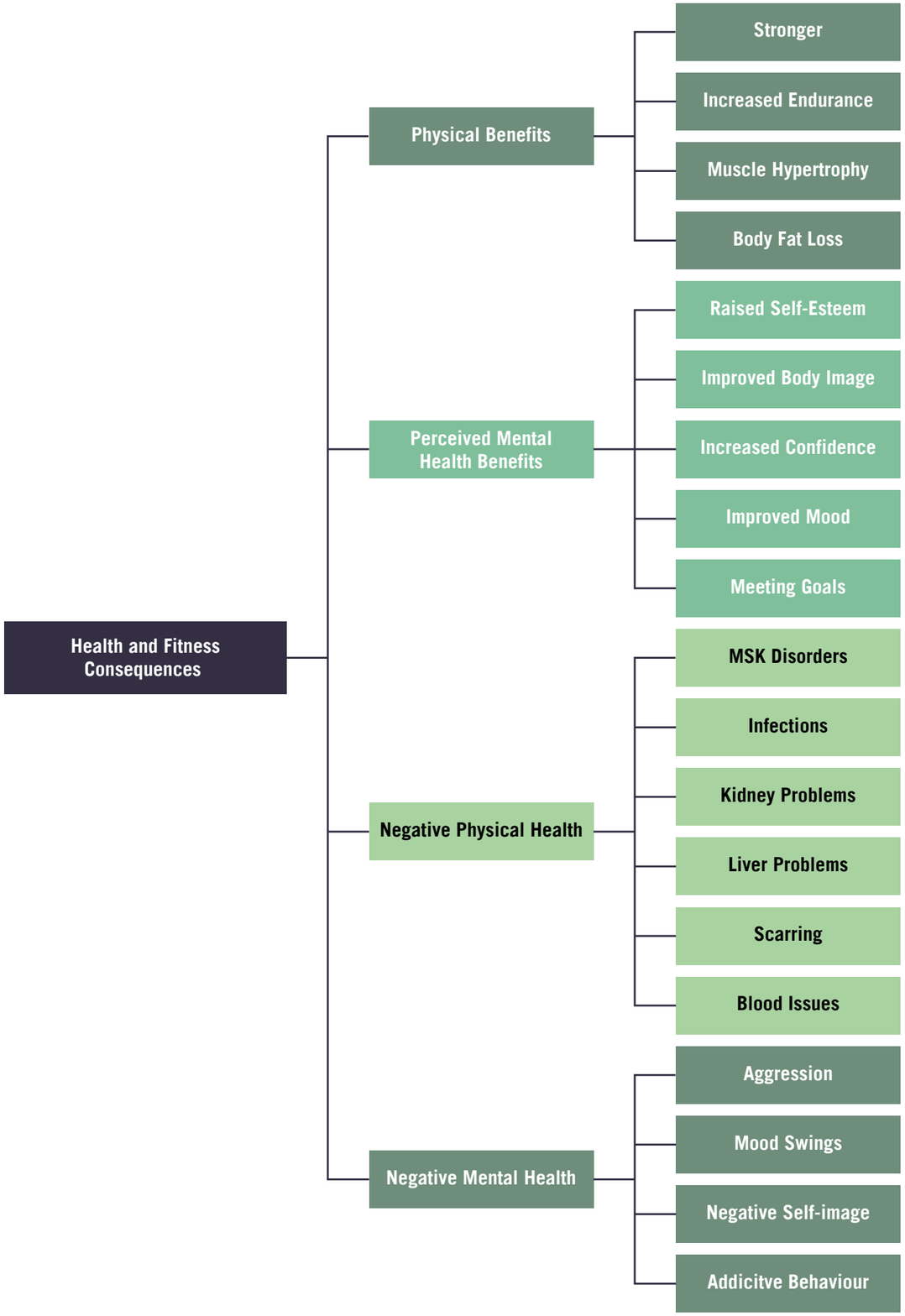


Figure 5: General dimension entitled: *Health and Fitness Consequences,* consisting of four categories from nineteen themes

most people, and high level or high intensity training has higher risks (Keogh & Winwood, 2017; Pope *et al,* 2014). But MSKs were considered 'an acceptable risk' for most of the participants, as detailed by one user who was asked whether he had experience of MSKs:

> *Loads. They're part of the territory if you want to train like me and me mates. Usually, it's muscle tears but my worst has been tendon rupture in my bicep only a couple of years ago, not long after I started injecting... pushing it too much I think* (M12)

Other than MSKs, there was a mixture of negative health consequences experienced by this group, with some relating to blood problems as well as infections at injection sites:

> *I got worried a bit [short while] back when I started to swell at an injection area... It got redder then started to rise and get sort of green-yellow puss like. Had to go to the doctor with that one and there was no hiding about injecting. I had to tell him. I'm careful with needles and things like that so no idea how it happened* (M2)

Other health issues raised included sepsis (M6), kidney (M11) and liver (M14) problems – all of which could have serious ramifications for those who experienced them. Linked with kidney issues, urinary tract infections (UTI) seemed relatively common among the participants; Six interviewees reported suffering UTIs from a cohort of 14, though this did not deter their re-establishing their PIEDs use following medical treatment:

> *I was taking stuff orally at the time and started to feel dodgy and sick, then needed to go to the toilet a lot. Quickly that became painful, like peeing broken glass and it was bloody too. Doc said it was my kidneys rebelling to the pills I was taking. I stopped taking for about six months after that* (M11)

Only two participants experienced liver trouble, and in both cases there could have been life-changing implications, if not life-threatening. For example, one interviewee recounted what he termed "a scary experience":

> *[I] never really had any problems until I began to feel a bit shit, just poorly. Then one morning I noticed that I was beginning to look pale and jaundiced. Spoke to a few of the boys and looked stuff up on the web before going to the doctors. He took blood and sent it away and my liver function came back as being damaged. I had to come clean with the doc then, came off the gear and got better gradually. Was out for about 16 months. Real poorly. Yeah, I'm back on but more careful about doses and 'plateau' or 'cycle' [reduce or stop taking doses] it more* (M14)

While these latter two examples are the extremes of what our participants experienced, they do not seem uncommon among PIEDs users (Hope, McVey & Marongui, 2013). Worse can and has happened to other such users, with Joynes (2010) and Montisci, (2012) highlighting serious heart conditions which can lead to death. These were risks of which our participants were aware:

> *I've not had many problems... infection where I inject, a UTI, but not sure if related, muscle injuries with pushing too hard. A couple of lads have died though... heart [attacks]* (M6)

Health and Fitness Consequences - Negative Mental Health

Allied with issues around negative physical health lie concerns about the negative mental health consequences of being a user. All respondents had experienced problems of this nature. Some had experienced aggression and mood swings, while others (two participants) suffered poor self-image.

Aggression is an oft-cited outcome of steroid abuse, known as 'roid' rage (Lumia & McGinnis, 2010). Our participants mentioned 'snapping' at the smallest thing, often at home but also when out socially or at work:

> *I was an easy-going type of guy but started to get annoyed easy... a bit at first then more often. It turned into anger then violence. I could always justify the violence as self-defence* (M9)

This loss of control is reinforced by other participants:

> *I'm normally ok but if anyone takes the piss or starts me up, I lose my temper easily. My lass is always trying to calm me down before I lash out. Afterwards I feel bad, but I don't know, I just get radgey [angry] easier than I used to* (M11)

Remorse was highlighted by four of the respondents as affecting their mood and perceptions of self.

An interesting finding was that despite many participants identifying positive self-image (which was often related to enhanced body image), two of the 14 interviewees had some psychological challenges. One respondent indicated that, although they recognised their body had changed considerably given their efforts, sometimes they struggled with reconciling the change with who they had once been, what they had become,

> "Don't get me wrong, I'm happy with how I look but there are times I look at myself in a shop or somewhere and wonder who the fuck that is looking at me. I don't recognise myself ... usually about then I feel shit as I have cheated or taken shortcuts to get this way. That's a big thing for me. I always played fair but when I see myself, I don't like what I've become. Not all the time, mind you."

and the method by which they had chosen to make that change happen:

> *Don't get me wrong, I'm happy with how I look but there are times I look at myself in a shop or somewhere and wonder who the fuck that is looking at me. I don't recognise myself... usually about then I feel shit as I have cheated or taken shortcuts to get this way. That's a big thing for me. I always played fair but when I see myself, I don't like what I've become. Not all the time, mind you* (M6)

The other participant who experienced psychological difficulty with what they had become described a vicious cycle of PIEDs use:

> *I feel as though I'm on a treadmill having to take more and more to keep going even if it makes me look different to everyone else... making me look like a freak in a freak show: for fuck's sake, I look like Arnie [Arnold Schwarzenegger] at his worst and I know that people stare at me... but not in an admiration way* (M1).

This aspect of being on a treadmill is part of the evidence for the most prevalent negative mental behaviour identified: the addictive nature of taking drugs and training. This has been reported previously in the literature (Lindqvist *et al,* 2013; Brennan *et al,* 2011). To illustrate the depth of addictive behaviour, we had reports by participants of their missing work or important family occasions to make sure that they could get to the gym:

> *It used to be twice or maybe three times a [per] week in the gym. Now it's every day sometimes twice a day, and if I don't get at the same time or something is stopping me, I get really twitchy. I've missed work to make sure I could get to the gym. Even went while my partner was in labour* (M2)

While this does not indicate a causal effect from taking PIEDs, it must be noted that PIEDs allow people to train extensively and recover quicker, thus enabling them to work out more often. Also, the gains that are reported when taking PIEDs possibly reinforce this training behaviour, with users following the adage of 'more is better'. None of the respondents reported any addiction to the drugs they were taking, only the impulse to keep training. However, there is evidence that PIEDs users can become addicted in the same way as users of other controlled substances (e.g. codeine), with the same concomitant risks (Kirkwood, 2017). These normally include cravings, willingness to go to any lengths for their drugs, issues with family and friends, and prioritising steroids or other drugs over potential health risks. The veterans in our cohort indicated similar issues, with one reporting concerns when his regular supplier went missing:

> *Me man went AWOL, just disappeared, we never knew what happened as we hadn't heard from him. I was running low and started to make sure that my supply would be coming. I wasn't the only one as he supplied a lot of the gym I use, but I started to get almost jumpy about making sure that we got an alternative, which we did. Nobody vetted the drugs; we were just glad to get them* (M1)

Another commented:

> *My family hate what I'm doing. They don't understand though, just moan about 'you've no idea what you are putting into your body' and 'look at the harm that you are causing yourself'. They don't understand that part of me has invested massively in the gym and it is what I am and the need to take gear is part of that ... I just walk out when they get on to me* (M13)

These comments were made by long-term users who also noted that they had experienced what seemed like withdrawal symptoms if they ceased using, even if part of a planned programme of drugs use. Such experiences were also reported by participants who were more recent 'starters'. M4 had only been using for a year but noticed changes in his body when 'cycling'[2] ; a method used by drug users to change drugs for different reactions. He said:

> *I've noticed two things when I cycle or come off some stuff to give my liver a rest, before going on to another. I get headaches and feel bloated. Not sure if they are connected but there are a few days of this, sometimes with aches and pains. I'm not sure if this is because I've only been injecting for the last year or so* (M4)

So there seems to be evidence of addictive behaviours from taking PIEDs, both causally (M1, M4) as well as associatively (M13).

The statement made by M4 above, mentioned 'cycling' as a means of managing consumption, and while the comment itself is redolent of addictive behaviour, it also sat within another general dimension that was identified thought the analysis process: *Risk Taking and Safety*.

