

Title: Libido as a motivator for starting and restarting non-prescribed anabolic androgenic steroid use among men: a mixed-methods study

Abstract

Anabolic Androgenic Steroids (AAS) are commonly used for their anabolic effects and potential detrimental consequences are well documented. Most studies focus on the motivations of increased muscle development and report increased libido as a secondary motivation. This paper aims to explore users' reports of libido as a motivator for starting and restarting AAS use. This mixed-methods study comprised questionnaires with 133 adult male AAS users (38% of selected increased libido as motivation for using), and 23 semi-structured interviews with a sub-sample. Thematic analysis identified four interlinked themes: increased libido as a motivation for starting/re-starting AAS; increased libido/sexual performance as a beneficial effect; mixed experiences with physicians regarding libido changes and hypogonadism and reduced sexual functioning and fertility after AAS cessation.

Increased libido was identified as a benefit by 90% but motivations for use changed over time. Reasons for AAS use included mitigating the effects of aging particularly linked to the concept of virility. AAS as self-medication for low testosterone needs further investigation as does the idea of hegemonic masculinity as a reinforcing driver for AAS use. This study highlights the need to consider how AAS users' views of medical support impact on self-medication choices.

Keywords: Anabolic-androgenic steroids (AAS); libido; low testosterone; low mood; sexual function; Testosterone Replacement Therapy (TRT)

Introduction

Anabolic Androgenic Steroids (AAS) are synthetic drugs mimicking male sex hormones, especially testosterone and often used for their anabolic effects e.g. increasing muscle and strength (Nutt, 2012). A meta-analysis of AAS use indicates a global lifetime prevalence of 3.3% (men: 6.4%, women: 1.6%) (Sagoe et al., 2014). [In the US, 1.5-2.1% of Americans aged 13–50 years had used AAS \(Pope Jr. et al., 2013\)](#), Sweden reports a lifetime prevalence of 1.7% (Hakansson et al., 2012) and in the UK the National Crime Survey found the lifetime use of 0.9% among 16-59 years olds (UK Home Office, 2018). Achieving a complete picture of AAS use is challenging, as studies often focus on sub-groups such as athletes or adolescents and use is under-reported in countries where AAS use is illegal or socially unacceptable.

AAS use can be detrimental to both physical and emotional wellbeing (Pope & Kanayama, 2012). Short and long-term negative physical health effects include but are not limited to: hypogonadism, testicular atrophy increased blood pressure, cardiovascular abnormalities, cardiac arrest (Baggish et al., 2017; Barbosa Neto et al., 2018; Hartgens et al., 2004; Kasikcioglu et al., 2009; Lusetti et al., 2015; Rasmussen et al., 2018) ruptured tendons, infertility, baldness, acne, sleep abnormalities, neurochemical abnormalities (Chyka, 2003; de Souza & Hallak, 2011; Jones et al., 2011), hepatic and renal injury, and hepatotoxicity (Bond et al., 2016; Hansma et al., 2016; Kafrouni et al., 2007; Niedfeldt, 2018; Robles-Diaz et al., 2015).

[Prolonged AAS use can impact on the body's natural production of testosterone and can cause hypogonadism \(Coward et al., 2013; Kanayama et al., 2015; Harrison Pope Jr. et al., 2015\)](#). Anabolic steroid-induced hypogonadism (ASIH) is the functional incompetence of the testes with impaired production of testosterone and/or spermatozoa due to administration of

AAS (Tan & Scally, 2009), as exogenous testosterone disrupts the HPG-axis (Rahnema et al., 2014). It could impair normal reproductive function (Harrison Pope Jr. et al., 2015) and symptoms may include: erectile dysfunction, infertility, decreased sex drive and depression (Walther et al., 2019). Another potential risk to health comes when AAS-users end a cycle and are no longer using AAS, as many choose to enter a phase of post-cycle therapy (PCT), using a variety of substances to help with the effects of stopping (El Osta et al., 2016; Griffiths et al., 2016), which can include loss of libido and depression (Kanayama & Pope, 2018).