13.3.5
General dimension No 5 - Risk taking and safety

This dimension covered an area that seems to encapsulate much of PIEDs use, highlighting risky behaviour that is followed in pursuit of users' goals, and the safety measures that are taken to minimise those risks (Figure 6). The data in this general dimension partially resulted from direct questions about how users monitored the safety of products that they were using, and how they took them. The remainder came from

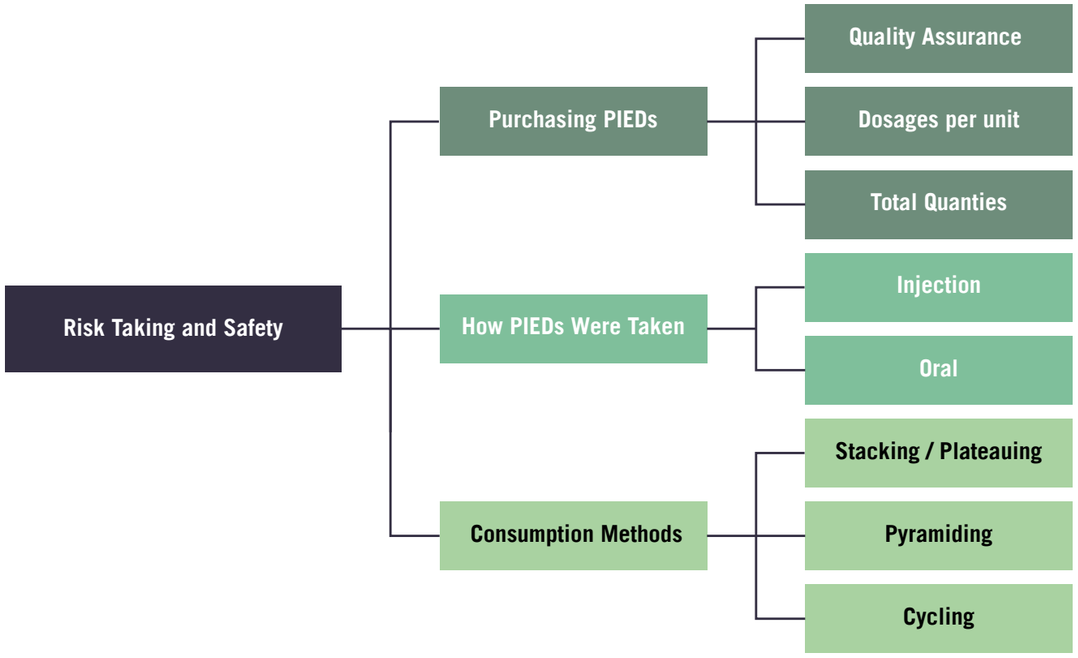


Figure 6: General dimension entitled: *Risk Taking and Safety,* consisting of three categories from eight themes

[2] 'Cycling' is the method by which PIEDs users take one drug for a period, come off it, take another type of PIEDs, then repeat as often as planned to optimise benefits of PIEDs use. PIEDs can have different reactions and the body can adapt to the doses and type of chemical. 'Cycling' reduces the likelihood of this adaptation. 'Cycling' is also a method to allow for breaks from using PIEDs to reduce potential medical damage.

discussions with participants about their lived experiences as users.

Three categories were developed from eight themes under this GD. The first category related to how our users purchased their PIEDS, and the ability to assure the quality of the product as well as the doses they were buying.

Risks - Purchasing PIEDs

Consumers of PIEDs all agreed that they were not able to guarantee in any meaningful way the quality of the products that they were purchasing. One acknowledged:

> *I have no idea how good or bad it is I just have to trust others. There's no kite [mark] thing on anything I get, I know it's risky so it's down to trust and believing others. She added, by way of justifying this risk: [It's] not much different to other parts of life really is it? Who knows where and how your chickens are being grown?* (F8)

Another respondent also put his faith in his supply chain:

> *No idea about the quality of what I'm taking. I just trust the suppliers and never thought too much about it but that's risky. I never see the suppliers; they are in Manchester but the go-between is a boy [young man] in my gym so he has used with them for ages and I trust him that the gear is good and clean* (M12)

While most purchased their PIEDs in the UK and felt that they could trust suppliers because they were known to the users or gatekeepers, those who started to take PIEDs in the Armed Forces took bigger risks at that early stage. One participant said that while on duty in Iraq, like most people he knew, he started to buy from the Americans out there, but eventually: *...I used to get one of the local boys, give him 10 dollars, and about 20 minutes later he would be back with my gear!* (M7). Again, like others in the UK, his trust was implicit and the desire for his PIEDs overrode his concerns about 'local boys' acting as sales and delivery agents: *These kids, the 'mules', had been doing this for ages for the Yanks and they introduced them to us, so they seemed up-front* (M44)

This optimistic view of trusting others and other people's contacts and experiences is also borne out when considering the veracity of dosages and pharmacological content:

> *I measure mine out for myself most times or just trust that the right stuff is in the vials. One thing, thinking about it, I never know if the tabs or vials have correct amounts or are laced or smoothed down [adulterated]* (M14)

Risks - How PIEDs Were Taken

When asked specifically about how they took their PIEDs, none of the veterans were taking PIEDs as fluids, although dietary supplements were taken in that form. All 14 respondents indicated that injections were their preferred mode, albeit that 11 of them had also taken or were taking some PIEDs orally. Most veterans only used oral steroids early in their training careers or used them only sparingly to help avoid the increased likelihood of toxic side effects associated with greater use:

> *My first load were orals [steroids] but they were making me feel sick and some of the lads said they were too risky, so I changed to injections. I still take oral supplements even now but not juice [PIEDs]* (M10)

Most of the users injected intra-muscularly but tended to rotate sites to give their tissues the chance to recover, using buttocks and outside of their thighs mostly:

> *I self-inject, usually in the ass or in the quads into the muscle. It was sore the first few times but just told myself to stop being a pussy and get on with it. It was a mate that showed me how to do it at first* (M4)

Despite being self-taught or shown how to inject by non-medical practitioners, the interviewees had a relatively sophisticated knowledge of technique and safety issues. One former soldier explained:

> *My drugs are usually oil-based so I can't stick the needle anywhere. It has to be in a muscle and before injecting, I pull the needle plunger back a bit to make sure no blood is getting drawn up. If that happens then I might be in a blood vessel, not good, I'll take it out and try another area* (M1)

Unsurprisingly, one of the participants was able to communicate how they injected themself and helped to instruct others due to their professional training:

> *They come to me because they think I know better than others in the gym. I tell them to do it the way I do to myself. Hold the syringe and use it a bit like they would play darts, then push the needle threequarters into the muscle at a 90-degree angle and don't hit the bone! I tell them to practice on an orange ... didn't do me any harm in training* (F8)

While all but one of the participants lacked any medical training, they seemed acutely aware of the health and safety issues that surround injecting PIEDs and due to this knowledge, regulated their behaviour accordingly. Given the lack of quality assurance about what exactly was in the PIEDs that participants were taking, it is

interesting that they cared about how to inject PIEDs into their bodies properly.

Risks - Consumption Methods

Not only were the veterans aware of how to administer their PIEDs, they also used several methods to manage their PIEDs use. The methods involved are known as 'stacking', 'pyramiding', 'plateauing' and 'cycling', all of which aim to optimise performance and appearance, while also giving the body some opportunity for respite and recovery. These terms are explained in the examples that follow.

One user defined two of the methods when explaining what he did and why:

> *I usually **stack** my juice [PIEDs] taking two or three different types of drugs at a time for different reactions ... all at the same time. I then come off that for a few weeks to let my body recover before trying what some lads call **cycling** where I took one drug, then after about six weeks move on to another, then same again with another drug. To stop the body getting used to it* (M5)

Another participant, who also did bodybuilding as a sport, used **pyramids** to manage his consumption:

> *I plan when I need to be ready for a competition [bodybuilding] then work out what I need to be on before cutting [losing fat to look leaner and more striated]. If I'm on for a while I usually 'pyramid', gradually increasing my use then cutting back or stopping but continue to train, to give my liver a rest* (M13)

A more dangerous behaviour is employed by a few of the veterans: **plateauing**. This was explained as a method in which doses are increased every six or 10 weeks to overcome the natural adaptation that the body has for any drugs that are ingested:

> *My body seems to get used to a drug quickly, so I either have to move to another that is much the same, or I plateau. I work out and take a steroid, the last one was winnies [Winstrol], and when I don't feel I'm getting better [reached a plateau] then I take a few days break then take a bigger dose, then do that again, possibly three or four times. Coming off that is hard though! But it needs to be done as you can't just keep taking it and*

> *taking it and expect to stay the same colour [meaning that liver problems could be likely]* (M7)

Thus, while all the practices outlined have potentially negative health consequences, the participants still use them. This highlights again that there may be an addictive quality to their behaviour but countered with an awareness that, for health and safety reasons, they need to give their body a break at some point, for example to reduce the risk of liver or kidney damage.

13.4 Mental health

While the issue of mental health was considered and noted throughout this work, the context was specifically around the participants' perceptions of positive and negative health consequences of their PIEDs use, and it was closely aligned with their training. We found that aggression (five cases), mood swings (seven cases), poor self-image (two cases) and addictive behaviour (eight cases) were reported as being related to PIEDs use, with some participants showing multiple consequences. However, at the outset, one of the key aims of this project was to identify mental health issues prior to PIEDs use and identify our veterans' current mental health state. As such, specific questions were asked of the participants: What mental health problems have you had in the past? When did they manifest? And what support have you sought, if any?

Five of the 14 participants detailed that they had experienced mental health problems in the past (i.e. 35% of our small cohort), with three of the five suffering from depression, and two of the five from Post-Traumatic Stress Disorder (PTSD). It is worth noting that, according to the most recent (2014) Adult Psychiatric Morbidity Survey [APMS 2014], the rate of depression in the general public appears to be roughly the same at 1 in 4 (25%); but general population PTSD rates appear to be substantially lower, at approximately 3% (McManus *et al*, 2016). Further to this, the relatively high PTSD rate of the veterans in this study is not far short of the 17% reported in veterans whose last deployment had been in a combat role (King's Centre for Military Health Research, 2018), which would indicate that these two veteran 'subgroups' are particularly susceptible to substantially higher PTSD rates than the general public. All five of the interviewees indicated that the conditions were relatively new in their lives, having arisen on leaving the Armed Forces. They had all sought medical treatment. Those suffering from PTSD had received (and were still receiving at the time of reporting) psychiatric support and ongoing counselling. They noted that their conditions related to experiences in Iraq where they had been under fire constantly and had seen comrades mortally wounded or seriously injured. One said:

> *There isn't a day goes by that things don't come to mind, either because of something I see on telly or hear, but sometimes I just wake up with what seems like palpitations not knowing where I am* (M7)

He continued in a more positive vein saying:

> *The support I get is great from the doc, and also from the group [Military PTSD support in the NE] – wasn't always like that though – but I also feel loads better after going to the gym* (M7)

All three of those who had been diagnosed with depression felt that it had to do with lack of direction on leaving, and a feeling of abandonment as they had trouble seeking employment. One detailed:

> *I had a screwy [dysfunctional] family life as a kid and the army came at the right time. I got a direction and purpose in life, a trade, mates that I could relate to, and saw the world, but when I was discharged, nothing. I did all the courses before to prepare me, but, bang, they didn't. Everything I did and everyone that had been part of my life for years had gone* (M5*)*

As part of their treatment, the three participants who reported having been diagnosed with depression had attended counselling and intervention sessions, notably Cognitive Behavioural Therapy (CBT)[3] Only one person was still receiving treatment when we interviewed them. The two others in this group were advised to take medication, but on starting at the gym, they ceased taking their medication and no longer felt that they needed support sessions. One of the interviewees reinforced this with his comment:

> *I was advised to start training and found that it helped. I then went to the gym with a couple of local mates and it was like being back in the army again. Discipline, hard work and camaraderie. All were there apart from the brass* (M12)

This was a factor that all five mentioned and seems to point to the positive power of exercise, albeit that exercise could be masking the underlying issue rather than positively eradicating/replacing the need for therapy to work through issues.

There is a final aspect of this work that did not form part of the main study and was, therefore, not addressed in the research questions or aims. Nonetheless, through discussions with participants, an issue arose that is worth highlighting: *all the participants stated that they would rather not have started taking PIEDs* but felt they would now have difficulty in following a path to cessation. Difficulty stopping PIEDs could be due to several reasons, for example: training routines becoming habitual, the resulting physical condition and image becoming an addictive obsession, and the perceived role of PIEDs as a facilitator to support those extreme and intense training routines. Participants also seemed comfortable providing information to others who sought their advice about PIEDs in the same way that they had sought advice from others initially:

> *I don't go out of my way to offer advice to others and wouldn't push anyone to take them [PIEDs] but if somebody asks me, I give what advice I can and if they want to start using, I won't encourage them but will tell them where to go and how to do things. I mean there is nothing wrong in taking juice, loads do it. Apart from small things, it hasn't done me any harm* (M7)

However, when asked a hypothetical question about what they would do if it was one of their children or a close family member seeking their advice or help, the responses were quite different, showing their awareness that taking PIEDs is a risk-fraught practice: *Not on your life. I don't want them near the stuff* (M1)

Perhaps these final two comments sum up the dichotomous relationship that the PIEDs users in this study have, regarding the potentially harmful substances involved versus the benefits. They will take the risks themselves, and even be willing to advise other interested users (short of encouraging PIEDs use), but when it comes to their own family, the case is quite the opposite: PIEDs users seem unwilling to put their loved ones at risk given their own knowledge (and potentially their own experiences) of the possible harmful side effects.

"I had a screwy [dysfunctional] family life as a kid and the army came at the right time. I got a direction and purpose in life, a trade, mates that I could relate to, and saw the world, but when I was discharged, nothing. I did all the courses before to prepare me, but, bang, they didn't. Everything I did and everyone that had been part of my life for years had gone."

[3] CBT is a talking treatment which focuses on how thoughts, beliefs and attitudes affect feelings and behaviour. It combines **cognitive therapy** (examining thoughts) and **behaviour therapy** (examining actions) and teaches coping skills for problems (see https://www.mind.org.uk/information-support/drugs-and-treatments/cognitive-behavioural-therapy-cbt/about-cbt/).

14
Discussion

This study recruited 14 participants from a hard-to-reach group. The small sample is a limitation to the study insofar as it makes it difficult to extrapolate the results to all ex-Service PIEDs users. However, the sample was homogenous, with participants reporting similar experiences and perceptions of their experiences in the Armed Forces, social backgrounds and PIEDs use. This provided a degree of robustness to the project. The data from Study Two was also reflective of the findings of Study One, which adds weight to the findings, despite the small numbers involved.

This section will discuss the findings to the research questions outlined in Section 11.3 of this report. Other issues that were identified through thematic analysis will then be considered as they help to meet the overall aim of Study Two: 'to identify issues related to PIEDs use among a sample of UK ex-Service personnel' (see Section 11.2).

RQ 1 What are the underlying motives for the use of PIEDs amongst ex-Service personnel in our sample?

As with existing research, participants in our study offered multiple motives for taking PIEDs, although the bulk of responses were focused on a desire to get bigger, stronger and improve body image. The existing literature proposes that a focus upon meeting the physical demands of the job is one motive that reflects the views of a small proportion of PIEDs users (see Study One - Literature Review), a finding that was reflected by our participants in Study Two. However, our data showed more motives for PIEDs use were actually linked to meeting work demands post-Service, rather than when serving in the Armed Forces. This post-Service use was also linked with extreme exercise regimes which participants related to work demands. Given that this attribution was cited by 10 participants, perhaps it reinforces a quasi-cultural acceptance of the need to take PIEDs (Grix & Dewar, 2014), and/or the nature of PIEDs use when allied with extreme exercise regimes (Kirkwood, 2017).

One other motive that was identified in Study One (Systematic Review of Literature), but which was absent from our primary data (Study Two), was a motive of 'peer pressure or influence of others'. None of Study Two's participants stated this explicitly, however, that is not to understate that peer pressure may have been a factor but not recognised as such. For example, all 14 participants indicated that they had used peers or mentors as gatekeepers to access PIEDs. Whether gatekeepers should be classed as 'influencers' depends upon the perceptions of the users. Our participants felt sufficiently uninfluenced or at least not motivated directly by gatekeepers, so based on our data, we can exclude this is a reason.

When peer pressure was considered in tandem with introduction to PIEDs use, all Study Two participants cited either machoism or 'beasting' as aspects of service life that led to their introduction. The former tends to be a comparator with others, for example, you view others as being macho, therefore you want to be similar or better, thus supporting the influence from others. The latter, 'beasting', can also be a form of influence, installing a need to seek help from colleagues to cope with the demands of training practices, resulting in perceptions of a need to take PIEDs. This is worthy of further consideration; Jacobson *et al* (2010) and Herbst, McAslin and Kalapatapu (2017) both reported similar findings with US Forces personnel. This may signify a military-based cultural issue that needs to be investigated if Service personnel are not to be 'encouraged' to seek external assistance. The UK military is fully aware of these issues and, for example, provides guidelines on taking supplements (PIEDS) safely (British Army, 2013). Given this awareness, there is a need to determine how effective, current and active military policy and educational communications are around the issue of PIEDs use among new recruits and more experienced Service personnel. This would be bolstered by further research into the prevalence of both PIEDS and PIEDs use, and how many disciplinary actions take place due to personnel failing Compulsory Drugs Tests (CDT) because of improper PIEDS or PIEDs use. This would form an evidence base on which to recommend what actions (if any) need to be taken by policy makers and/or service deliverers.

RQ 2 How are ex-Service personnel introduced to PIEDs?

Ten of those in our study were introduced to PIEDs while serving, with eight indicating that peers in the Armed Forces were their gatekeepers. This accords with the work of Coomber & Moyle (2014) and of Coomber, Moyle and South (2016), which identify that friends or associates are the most likely sources of PIEDs.

While Study Two showed peers and colleagues to be highly implicated in the introduction to PIEDs, the use of other drugs as a gateway to PIEDs use was not deemed to have been influential by our participants, even though all our Study Two participants had taken cannabis or cocaine recreationally at some point. This differed from the findings of Study One where excessive alcohol and tobacco use was prevalent in PIEDs users, but the use of other recreational drugs was not. However, this latter finding may have been influenced by the fact that the studies involved (primarily US) were mostly of currently serving personnel. The personal use of illegal substances may not have been voluntarily admitted by those cohorts, given that such a disclosure would likely have led to disciplinary action. Our Study Two involved only ex-Service personnel and as such, admitting historical accounts of illegal recreational drugs carried no such consequences. Notwithstanding the perception by our participants that taking other drugs had not been a gateway to their PIEDs use, the fact that they had all taken drugs recreationally may suggest otherwise, indicating an existing acceptance and values-base that deemed it acceptable to take some drugs.

RQ 3 What are the histories of ex-Service PIEDs users in our sample with the Criminal Justice System (CJS)?

While three of the veterans volunteered information of what they perceived was involvement with the CJS, all took place when the participants were aged 16 to 18 years (pre-Service). Importantly, participants reported having had no contact with the CJS while actively serving, nor since leaving the Armed Forces. Notwithstanding the fact that we had a small sample, this is a positive finding, given that research in 2018 found approximately 4% of ex-Service personnel were in prison in England or Wales (Ministry of Justice, 2018). This statistic accounts for 2032 persons (as of 30 June 2018), or approximately 0.15% of the 136,770 full-time trained strength (Ministry of Defence, 2018).

RQ 4 What knowledge do ex-Service PIEDs users have of the consequences of drug and supplement use in our sample?

With usage of PIEDs being clearly linked to fitness training in our sample, we were interested in finding out

where participants accessed information about training and PIEDs use and administration. It was revealed that all accessed information related to PIEDs use from the internet. Strength training and body-building websites, forums and blogs were the primary sources of information. This was supplemented by general literature (e.g. body-building magazines) and, as with previous responses in other topic areas, by mentors and gatekeepers. This range of sources is no different from that which PIEDs users in the general population access (Tighe *et al,* 2017; Zahnow *et al,* 2018). With our participants, these sources were also the same preliminary sources for medical issues, rather than appropriate clinical authorities. Andreasson and Johansson (2014) and Clement *et al (*2012) suggested that using such sources for medical concerns is not abnormal among PIEDs users, but it is nonetheless concerning that they are the primary routes for information gathering and potential treatments, especially given the potential health risks of PIEDs use.

Our study also asked questions that provided both positive and negative responses about the perceived impact of PIEDs use on our sample. All participants experienced physical benefits of getting stronger, bigger (muscular hypertrophy) and of having more endurance. However, they also experienced musculoskeletal (MSK) disorders or injuries at some point. While MSKs are a negative outcome of extreme fitness training, such injuries are prevalent within both the general population who undertake physical activity across a range of exercise regimens and intensities (Waryasz *et al,* 2016; Keogh & Winwood, 2017) and within military populations (Poston *et al,* 2016*;* Everard, Lyons & Harrison, 2018). Of substantially greater concern are the liver, kidney, blood and infectious disorders reported by some of the participants in this study, which we found to be the same negative health impacts reported in the literature review (Rowe, Berger & Copeland, 2017; McVeigh & Begley, 2017; Horwitz, Andersen & Dalhoff, 2018). Despite being aware of the potential health risks of PIEDs, research shows users accept the risks (Santos & Coomber, 2017); and our participants conformed to that same finding.

Similar to their accounts of both negative and positive physical outcomes of PIEDs use, our participants reported positive and negative mental health consequences from taking PIEDs.

Positive mental health outcomes were related to enhanced mood and body image, while reduced self-esteem and addictive behaviour were linked to negative mental health outcomes. As body image and self-esteem[4] improvement through PIEDs use is well documented in the literature, it appears counter-intuitive to find that body image can also be damaged by such use, but Hildebrandt and Langenbucher's (2010) found exactly this. In their study of 1,000 male users, results showed that many participants had a developed sense of body dysmorphia in which they were never happy with the way they appeared in the mirror. Thus, for many users, the relatively positive feelings that they garnered initially from getting fitter and bigger seemed to switch to harmful negative images of their bodies, and reduced self-esteem as they developed negative feelings about themselves.

In terms of addictive behaviour reported by our veterans, Goldsworthy and McGillivray (2016) recently identified the self-same outcomes amongst a cohort of Australian users. Addictive behaviour was believed by their respondents to be 'based on the satisfaction of achieving seemingly unattainable results which translate to enhanced self-esteem in either image and/or performance improvement' (Goldsworthy & McGillivray, 2016, p vi). This confirms our previous assertions about why using PIEDs may become addictive. It may not be the drugs in and of themselves that are addictive, so much as the associated psychological outcomes from training while using them.

RQ 5 What was the reported mental health status of ex-Service personnel who use PIEDs in our sample at the outset, and subsequently?

The past and current mental health status of our veterans was identified through direct questioning of our participants. Firstly, none of our veterans indicated negative mental health prior to active service, other than what they perceived as stress and anxiety related to everyday living. They did not view these as mental health conditions and dealt with them on a day-to-day basis.

The more recent mental health situations of our participants were considered in the section of this report that dealt with *Health and Fitness Consequences* (section 13.3.4). It detailed that aggression (five cases), mood swings (seven cases), poor self-image (two cases) and addictive behaviour (eight cases) were cited by our participants as being related to PIEDs use, with some participants claiming to still have or to have had at least one of these issues. Concerning PIEDs users in the general population, such consequences were found to be commonly identified negative behaviours in our literature review (Pope *et* al, 2014; Zahnow *et* al, 2017), which would indicate that our Study Two cohort had few notable differences comparatively.