The prominent motivations for use are enhanced physical appearance/ performance (Begley et al., 2017; Cohen et al., 2007; Rowe et al., 2016). Additional reasons for initiating AAS use include occupational (Olrich & Ewing, 1999; Scull, 2013), personal security, psychological well-being, peer influence (Joubert, 2014), increasing confidence (Vassallo & Olrich, 2010) social/sexual attraction (Cohen et al., 2007; Olrich & Ewing, 1999), injury prevention (Midgley et al., 1999), overcoming depression (Hanley Santos & Coomber, 2017), media influence, use of AAS as a sporting or social norm (Grogan et al., 2006), reached a plateau in muscle development, frustration as others had over-taken them in size and curiosity about the efficacy of AAS (D. Smith et al., 2009). Further motivations include: preparation for crime, concealing concomitant substance use, becoming brave (Pettersson et al., 2010), generating income (Boardley & Grix, 2014), increasing sex drive, and fat loss (Bates & McVeigh, 2016). Within AAS studies sexual functioning, particularly hypogonadism (Moss et al., 1993), which can result from long-term AAS use has also been given as a reason to re-start AAS use (H. Pope Jr. et al. 2015). AAS use can be self-medication as hormone replacement (Underwood et al., 2020), and ‘increased sex drive’ has been reported as one of the psychological benefits of AAS use (T. Hildebrandt et al. 2006); this has not been explored in depth. Moreover, only one article in the literature appears to consider “cultural and symbolic

meanings assigned to testosterone shape the ontological politics of men's steroid consumption" and importance of libido to masculinity (Fomiatti et al., 2019, p.323). The main focus on motivations has been on the increase of muscle either for competitive or aesthetic reasons, hence this study aims to investigate men's recreational use of AAS, and this paper aims to explore users' reports of libido as a motivator for starting and restarting AAS use.

Methods

This article forms part of a wider exploratory study (cite post review) and reports on a subset of users who identified libido and sexual function as reasons for starting and continuing non-prescribed AAS use. Our mixed-methods approach (Creswell, 2009) employed a questionnaire survey, with both quantitative and qualitative questions, and semi-structured interviews. Both methods were piloted (van Teijlingen & Hundley, 2001) to identify if questions were understandable to participants (Kelley et al., 2003). The theoretical framework, commonly used in mixed-methods health research, is pragmatism (MacKenzie Bryers et al., 2014).

Questionnaire development and distribution

A questionnaire was developed to explore experiences of AAS use (Supplemental material 1). Participants were asked to select motivations for use, based on those identified in the literature (Hanley Santos & Coomber, 2017; McVeigh et al., 2015; Petersson et al., 2010). As motivations for use in the literature were similar across geographical locations, no participants were excluded on the basis of nationality. However, adequate English comprehension was necessary for both methods. Most AAS-users are men motivated by

increased muscle size (Kanayama et al., 2009) whilst female AAS-users are more likely to be competitive bodybuilders than recreational users (Ip et al., 2010). Most studies are overwhelmingly focussed on male populations; consequently, with the intention of gaining further insight from the little understood female AAS-user, this study was open to all genders to see if any women were willing to share their views, however the hypothesis was that there would be significantly fewer female respondents.

Recruitment

AAS users are a hard-to-reach population (D. Smith et al., 2009) experiencing stigma (Maycock & Howat, 2005; Yu et al., 2015). Therefore, we used several non-random, opportunistic sampling methods: self-selected (Patton, 2013; Rees, 2011), time-location space and snowballing, which are useful in sensitive areas of research (Shaghaghi et al., 2011). Snowballing meant having a gatekeeper sharing questionnaires within their community (Biernacki & Waldorf, 1981), snowball sampling is a useful recruitment tool when the participant characteristics are rare and when there are sensitivities involved (Shaghaghi et al., 2011) but can lead to a more homogenous set of participants (Zahnow et al., 2018). To reduce this homogeneity the authors targeted a variety of services which AAS users are likely to access (e.g. muscle gyms, supplement shops), online muscle-building fora, personal social networks and social media, and professionals at Needle and Syringe Programmes working with AAS users, in the hope that their extant relationships with users would encourage participation, As the questionnaire asked for personal information, the anonymity of the internet could help encourage people to participate (Rodham & Gavin, 2006). Consequently, a large part of the questionnaire distribution was done online, targeting AAS users with the use of hashtags on social media. AAS use has been linked to the idea of masculinity