Specifically, three of our 14-person cohort reported suffering from depression (21%) and two indicated they had been diagnosed with PTSD (14%). It is worth noting that, according to the most recent Adult Psychiatric Morbidity Survey [APMS, 2014] (McManus *et al*, 2016), the rate of depression in the general public appears to be roughly the same as our sample at 1 in 4 (25%); but general population PTSD rates are substantially lower than our sample at approximately 3%. In fact, the relatively high PTSD rate of the veterans in this study is not far short of the 17% prevalence rate found in veterans whose last deployment had been in a combat role (King's Centre for Military Health Research, 2018).

The three participants who reported suffering depression had initially sought treatment for the condition. During this period, they were still gym attenders, albeit with reduced regularity. At the time of our study, only one of the three was still accessing their medical treatment support. The other two recounted that they had been able to increase gym attendance and, of their own volition, ceased taking their prescribed medication. They also decided that they no longer needed to attend their GPs. Those two veterans did not state that gym attendance was a causal factor in their decisions, but they associated training with their personal feelings that they no longer needed medical intervention. In fact, all five of the respondents with mental health issues indicated the positivity they experienced through working out in the gym. Notwithstanding the fact that they were not only gym users but also gym users who engaged in potentially harmful practices by taking PIEDs, the positive effects of gym attendance and working out illustrates the well-established case for exercise as a means of both maintaining positive mental health and as treatment for poor mental health (Furzer *et al*, 2021).

Risk taking

The final topic reflected by the data concerned the risks of taking PIEDs, including the purchase and use of PIEDs and the modes of consumption.

In terms of purchase and use, our data clearly showed there was no quality assurance undertaken by the participants; rather they placed a marked amount of trust on the supply system, including the gatekeepers, suppliers and even the manufacturers. Recent research indicates quality risks are increasing as more suppliers resort to what Turnock (2020) termed as 'home brewing' of steroids (i.e., when suppliers buy pharmacological compounds and produce their own steroids). Yet, our veteran participants trusted that whatever they were injecting was of sufficient standard – toxin-free or unlaced (i.e. not mixed with other ingredients), of the correct dosage per unit and would bring them no immediate harm. Our users had no idea if the products were safe and appropriate, but they assumed that the products were sound due to previous experiences and trust in the supply chain. This 'blind' faith is corroborated by the work of van de Ven and Mulrooney (2017) in England, and van de Ven, Dunn and Mulrooney (2020) in Australia, who found that PIEDs users had implicit trust and faith in their product and supplier, even when that faith was misplaced (Coomber *et al,* 2014).

Many of these findings are of concern as none of the internet nor peers nor gatekeepers can be guaranteed to give appropriate advice. The web is relatively unregulated and subject to whims and lore; although it can be argued that the internet provides a considerable amount of useful information, being able to sift for quality and substantiated content demands that the users are suitably discerning. With regards to significant others, peers, mentors, leaders or gatekeepers are not necessarily qualified to give accurate information. Certainly, some fitness leaders and instructors are likely to have relevant coaching or vocational qualifications, and as such will have received information about the use of legal supplements, but the same quality of advice from friends or others who are not qualified is less likely. The situation could be considered much more dangerous with respect to seeking PIEDs-related information and related products from peers and gatekeepers. Without necessarily having the evidence to support this it could,

[4] Body image reflects how we see ourselves and is concerned with external physical appearance. Self-esteem is about how we feel about ourselves and how we value ourselves. It reflects whether we feel positive or negative about ourselves. A positive body image generally improves self-esteem, whereas a negative body image can harm self-esteem (See O'Dea, 2012 for further insight).

however, be hypothesised that it is unlikely that information gleaned from significant others about PIEDs and their use, could be based on anything other than relaying personal or second-hand experiences, or knowledge of custom and practice. This brings serious risks with it and needs addressing (for areas of concern see Andreasson, & Johansson, 2014; Clement *et al,* 2012).

For method of use, trust again played a role. Several safety matters were raised by our participants in the interviews for Study Two, including choice of site for injection (i.e. areas of the body), injection technique used and the management of use (such as planning cycles). All our veteran participants took PIEDs by injection, albeit that they reported oral consumption early in their careers. For the most part, our users were 'taught' by peers how to inject, how to ensure that they were doing so hygienically and what injection sites were appropriate. This knowledge was topped up by internet-derived information which veterans used to keep abreast of new developments and contemporary thinking. Likewise, the methods by which our veterans managed their PIEDs use stemmed from the same sources and involved relatively dangerous activities to increase PIEDs 'loads' or to maintain or increase efficacy (Harvey, 2020).

Irrespective of the faith that our users had of the overall quality of the PIEDs product, the method they chose to introduce it into their bodies and the way they managed their consumption, most of our participants experienced negative health consequences, such as infections at injection sites or kidney infections. Yet they still returned to the self-same environments, practices, suppliers, and supplies, akin to the behaviours of drug addicts in society (Binswanger *et al.,* 2012).

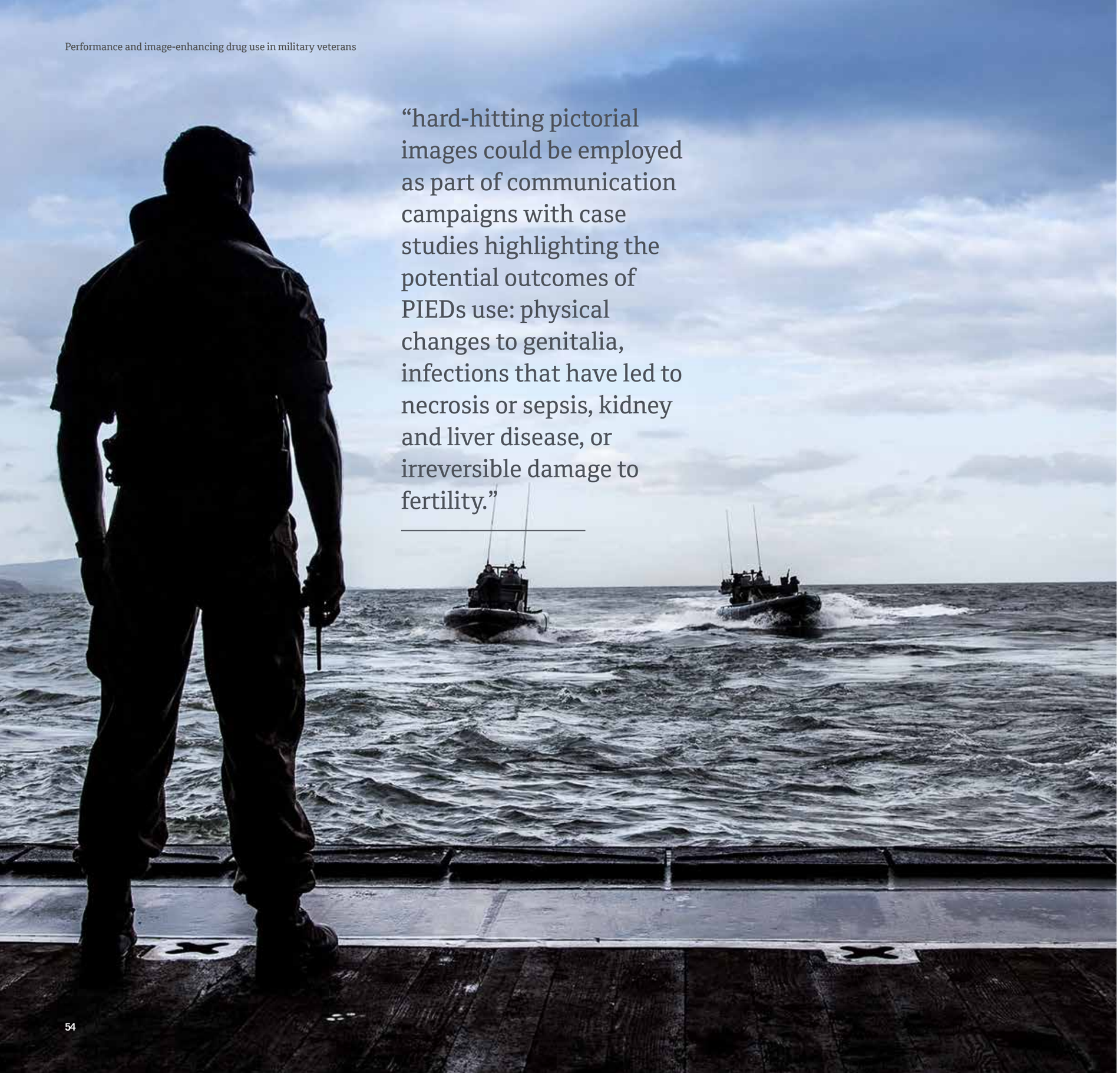
This work shared similar findings to other studies of military personnel PIEDs use. It also identified many issues that are similar to those of PIEDs users more generally, including users beyond the UK. These shared findings include how users are introduced to PIEDs; the roles of significant others and gatekeepers; knowledge bases and access to knowledge; the consequences of use (both positive and negative); and the potential risks involved and methods to help reduce them. However, there are also some Armed Forces-specific aspects of PIEDs use that are worthy of further investigation, such as possible peer pressure or peer influencing factors, the machismo associated with the Armed Forces culture, the 'beasting' associated with military physical training sessions and the sheer scale of the physical demand of some roles.

14.1 Implications

As expected with a study of this sort, there are several implications that can be drawn (see Section 15 for a table of specific recommendations) from the results and discussion . Firstly, all participants in this study stated that the gateway to starting PIEDs was taking oral supplements as nutritional aids to help them cope with, adapt to, and recover from training. In most cases they reported that taking legal supplements was advised by peers, mentors or leaders, such as physical training instructors (PTIs). It seems possible that those in authority are unintentionally 'opening the door' to the first level of ergogenic assistance, which in turn can lead to supplementation through illegal PIEDs use.

'Beasting' during training was raised by all the veterans as a particularly challenging process that they needed to get through successfully at a specific period in time, and as such, tended to accept anything offered to increase the likelihood of this. While recent internal reviews have seen this practice reduce, fitness training with new recruits and more experienced personnel is something the military should consistently review. Specifically, the physical demands required and the manner in which they are elicited needs to be addressed, given the mental anxiety and stress this causes, for which PIEDs use has been perceived by those in this study to be the best (or only) solution. It may also be worth the military considering how best to (re)communicate to those applying to the Armed Forces, to new recruits and to those currently serving, the message of what is considered to be 'acceptable legal supplement use' for personnel to take, to safely enhance their ability to perform to the standard required. A clear message should condemn proscribed PIEDs use for optimising physical capacity, while simultaneously raising the profile of the serious health and career risks involved. Military medical practitioners could reiterate and reinforce such messaging, as their professional clinical input may lend independent credibility and gravitas to the issue.

It seems likely that it will take time to change perceptions that PIEDS and/or PIEDs use is the only way to cope and succeed with military physical training requirements. As such, a mixed method plan combining formal and informal communication channels and awareness-raising activities may be necessary to help prevent the potentially life-threatening health consequences that can be experienced by PIEDs users.



“hard-hitting pictorial images could be employed as part of communication campaigns with case studies highlighting the potential outcomes of PIEDs use: physical changes to genitalia, infections that have led to necrosis or sepsis, kidney and liver disease, or irreversible damage to fertility.”

Next, concerns have been identified about access routes to PIEDs. When in the Armed Forces, access seems relatively easy in the UK and when deployed overseas, tends to be through liaison with personnel from the Forces of other allied nations. The biggest risk reported was that those starting or taking PIEDs while deployed overseas may use local suppliers, even when deployed in a hostile territory, where quality assurance would be particularly risky. Two interventions could help mitigate such risk. First, educational campaigns/guidance regarding the risks of procuring PIEDs in the UK and abroad could be developed. Messaging content should focus on the potential for unknowingly using contaminated products, whether in the UK or while on deployment overseas, which would not only place users’ health at risk, but could also result in failing a CDT if substances contained contaminated ingredients. In addition to such messaging, it would be useful if the Ministry of Defence (MOD) could consider supporting the sale of appropriate, quality-assured supplements on their bases.

The third implication follows from the last point on quality risk. Our findings indicate a level of acceptability of a variety of risks, from product quality to manner and method of use, and further to potentially harmful side effects. Even though our participants knew many of the risks and in some cases, had experienced serious medical side effects, they continued to inject PIEDs. There is a need to understand more fully what it is that underpins users’ acceptability and overriding motivation to take PIEDs, regardless of their knowledge of the potential serious health risks, if stakeholders are to effectively develop counterstrategies. Similarities may be drawn with efforts to stop other unhealthy behaviours such as excessive alcohol consumption, smoking and gambling, given that these are all forms of addiction with known negative mental and physical health impacts. We recommend a larger-scale study to first identify the scale of the PIEDs problem in serving personnel, before considering which of the range of actions that have been used to help prevent, reduce, or stop other addictive behaviours may be used in this case. For example, hard-hitting pictorial images could be employed as part of communication campaigns with case studies highlighting the potential outcomes of PIEDs use: physical changes to genitalia, infections that have led to necrosis or sepsis, kidney and liver disease, or irreversible damage to fertility.

In addition to the above, there is a need for contemporary health promotion material. Although the MOD has

invested heavily in improving nutrition as well as nutritional education for new recruits (Ministry of Defence, 2011, Chapter 4), little reference is made in relation to supplements. For example, the *UK Armed Forces Personal Guide to Nutrition* has a section (Section 5) with only one short paragraph on protein supplementation, and another paragraph on vitamin and mineral supplementation (QinetiQ, 2006). Both paragraphs provide relatively innocuous statements, albeit that a concluding comment guides personnel to seek medical advice and support if they have concerns (see QinetiQ, 2006, p30). Nonetheless, despite their message that supplementation is not needed, the Armed Forces, in particular the Army, are aware that supplements are taken. As such, a briefing note has previously been issued (British Army, 2013) and associated health promotion material produced to inform personnel that should they wish to take supplements, they should use the Informed Sport website (www.informed-sport.com) to identify safe, certified brands. This is welcome guidance as the site is trusted, is used by world sports bodies, and provides strong recommendations of the brands that are unlikely to be contaminated. However, both sets of literature mentioned above are quite dated. We recommend that the MOD updates both the content and the guidance in publications and other materials (e.g. posters) to ensure that they reflect contemporary issues, recommendations and procedures, and that the messaging is prominent throughout Service life.

The penultimate implication from this study reflects the fact that PIEDs use is not condoned by the Armed Forces and that there could be significant ramifications for personnel if caught, including discharge from Service (Ministry of Defence, 2020b). It is for this latter reason that the ex-Service personnel who used PIEDs in this sample reported that they did not favour using medical officers for advice or assistance when issues arose around their use; rather, the cohort in this study relied on peers, gatekeepers and especially the internet for information on all PIEDs matters, including related health issues. In light of this and given the fact that negative health consequences may be exacerbated by not using, or not feeling able to speak to, medical practitioners, we recommend a review of policies and procedures around military medical support. This should include further consideration of medical confidentiality. Lastly, given that the risk of disciplinary action stops PIEDs users from seeking medical assistance, we propose that the MOD reviews the disciplinary policy given the possibilities for unknown contamination (see Maughan *et al.*, 2018, for insight).

Finally, a minority of the participants reported that they had been diagnosed with mental health conditions since leaving Service but did not state whether their mental health diagnosis was made prior to or following the commencement of PIEDs use. The positive health benefits of exercise are commonly communicated to the UK general population (see Public Health England [PHE], 2020) and, in common with PHE's assertions and guidance, our participants reported that exercise helped to ameliorate their mental health conditions. However, the form (heavy weight training and bodybuilding) and degree of exercise that our participants undertook ,places excessive and potentially seriously harmful demands on their bodies. Indeed, their training could be considered extreme when compared to that undertaken by members of the general public. Adding to the 'extreme' exercise regime, the addition of PIEDs use exacerbates health dangers. Recommending gym use to ameliorate or manage mental health conditions in such veterans, therefore, seems counterproductive unless the harmful (and potentially addictive) degree of exercise and use of PIEDs is dealt with first. One recommendation would be for the MOD to develop policies around 'healthy' gym use, and to train gym staff to be on the look-out for unusually excessive gym behaviours, including disproportionate changes to body shape and composition. Such actions could be the early warning signs flagging a need for intervention.

14.2
Conclusion

Further work is needed to understand more fully many elements of PIEDs use, and the associated issue of excessive exercise to the point of being harmful. Service personnel are raised outside the Armed Forces but grow and develop within it. Understanding how we can support their development, both mentally and physically, is a key part of ensuring personnel are combat-ready, healthy and have the knowledge they need to take that learning and healthy behaviour into their communities, when they transition at the end of their military career to civilian life.

14.3
Summary - Study Two

SUMMARY – STUDY TWO	
Participants	• Fourteen UK ex-Service personnel from Army (12) and Navy (two) participated in the study, including one female. • All participants had passed initial training. • All participants were current users of anabolic agents and had taken PIEDs both orally and by injection. • Ten participants used multiple drugs in combination (aka 'stacking'). • Five participants reported mental health illness post-Service. • All five had received medical support for either depression (three) or PTSD (two). All found that gym work made them 'feel better.'
Motives for taking PIEDs	• Multiple reasons were reported for taking PIEDs; strength gains, muscle hypertrophy and improved body image were most cited
Issues around introduction to PIEDs use	• Users were introduced to PIEDs through 'gatekeepers' (mainly peers or mentors). • PIEDs users reported alcohol, cannabis, cocaine and other recreational drug use, though without excessive consumption.
Aspects of knowledge acqusition around PIEDs use	• Participants sought information on PIEDs, including consequences of use and training methods, mainly from the world-wide-web, specialised gym related magazines and from gatekeepers/peers. • Medical professionals were not used as information sources primarily due to fears around confidentiality.
Perceived physical and mental health outcomes of PIEDs use	• Positive physical changes experienced by participants included increased strength, muscular hypertrophy and greater endurance. • Perceived mental health benefits were reported through their improved body image and increased self-esteem. • Negative physical outcomes of PIEDs use included musculoskeletal injuries, kidney problems/UTIs and sepsis. • Adverse mental health behaviours included increased aggression, mood swings and addictive tendencies.
Risk taking behaviour identified	• Risks were taken in purchasing PIEDs, through using unknown suppliers, with no quality assurance. • PIEDs were taken in all cases, orally and by injection, with most injections being noted as intra-muscular. Most participants had no clinical training for this procedure. • Multiple modes of consumption were reported, with 'stacking (multiple drugs being taken in combination) and 'pyramiding' (increasing dosages) being most common. At times both modes were executed simultaneously.
Limitations of Study Two	• The small number of participants reduces the generalisability to all ex-Service PIEDs users. • Inability to recruit more women for the study.

15 Recommendations

Area of impact	Issue/need	Recommendation	Timescale
Strategy/policy	Fitness training regimen as a gateway to PIEDs use	Continue to review the level of physical demand at the outset of Service and the way in which it is elicited in training, e.g. training demands tailored to work demands.	Immediate/ongoing
	Need for pre-recruitment strategies	In locales around key recruitment areas, consider setting up 'kite-marked' facilities where potential recruits can be trained by accredited fitness professionals with possible linkage to the 100% ArmyFit app. (https://apply.army.mod.uk/how-to-join/can-i-join/fitness/army-fit-at-home)	Medium-term
	Seeking expert support	Seek sports medicine involvement through the Royal College of Sports Medicine to assist military physicians with evaluating fitness training needs with appropriateness of regimens.	
	A holistic, inclusive approach to fitness training	Consider longer 'lead time' in basic training when in-Service to allow for staged, progressive workloads while effecting the same fitness outcomes.	
	Negative health consequences may be exacerbated by not using, or not feeling able to speak to medical practitioners	Review policies and procedures around medical support to include consideration of medical confidentiality.	
	Reduce purchase of unknown products at home or abroad (e.g. in U.S. military bases)	The MOD should review retail policies and consider the sale of appropriate, quality assured supplements on its bases.	Long-term
	The risk of discharge stops PIEDS/PIEDs users from seeking medical assistance	MOD to review the discharge policy for PIEDs use given the possibilities for unknown ingredients or contamination (see Maughan et al., (2018) for insight). For example, taking Sudafed for a cold could lead to a failed CDT.	
Interventions	Identifying the early signs	MOD to develop policies around gym use to discourage addictive training practices.	Immediate
	Building the team	CPD with Physical Training Instructors (PTIs) to raise awareness of PIEDs-related issues and how they may help in their roles as PTIs. Train PTIs and other military staff to monitor personnel for excessive or addictive use, or for disproportionate changes to body shape and composition compared with their peers, as precursors to early intervention.	
Communications	Contemporise promotional literature	MOD literature around PIEDS and PIEDs use is dated (2006, 2013). The MOD should update both the content and the guidance in publications and other materials (e.g. posters) to ensure that they reflect contemporary issues, recommendations, and procedures. Further, the MOD should ensure that updated materials are actively promoted throughout Service life to help change the way personnel think about PIEDs' benefits and challenge unhealthy behaviours.	Immediate and ongoing
	Promotional campaigns to spread the message	Educational campaigns/guidance should be developed and disseminated on the risks of procuring PIEDS and PIEDs in the UK and abroad. Messaging should focus on the real possibility of unknowingly consuming contaminated products and the associated consequences of both severe health damage and risk to military career.	
	Consistent messaging around drug-taking (PIEDs)	Clear messages should continue to condemn proscribed PIEDs use for optimising physical capacity while also raising the profile of the serious health and career risks involved.	
	Consistent messaging around supplements (PIEDS)	Reinforce the clear messages that the Armed Forces gives to personnel about not needing nutritional supplements.	
	Safer consumption of supplements (harm minimisation)	Personnel are likely to continue to take supplements irrespective of communication campaigns. Messages should continue to communicate acceptable routes for safer supplement use e.g. promotion of the informed sport website (www.informed-sport.com).	
	Need for medical practitioners' input	Medical practitioners should be proactively involved early in the training of recruits to provide professional clinical input on PIEDs to lend additional credibility and gravitas to the messaging. Message content and mode of delivery should vary to allow for differing levels of background education and awareness. Medical centres and gyms should prominently display and make available information that includes the potentially severe health consequences with graphic representations of the realities of physical harm – in much the same way as lung cancer images were shown for 'Stop Smoking' public campaigns.	
Research	Evidence to inform policymaking and interventions	Determine how effective, current military policy and educational training or communication are around the health and career-risk issue of PIEDs use, starting at new recruit training (and even in recruitment materials around how to get fit for service).	Immediate and ongoing
	Evidence to inform policymaking and interventions	Determine the prevalence of both PIEDS and PIEDs use across the Armed Forces, where supplements are purchased, and how many CDT disciplinary actions are due to improper PIEDS or PIEDs use.	