(Kanayama et al., 2012), some targeting of western high-income countries via social media and online muscle fora was part of the questionnaire distribution. A summary of overall distribution of questionnaire is in Supplemental material 2. Ethical approval was gained from xx [name to be added after anonymous peer review] University and from addictions services as required.

Interviews

A pilot interview was carried out with a current AAS-user, who completed the questionnaire and gave feedback on the interview process. No changes were made to the structure of the interview based on the pilot. [The interviewer re-read the participants' questionnaires prior to each interview.](#) Semi-structured interviews lasted 45 to 110 minutes and were undertaken either in person, virtually or via online chat. The interviews covered subjects including motivation for use, side effects experienced, advice sought / support wanted ([Supplemental material 3](#)), with multiple communication channels offered to allow participants to choose their desired level of anonymity. The interviews were transcribed, with interviewees being offered the opportunity to review their transcripts.

Data Coding and Analysis

Quantitative Data

[The data set was cleansed and recoded e.g., redefining USA, US and America under one heading, amalgamating non-UK Europeans under one category.](#) Descriptive analysis, using SPSS, established patterns specifically looking for factors that might influence or indicate types of support desired. [As no questions were compulsory on the questionnaire findings will be presented with the 'n' given when there was missing data. Missing data should be checked for randomness \(Osborne, 2013\) and there were no clear patterns in the missing data and all](#)

answered the majority of questions. There were a very small number of participants who had not selected an option for the Likert scales, however these have been incorporated in the data set as it was less than 3% of the selected options. As the piloting led to no changes to the online questionnaire, three of the four pilot participants were added to the data set (n = 136), one was excluded who was not using AAS at the time. One person was excluded due to missing data as were the only two females whose motivations for use and side-effects were different, and who did not want to be interviewed, leaving 133 survey participants.

Qualitative Data

This was an explanatory design with the qualitative data being used to explain the results of the quantitative data. Thematic analysis was applied to the qualitative interview data using an iterative process (Braun & Clarke, 2012), and N-Vivo was chosen for managing the data. The interviews were analysed by the authors, coding was both deductive and inductive, as the participants' often added information pertinent to other questions at different times and shared their own thoughts and ideas around AAS use in general. Therefore, the categories used for the questions (Supplemental material 3) provided an initial coding framework, and other data were coded inductively. Reliability of coding is critical (De Wever et al., 2006), therefore three interviews were coded independently by the third author and a secondary coding framework was created. The second author used the framework to code three different transcripts for quality assurance.

The qualitative data from the questionnaires was analysed in two-ways. Short answers to open-ended text questions such as lists of side-effects were tallied to ascertain frequency of reported effects of use (Krippendorff, 1980), and explanatory comments were incorporated into the dataset using the coding framework developed from the interviews and was coded

deductively using the coding framework and inductively if data was found that did not fit any already identified themes to create a fuller picture as thematic analysis allows for large amounts of data from multiple participants to be synthesized to create a meaning (Boyatzis, 1998). The quotes have pseudonyms as identifiers and distinguish between quotes from the interview {I} and those from the questionnaire {Q}. This paper reports the qualitative data from interviews and questionnaires focused on libido, sexual function or masculinity with the quantitative data used to provide context for the qualitative themes reported.

Results

Table 1 summarises demographics. Participants reported on whether their quality of life had changed since starting AAS use. Of the 128 participants who answered this question 74% (n=95) stated their quality of life had improved, 20.3% (n=26) had stayed the same, and 5.4% (n=28) said it had got worse.