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17
Appendices

17.1
Appendix 1: Search terms used

Database: Medline Date of Search: 05/01/2019

Military Search Terms	PIEDs Search Terms	Other Search Terms	Number of Results	Excluded (at abstract)	Excluded (at full text)	Duplicates	Number taken to Synthesis
air force personnel; armed forces personnel; army personnel; coast guard; deployment, military; force personnel, air; Marines; Military; military deployment; military personnel; navy personnel; personnel, air force; personnel, armed forces; personnel, army; personnel, military; personnel, navy; Sailor; Sailors; Soldier; Soldiers; Submariner; Submariners; medicine, military; military medicine; Veteran; Veterans; hospital, veterans; hospitals, veterans; veterans hospital; veterans hospitals	drugs, performance-enhancing; effect, performance-enhancing; effects, ergogenic; effects, performance-enhancing; ergogenic effects; ergogenic substances; performance enhancing drugs; performance enhancing effect; performance enhancing effects; performance enhancing substances; performance-enhancing drugs; performance-enhancing effect; performance-enhancing effects; performance-enhancing substances; substances, ergogenic; substances, performance-enhancing; agents, anabolic; anabolic agents; anabolic effect; anabolic effects; effect, anabolic; effects, anabolic; agonists, hormone receptor; Hormone; Hormones; receptor agonists, hormone; image enhanc* drug; hormone receptor agonists; body image		36	24	0	0	12

Database: PsycINFO Date of Search: 12/01/2019

Military Search Terms	PIEDs Search Terms	Other Search Terms	Number of Results	Excluded (at abstract)	Excluded (at full text)	Duplicates	Number taken to Synthesis
military personnel; military veterans; volunteer military personnel; air force personnel; navy personnel; army personnel marine personnel; combat experience	Performance enhancing drugs; image enhanc* drug; steroid, anabolic; steroid		65	60	0	2	3

Database: PubMed Date of Search: 12/01/2019

Military Search Terms	PIEDs Search Terms	Other Search Terms	Number of Results	Excluded (at abstract)	Excluded (at full text)	Duplicates	Number taken to Synthesis
military personnel; armed force*; veteran; army; navy; air force; war fighter; royal marine; armed service*	Performance enhanc* drug*; image enhanc* drug*; steroid, anabolic; steroid		50	43	0	2	2

Database: CINAHL Date of Search: 18/01/2019

Military Search Terms	PIEDs Search Terms	Other Search Terms	Number of Results	Excluded (at abstract)	Excluded (at full text)	Duplicates	Number taken to Synthesis
military personnel; armed force*; veteran; army; navy; air force; war fighter; royal marine; armed service*	Performance enhanc* drug*; image enhanc* drug*; steroid, anabolic; steroid		5	2	0	2	1

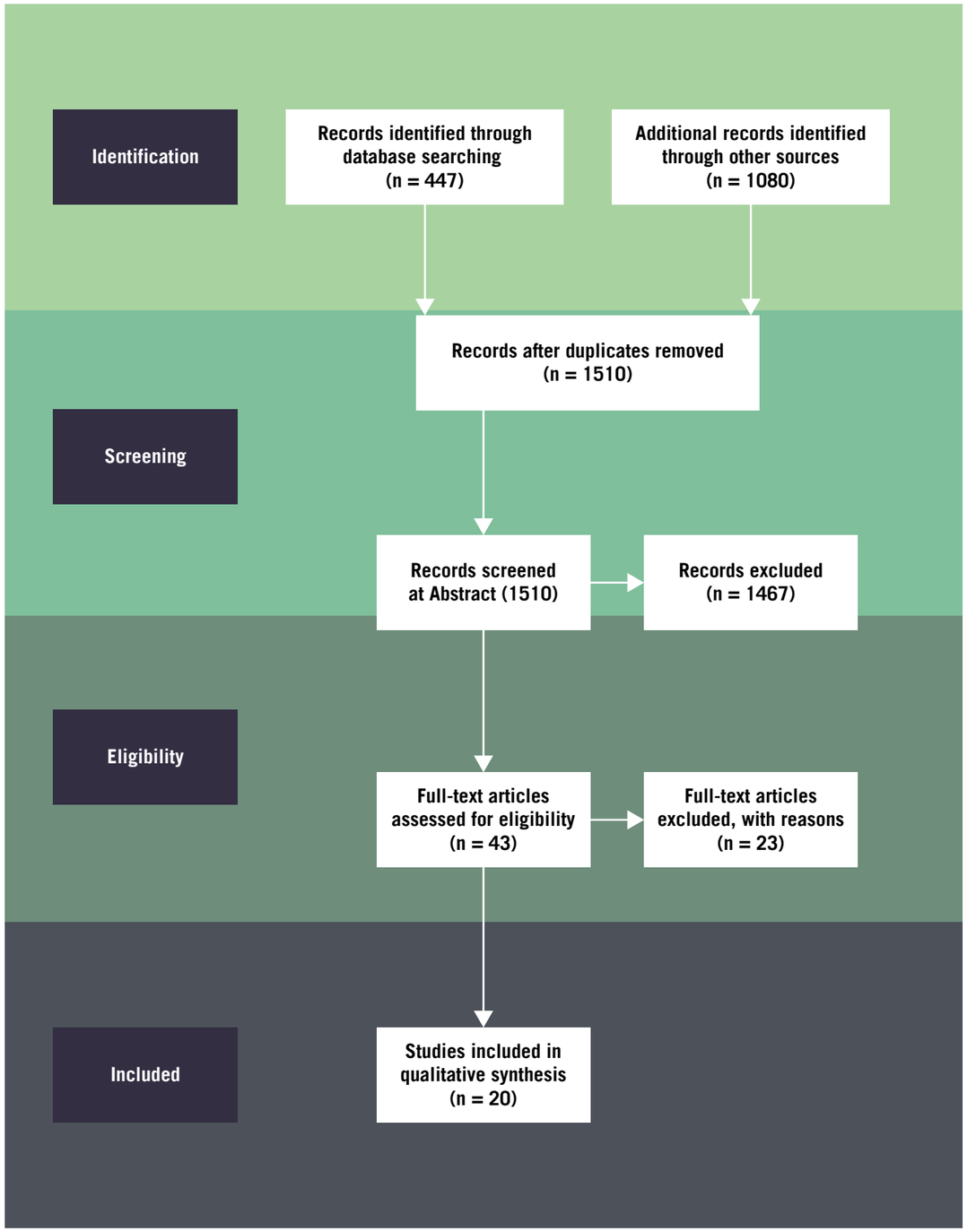
Database: EMBASE Date of Search: 07/01/2019

Military Search Terms	PIEDs Search Terms	Other Search Terms	Number of Results	Excluded (at abstract)	Excluded (at full text)	Duplicates	Number taken to Synthesis
armed forces; Military; US army; active duty personnel; enlisted personnel; Infantryman; military people; military personnel [MeSH Descriptor]; military recruit; military selection; military staff; personnel,military; reserve personnel; armed forces medicine; psychiatry, military; war medicine; Navy; air force; Veteran; Veterans; marine corps personnel; marine crew; marine recruit; Mariner; naval crew; Seaman; submarine crew; submarine sailor; Yachtsman	performance enhancing drug; performance enhancing drugs; performance enhancing substances; performance-enhancing drug; performance-enhancing drugs; performance-enhancing substance; performance-enhancing substances [MeSH Descriptor]; anabolic agents [MeSH Descriptor]; anabolic drug; anabolic hormone; anabolic steroid; anabolic steroid agent; anabolic steroids; anabolizing agent; anabolizing cream; anabolizing drug; anabolizing treatment; steroid,anabolic; accretropin [Drug Trade Name]; Asellacrin; asellacrin 10; asellacrin 2; bio tropin [Drug Trade Name]; bio-tropin [Drug Trade Name]; biosynthetic human growth hormone; biotropin [Drug Trade Name]; cb 311 [Drug Trade Name]; cb311 [Drug Trade Name]; corpormon [Drug Trade Name]; crescormon [Drug Trade Name]; genotropin [Drug Trade Name]; genotropin miniquick [Drug Trade Name]; genotropin preservative free [Drug Trade Name]; growject bc; growth hormone,human; growth hormone,recombinant human; h.g.h.; hGH; hormone,human growth; human somatotropin; humatrop [Drug Trade Name]; humatrope [Drug Trade Name]; jintropin [Drug Trade Name]; lb 03002 [Drug Trade Name]; lb03002 [Drug Trade Name]; neutropin [Drug Trade Name]; norditropin [Drug Trade Name]; norditropin cartridge [Drug Trade Name]; norditropin flexpro [Drug Trade Name]; norditropin nordiflex [Drug Trade Name]; norditropin s [Drug Trade Name]; norditropin simplexx [Drug Trade Name]; novotropin [Drug Trade Name]; nutropin [Drug Trade Name]; nutropin aq [Drug Trade Name]; nutropin aq nuspin [Drug Trade Name]; nutropin aq pen [Drug Trade Name]; nutropin depot [Drug Trade Name]; nutropinaq [Drug Trade Name]; omnitrope [Drug Trade Name]; prolease [Drug Trade Name]; recombinant human growth hormone; recombinant somatropin; saizen [Drug Trade Name]; salzen [Drug Trade Name]; scitropin [Drug Trade Name]; serostim [Drug Trade Name]; serostim lq [Drug Trade Name]; serotim [Drug Trade Name]; sj 0011 [Drug Trade Name]; sj0011 [Drug Trade Name]; somatotropin,human; somatropin [Drug Trade Name]; somatropin pegol; somatropin rdna origin; somatropin recombinant; somatropin, biosynthetic; subtropin [Drug Trade Name]; subtropin hGH [Drug Trade Name]; tev tropin [Drug Trade Name]; tev-tropin [Drug Trade Name]; tevtropin [Drug Trade Name]; umatrope [Drug Trade Name]; valtropin [Drug Trade Name]; w 752 a; zomacton [Drug Trade Name]; zorbtive [Drug Trade Name]; body image; image enhanc* drug;		293	281	1	6	6

Database: SportDiscuss Date of Search: 22/01/2019

Military Search Terms	PIEDs Search Terms	Other Search Terms	Number of Results	Excluded (at abstract)	Excluded (at full text)	Duplicates	Number taken to Synthesis
military personnel; armed force*; veteran; army; navy; air force; war fighter; royal marine; armed service*	Performance enhanc* drug*; image enhanc* drug*; steroid, anabolic; steroid		28	27	0	1	0

17.2
Appendix 2: PRISMA flowchart depicting the flow of information through the different phases of the systematic review



17.3
Appendix 3: Data extraction summary for systematic review

Author Name	Year of Publication	Methodological Approach	Active/ Veteran	Service Type	Country	Type of Drug	Adverse Effects	Reasons for Use	When started using	Main Findings
Austin et al.	2016	Quant	Active	Army	U.S.	Weight-loss, anabolic steroids		Physical expectations of the job		The prevalence of DS use for promoting weight loss was significantly less among deployed (12%) compared with garrison (16%) personnel. However, use of weight loss DS to improve weight loss was more prevalent among garrison (3%) than deployed (0.5%) soldiers. No significant different between anabolic steroid use between garrison and deployment.
Austin, et al.	2014	Quant	Active	Army, Air-Force	U.S.	Anabolic steroids	Aggression			Users of Steroid products reported feeling less friendly and more aggressive
Boos et al.	2010	Quant	Active	Did Not Specify	UK	Anabolic steroids, PEDs, hormone boosters	Insomnia, mood changes, palpitations, anxiety	Physical expectations of the job, image enhancement		Fourteen (1.4%) admitted to current use of anabolic steroids. The most-frequently given reason for taking supplements was to 'increase muscle bulk' (40.4%). Users of anabolic steroids were significantly younger than non-users, (24.4 [6.4] years vs 25.6 [7.3]; p=0.002) and were all male. Those currently taking anabolic steroids exercised (non-significant trend) more regularly (6.3 [2.2] vs 5.0 [2.3] exercise sessions per week; p=0.07). There were no other identifiable factors that predicted use.
Brazeau et al.	2015	Case Study	Active	Army	U.S.	Anabolic steroids	Liver injury	Image enhancement, muscle growth		A case of a healthy, young, active duty Army male soldier who developed pruritis and jaundice shortly after starting to take a body-building supplement containing anabolic steroids, and was subsequently found to have significant biopsy proven drug-induced liver injury.
Bucher	2012	Qual	Active	Army	U.S.	Anabolic steroids	Negative body image, aggression	Seen as acceptable, physical expectations of the job, keeping up with others, influence of others, coping with combat	Some participants mentioned using recreational drugs before, during and after military service. One began PIEDS use in basic training; two started while deployed in a combat zone	Participants mentioned that forces medics were dealing the steroids, one medic admitted to dealing steroids before they started to use themselves. Participants highlighted a concern of steroids contributing to non-combat deaths and poor conduct. Qualitative findings illustrating reasons for use, when using started and side effects.
Campagna & Bowsher	2016	Quant	Active	Army, Navy, Air-Force	U.S.	Bodybuilding, weight loss		Men - performance enhancement, image enhancement Women - weight loss and overall health		The prevalence rate of all service members with Body dysmorphic disorder is 15.3%. The prevalence of BDD in soldiers is 18.4%, which is higher than sailors (11.8%) or airmen (13.1%). Disordered self-image is much higher in women (n = 82, 21.7%) and 10 to 12 times greater than that of the general population. The prevalence rate of MD was 9.3% for all service members, with a breakdown of Army at 9.4%, the Navy at 10.1%, and the Air Force at 10.2%. The prevalence rate for male service members was 12.7% and for females, 4.2%; markedly greater than expected. Supplement use in service members is extremely common with 59% reporting use of any type of supplement.

Author Name	Year of Publication	Methodological Approach	Active/ Veteran	Service Type	Country	Type of Drug	Adverse Effects	Reasons for Use	When started using	Main Findings
Carol	2013	Case Study	Active	Army	U.S.	Weight-loss	Pain, cramping, vomiting, rhabdomyolysis	Concerns about weight gain due to injury and restricted exercise		Dietary supplements containing caffeine may potentiate the rhabdomyolysis cascade, and present an area of attainable prevention. Three cases of soldiers using the weight loss supplement, Hydroxycut. Patient education regarding caffeine and supplement safety may shield against morbidity and delayed soldier readiness associated with over-caffeination. No soldier felt using weight loss supplements was potentially harmful.
Casey et al.	2014	Quant	Active	Army	UK	Anabolic steroids, hormone boosters		Physical expectations of the Job		A small proportion of respondents reported the use of amphetamines and similar compounds (1.6%), cocaine (0.8%), anabolic androgenic steroids (1.1%), growth hormone (2%), and other anabolic agents, e.g. testosterone (4.2%). Junior non-commissioned officers reported greater use of steroids than other groups.
Harris, et al.	2017	Case Study	Active	Air-Force	U.S.	Body building	Haemorrhagic Stroke, severe headache, nausea, vomiting, and balance disturbances			Case of a healthy 25-year-old active duty male who experienced a bilateral cerebellar haemorrhagic stroke occurring shortly after taking a supplement named Animal Rage XL.
Herbst, et al.	2017	Case Study	Veteran	Army	U.S.	Body building	Panic attacks, disturbing thoughts	Image Enhancement		Study of a 31-year-old male student and army veteran who served two tours in Iraq as a medic. A year after returning from his last deployment, and 6 months after he separated from the military, he began experiencing PTSD symptoms. Patient saw noticeable drop in PTSD after discontinuing PIED use and starting Cognitive Behavioural Therapy
Jacobson et al.	2012	Quant	Active	Army, Navy, Air-Force, Marines	U.S.	Weight-loss, body building		Physical expectations of the job, Coping with Combat		Male deployers were more likely to use bodybuilding supplements, whereas female deployers were more likely to use weight loss supplements. Physically active and younger subjects reported all types of supplement use. 17.3% reported use of bodybuilding supplements (22.8% of men, 5.3% of women), and 19.4% reported use of weight loss supplements (15.9% of men, 26.9% of women). Deployment experience, younger age, and problem drinking were significantly associated with increased adjusted odds of reporting bodybuilding and weight loss supplement use
Liane & Magee	2016	Case Study	Active	Marines	USA	Anabolic steroids within PED	Pancreatitis, cramping, nausea, decreased appetite			Steroid-induced pancreatitis in young active marine.
Lui et al.	2018	Quant	Both	Army, Navy	Australia	Weight-loss, Body building			Veterans who did not report using supplements regularly on deployment were far less likely to use them subsequently	Overall use of supplements was highest on deployment to Afghanistan (27.8%) compared to Iraq (22.0%, $p<0.001$) or post deployment (current use 21.2%, $p<0.001$). Men were more likely to use body-building supplements while women more often used weight loss supplements. Combat exposure, mixed duty cycles and working long hours during deployment were associated with higher supplement use. Use of body-building supplements and energy supplements was more common in Army personnel than other Services.
Lukas et al.	2007	Quant	Active	Did Not Specify	Hungary	Anabolic steroids				Comparison of bodybuilding behaviours and supplement use in military and general public. Military college sample (3.3%) used significantly more anabolic androgenic steroids than general public college sample (1.5%)

Author Name	Year of Publication	Methodological Approach	Active/ Veteran	Service Type	Country	Type of Drug	Adverse Effects	Reasons for Use	When started using	Main Findings
Magee et al.	2016	Case Study	Active	Did Not Specify	U.S.	Anabolic steroids, body building	Liver injury			Two case reports of bodybuilding supplement users suffering liver injury. Analysis of supplements demonstrated the supplements were falsely labelled and they present a significant clinical risk to health and mission readiness
Mattila et al.	2010	Quant	Active	Did Not Specify	Finland	Weight-loss, anabolic steroids				Study involved Finnish male conscripts entering obligatory military service. 0.9% reported PIED use and 0.6% reported willingness to use PIEDs if they could obtain them. Participants over 20 years were 2.4 times more likely to use than under 20s. Participants with lower educational attainment were more likely to use PIEDs. Smoking, drinking and exercise frequency were also significantly associated with PIED use.
Paisley	2015	Quant	Active	Army	U.S.	Weight-loss, PEDs	Shortness of breath, dizziness, dehydration, pain, sickness, insomnia	Image enhancement Muscle strength		77% reported using at least one supplement during deployment. On average, 2.5 supplements were used per individual surveyed. Nine respondents reported adverse effects of supplement use. None reported serious complications of supplement use, drug interactions, or seeking medical care for supplement adverse effects. The Internet was the most frequently reported source of information on supplement use. Most frequently, supplements were acquired by Internet mail order. 3.59% used weight loss supplements, 27.89% used pre-workout PEDs
van de Pols et al.	2017	Quant	Both	Army, Navy, Air-Force	Australia	Weight-loss, body building	Headaches, sleeping difficulties, flatulence, diarrhoea, indigestion			Bodybuilding supplements were used by 17·5% of participants and weight loss supplements by 7·6 %. Bodybuilding supplements were more often used by men, younger persons and those in the Army, while weight loss supplements were more commonly used by women and Navy personnel.
Varney et al.	2017	Quant	Active	Army, Navy, Air-Force, Marines	U.S.	PEDs, Weight-loss	Insomnia	Boost energy, enhance performance improve health, decrease fat, lose weight, gain strength, gain muscle		65% of participants reported increased use and increased frequency of use of supplements (e.g., daily) during deployment compared with pre-deployment. 8% increase in PED use during deployment when compared to pre-deployment and 1% increase in weight loss supplement use.
Young et al.	2012	Case Study	Active	Did Not Specify	U.S.	PEDs, Hormone Boosters	Haemorrhagic stroke, behaviour change, headache			Unclear whether Jack3d use directly caused this patient's haemorrhagic stroke or whether Jack3d in combination with other predisposing factors (e.g., tobacco use, physical exertion, or anatomic abnormality such as an undetectable berry aneurysm or PFO) contributed to the event or whether Jack3d use was merely coincidental.

17.4
Appendix 4: Demographic information for participants

Part. ID	Sex	Age in Years	Armed Service	Rank	Age on Joining	Years of Service	Years as Civilian	Years on PIEDs (i) = in-Service	Occupation on Leaving
M1	M	38	Army	L Corp	18	6	14	16i	Lorry Driver
M2	M	26	Army	Pvt	19	6	1	3i	Unemployed / PT Security
M3	M	33	Army	L Corp	19	7	7	8i	Unemployed / PT Security
M4	M	28	Navy	Petty Officer	18	8	2	1	Engineer
M5	M	33	Army	L Corp	18	10	5	4	Mechanic
M6	M	34	Navy	Chef/Able Seaman	18	8	8	7	Chef
M7	M	44	Army	Sergeant	19	8	17	22i	Security
F8	F	34	Army	Nurse/Corporal	18	8	8	4	Social care
M9	M	26	Army	Pvt	18	6	2	4i	Doors/Security
M10	M	31	Army	Pvt	20	7	4	8i	IT
M11	M	31	Army	L Corp	19	8	4	6i	Security
M12	M	28	Army	Pvt	18	8	2	6i	Construction
M13	M	32	Army	Pvt	18	6	8	12i	Security
M14	M	32	Army	Pvt	20	6	6	10i	Unemployed
Mean		32.14 years			18.6 years	7.29 years	6.28 years	7.93 years	

17.5
Appendix 5: Findings from thematic analysis showing general dimensions, categories, themes, and examples

Example of meaning units with Part. ID	Themes	No. of meaning units	No. of participants who contributed MUs	Categories	General dimensions
It pretty much started in the recruiting office when I sussed that I wasn't fit enough to make the cut to get in. I started on a training plan with supplements M2	Fitness Demands to Enter Service	8	5	Cultural Aspects of Service	Introduction to Use
We were 'beasted' at various times in my career for the sake of it… the only way to get through it was to take stuff M3	'Beasting' Ethos	16	12		
There was this constant demand to be a man, to show to everyone that you were a real man and that involved being fit and showing you could take it M12	'Machoism'	7	6		
Just talking to others, like, they would say, if you want to get there fast then you need some gear M11	Peers in Service	9	5	People / Gatekeepers	
Mates in the gym, or from the job, told me what to take, and when and how to do it. He then showed me 1st time to prove it wasn't sore 13M	Peers External to Service	16	14		
People I looked up to and asked for help, you know, supporting and shadowing (helping to lift) and technical stuff, started to say that they knew how to get stronger faster 4M	Mentors	14	10		
Started on the ganj [cannabis] at school just a spliff or two never a full joint until older. Taking stuff was second nature 4M	Cannabis	9	8	Previous Personal History of Substance Taking / Abuse	
Moved from weed and smokes to a line or two while clubbing, no harm to it. I was never addicted 10M	Cocaine	2	2		
I never took anything much, not even drinking. I looked young and didn't want to get done for under-age drinking or something. I had some Es at a music festival; everyone was at it there, so it seemed OK, part of the experience culture. We knew there was dodgy stuff about, but you still took it F8	'E's and other social / recreational drugs	12	9		
Like loads of the lads back home we took anything we could to get a buzz, glue, lighter fuel anything. We knew it could kill but it was never going to happen to you M10	Glue	2	2		
Was drinking a lot by 14 mostly cider or cheap lager M6	Alcohol	19	13		
I never injected before but have took supplements for years…creatine, amino acids, recovery powders … M12	Supplements	26	14		

Example of meaning units with Part. ID	Themes	No. of meaning units	No. of participants who contributed MUs	Categories	General dimensions
My main big want was to improve strength and the improvements were unbelievable … taking Winstrol, I was a different man in 3 to 4 weeks nearly. It was scary…didn't double in strength but felt like it, M5	Strength	14	12	Fitness Gains	Motivation for Use of PIEDs
I was looking to be strong and fast and wanted to look good at the same time – not enormous just buff. I was doing tai-kwon-do and wanted to be powerful. So, … worked on strength first but then on power to do things fast, better for a quick jab when it might be needed. I got much better and body looked ace too M1	Power	5	3		
I felt I wanted to do more and more and once I was taking the gear was able to go on for ever. [In] fact I increased my time on the gym from about 70 mins a night to near 3 hours but it allowed me to use my time and keep lifting M9	Endurance	8	5		
I just wanted bigger guns [biceps] and pecs, the lasses liked them where I'm from M13	Localised hypertrophy (e.g. arms and upper body)	17	11	Size Gains	Motivation for Use of PIEDs
My goal was just to get a buffer body, bigger pecs, bigger quads, like Arnie but not so big M2	Total Body Hypertrophy	12	7		
… just wanted to look less weedy M11	Look better	26	14	Body Image	
The job I do can be dangerous, drunks and drugged punters trying to get in the premises. I need to be able to stop them if necessary and preferably without trouble. I just needed to look like I could do the business M3	Look tougher / meaner	14	11		
We showered together and I used to look at some of the lads and wish I could look like them. I mean I wasn't skinny but looked it compared with them M13	Comparisons with others	9	7		
I took supplements to make sure that I could get the best out of myself. I mean we had to be able to handle ourselves in case of trouble. Being bigger makes trouble less likely as well … the supplements became gear (from the Americans) M3	In-service	12	9	Work Demands	
In my line of work [security] it pays to be bigger and stronger looking, but there is always somebody wanting to take a pop so I need to be fit to take care of myself M7	Ex-Service	17	10		

Example of meaning units with Part. ID	Themes	No. of meaning units	No. of participants who contributed MUs	Categories	General dimensions
I use the body building sites a lot, there' masses of tips and knowledge there. Masses of programmes to follow for best results M9	Internet	20	14	Fitness Related	Knowledge Sources about PIEDs and Related Aspects
I ask around a lot but generally get tips from guys I trust in the gym and I'm always watching what others are doing. There are good ideas everywhere M12	Other gym users	16	12		
We have two guys at our gym and they give plans and advice, and help out spotting. Founts [sic] of knowledge they are F8	Mentors/advisors	19	12		
Tended to look and read the magazines though doing that less nowadays M4	Literature (Books/Magazines)	11	10		
You get everything you need on the web now. Forums for taking drugs, what's best for what purpose. You can get pics of how to inject and clean up etc. M13	Internet (YouTube / forums)	23	14	PIEDs	
We all talk to each other and when anything new is around we always ask around, in the gym and outside. A real network of knowledge, like a tree with branches everywhere [laughs] M1	Other Users	25	14		
A bit stupid but the people I listened to most were the lads I was buying from, or people they knew M3	Gatekeepers	22	14		
I've asked the medics about it, not about me, you know, always looking for information for 'someone else; but really I was looking for info or assurance M5	'Medical Professionals'	8	5		
I look at books but they tend to be complicated with lots of chemistry and stuff but [every] so often you can find a gem or two. I found about 'ghosting' from one M8	Literature (Books/Magazines)	18	3		
Only when there is no other option do I go to the doctors. I usually ask my mates and try to deal with it myself. I went to find out if there was anything I could do for plooks [acne] on my back but was basically told [to] stop using. [It] defeats the purpose reallyM6	Medical Professionals	9	7	Medical Issues	Knowledge Sources about PIEDs and Related Aspects
I've tended to ask the guy that I get my supplies from as he has been there, seen it, done it, got the T-shirt. Like [for instance], when I was on nandrolone [steroid] I was beginning to look fat and didn't know why or what to do. He told me to change [drugs] as it was water retention M14	Peers / gatekeepers	15	13		
If I've got anything that I think is medical I usually look to hit two areas. My mates first then, I've got a couple of good books that I can dip in and out M6	Literature (Books/Magazines)	16	12		
… but then its Dr Google or into specialist chatrooms. You can get answers to anything from the chatrooms M7	Internet	18	14		

Example of meaning units with Part. ID	Themes	No. of meaning units	No. of participants who contributed MUs	Categories	General dimensions
I was lifting bigger weights within ten days. Six to eight weeks after starting 'oxes' [oxandrolone] I was lifting like three men … half as much as before; and I mean, I wasn't a weakling then M9	Stronger	21	14	Physical Benefits	Health and Fitness Consequences
It didn't start with this in mind, I just wanted to get bigger and stronger but I was able to train longer and more often; my recovery was much better I suppose and that let me do more reps and sets M13	Increased Endurance	11	10		
They [drugs] did everything I wanted. I could look at the mirror and see the difference in my size. Pecs, biceps, delts [deltoids], lats [latissimus dorsi], quads [quadriceps], even my ass; everything looked bigger M2	Muscle Hypertrophy	17	13		
My main aim was to get trimmer and cut [reduce fat] and I was able to do that, training hard and using trenz [trenbolone]. Lost my period too but wasn't too fussed about that anyway F8	Body Fat Loss	8	8		
My feelings about myself were and still are really good. The army gave me discipline and made me feel good about myself but when I left I was lost a bit and down, but training and the changes brought me back to where I am now. I feel good about myself in other company M1	Raised Self-esteem	24	12	Perceived Mental Health Benefits	
I love the way I look. Some people think that I'm too big but I don't care, I like the way I look, tight white t-shirt, tight jeans… nothing to beat that look even at my age M44	Improved Body Image	20	14		
My appearance, my strength, my looks, the way I feel my muscles working, all make me feel good about myself give me confidence. I think that I can handle most situations now where before I might not have been as confident, especially when someone tries it on F8	Increased Confidence	13	12		
The gym makes me happy. Working out makes me happy. Don't get me wrong, it's tough but a good tough if you know what I mean. But after a workout I am just an easier-going more relaxed person M7	Improved Mood (more relaxed)	9	9		
I like to give myself goals and meeting them goals in the gym is a real plus. Doesn't matter if it is on max lifts or numbers of reps, getting there and achieving is major [a positive] M1	Meeting Target	4			

Example of meaning units with Part. ID	Themes	No. of meaning units	No. of participants who contributed MUs	Categories	General dimensions
Loads. They're part of the territory if you want to train like me and me mates. Usually, it's muscle tears but my worst has been tendon rupture in my bicep only a couple of years ago, not long after I started injecting… pushing it too much I think M12	Musculoskeletal Disorders	18	11	Negative Physical Consequences	Health and Fitness Consequences
I got worried a bit back [short time ago] when I started to swell at an injection area just at the wee hole. It got redder then started to rise and get sort of green-yellow puss like. Had to go to the doctor with that one and there was no hiding about injecting. I had to tell him. I'm careful with needles and things like that so no idea how it happened M2	Infections injection sites)	4	4		
I was taking stuff orally at the time and started to feel dodgy and sick, then needed to go to the toilet a lot. Quickly that became painful, like peeing broken glass and it was bloody too. Doc said it was my kidneys rebelling to the dosages I was on. I stopped taking for about 6 months after that. M11	Kidneys (UTI)	6	6		
[I] never really had any problems until I began to fill a bit shit, just poorly. Then one morning I noticed that I was beginning to look pale and jaundiced. Spoke to a few of the boys and looked stuff up on the web before going to the doctors. He took blood and sent it away and my liver function came back as being damaged. I had to come clean with the doc then, came of the gear and got better gradually. Yeah, I'm back on but more careful about doses and 'ghost' [reduce or stop taking doses] it more M14	Liver Problems	2	2		
The biggest disaster I had when taking steroids was [when] I got big too quickly in some areas and ended up with bad stretch marks that left they horrible scars. Dead unsightly around my shoulders and quads and ass. They've never gone away either M7	Scarring (skin)	6	4		
It was always at the back of my mind but I was extra careful injecting and making sure that things were clean, but I ended up with sepsis … wasn't well for a long time M6	Blood Problems	3	3		
I'm normally ok but if anyone takes the piss or starts me up, I lose my temper easily. My lass is always trying to calm me down before I lash out. Afterwards I feel bad but I don't know, I just get ragey [angry] easier than I used to M11	Aggression	7	5	Perceived Negative Mental Health Consequences	
It doesn't happen a lot but there are times that I have felt real low and depressed and others, usually on lower doses I feel high. The lads I work with noticed changes, or so they say, and sometimes don't know how to take me M3	Mood Swings	10	7		
Don't get me wrong, I'm happy with how I look but there are times I look at myself in a shop or somewhere and wonder who the fuck that is looking at me. I don't recognise myself … usually about then I feel shit as I have cheated or taken shortcuts to get this way. That's a big thing for me. I always played fair but when I see myself, I don't like what I've become. Not all the time, mind you M6	Poor Self Image	3	2		
It used to be twice or maybes three times a [per] week in the gym. Now it's every day sometimes twice a day, and if I don't get at the same time or something is stopping me, I get really twitchy. I've missed work to make sure I could get to the gym. Even went while partner was in labour M2	Addictive Behaviour	10	8		

Example of meaning units with Part. ID	Themes	No. of meaning units	No. of participants who contributed MUs	Categories	General dimensions
No idea about the quality of what I'm taking. I just trust the suppliers and never thought too much about it but that's risky. I never see the suppliers; they are in Liverpool but the go between is a boy in my gym so he has used with them for ages and I trust him that the gear is good and clean M12	Quality Assurance	15	12	Purchasing	Risk Taking and Safety
I measure mine out for myself most times or just trust that the right stuff is in the phials. One thing, thinking about it, I never know if the tabs or phials have correct amounts or are laced or smoothed down [adulterated] M14	Doses	11	10		
I self-inject, usually in the ass or just above it in the fatty bit and into the muscle. It was sore the first few times but just told myself to stop being a pussy and get on with it. It was a mate that showed me how to do it at first M4	Injection	18	14	Consumption	
My first load were orals [steroids] but they were making me feel sick and some of the lads said they were too risky, so I changed to injections. I still take oral supplements even now but not the heavy stuff M10	Oral	15	11		
I usually stack my juice [PIEDs] taking two or three different types of drugs at a time for different reactions … all at the same time. I then come off that for a few weeks to let my body recover before trying what some lads call cycling where I took one drug, then after about 6 weeks move on to another, then same again with another drug. To stop the body getting used to it M5	Stacking	9	9	Managing Consumption	
I plan when I need to be ready for a competition [bodybuilding] then work out what I need to be on before cutting [losing fat to look leaner and more striated]. If I'm on for a while I usually 'pyramid', gradually increasing my use then cutting back or stopping but continue to train, to give my liver a rest M13	Pyramiding	8	5		
I cycle a lot. Not on a bike (laughs). I take my pharms in chunks. I'll use one steroid like decas (Deca Durabolin) for about 5 or 6 weeks, then move to another like sussies (Sustanon) for another 5 or 6 weeks before moving to trenz (Trenbolone) and so on. That lets my body get a rest a bit and stops me from becoming sort of used to one type M10	Cycling	8	7		
My body seems to get used to a drug quickly, so I either have to move to another that is much the same, or I plateau. I work-out and take a steroid, the last one was winnies [Winstrol], and when I don't feel I'm getting better [reached a plateau] then I take a few days break then take a bigger dose, then do that again, possibly three or four times. Coming of that is hard though! But it needs to be done as you can't just keep taking it and taking it and expect to stay the same colour [meaning that liver problems could be likely] M7	Plateauing	4	4		

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SUCCESSFUL SUSTAINABLE TRANSITION

Performance and image-enhancing drug use in military veterans

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