(Table 1 near here)

(Figure 1 near here)

Twenty-three people were interviewed including the pilot interview as no changes were made after the pilot.

All interview participants were male aged 20-52 years. Nearly all (n=20) were college/university educated and 3 were secondary school educated. 11 participants were from the UK, 7 from the USA, and 1 each from Canada, Hong Kong, Spain, Belgium and Denmark. All but one (Hispanic) were White. 20 identified as heterosexual and 1, gay, 1 pansexual and 1, bisexual. 6 were self-employed, 11 employed, 1 as both student and employed, 3 as students, 1 as retired and 1 as other. 3 described themselves as competitive bodybuilders, 3 as competitive athletes, 8 as recreational exercisers, 3 as personal trainers, 4 participants described themselves as a mixture of these and one called damaged goods and one fat trying to lose weight.

Motivations for AAS Use

Overall motivations for use were complex (Table 2), highlighted by the fact that no participants selected less than four reasons underlying the decisions to use AAS.

(Table 2 near here)

As age was not normally distributed, Mann-Whitney U tests were run as a non-parametric alternative to the independent samples t-test to investigate any age-related differences in motivations. The distribution of age was significantly different between the yes and no categories for five motivations for using AAS most notably: improve appearance ($p < .01$), increase confidence ($p < .01$), and increase sexual attractiveness ($p < .01$), with younger participants more likely to select yes for these items (Table 3).

(Table 3 near here)

Motivations for use were often interlinked, for example:

It's a two-sided coin. The first side is improved physical and muscular appearance and strength. And the second side is improved sexual performance and attractiveness. These two things really go hand-in-hand (John, 22, USA, {Q})

Some participants added further motivations, in the free text box under 'other reasons'.

Notably, a number of participants self-reported other reasons for starting non-prescribed AAS use linked to a number of health-related conditions including: preventing HIV (Human Immunodeficiency Virus) wasting, recovery from a car accident, auto immune disease, chronic illness and one participant reported managing their ADHD (Attention Deficit Hyperactivity Disorder). For completeness, all the unique 'other' motivations, are included in at Supplemental material 4.

Positive feelings from use

As an unexpected finding was that most (n=118), representing 90% selected ‘increase in my libido’ for positive emotions experienced (Figure 2).

(Figure 2 near here)

Mann-Whitney U tests were run to investigate any age-related differences in perceived positive emotions from using AAS. The distribution of age was not significantly different for increase my libido however, there were significant difference between the yes and no categories for experiencing the following positive emotions from AAS use: feeling unconquerable ($p<.01$), feeling pumped ($p<.01$), and feeling high ($p<.05$), and with younger participants more likely to select yes for these items (Table 4).

(Table 4 near here)

A descriptive statistical comparison investigated difference between those who stated using AAS to increase their sex drive as a reason for using [a] and those who did not [b] (Supplemental material 5). 48.3% (n=28) of those who had increase my sex drive were from US/Canada. Those who chose this reason were less likely to be taking part in competitive sports ([b] 69%, no; [a] 31%, yes) and less likely to use AAS in cycles ([b] 81.6%, no; [a] 18.4%, yes). They were also less likely than those who did not have sex drive as a motivation for use: to use other supplements in conjunction with AAS ([b] 64.9%, no; [a] 31%, yes); seek help for side-effects ([b] 60%, no; [a] 37%, yes) and answer ‘yes’ to the question on whether they could stop using AAS at any time they choose to do so ([b] 66%, no; [a] 34%, yes).

The further analysis led to the emergence of four themes in this paper:

1. Increased libido as a motivation for starting/re-starting AAS use;
2. Experiences of increased libido and sexual function related to AAS use;
3. Experiences with physicians regarding libido changes and hypogonadism;
4. Reduced libido, sexual function and fertility after AAS cessation.

Increased libido as a motivation for starting/re-starting AAS use

Increased libido as a motivation for starting

Fifty-one participants (38%) selected increased libido as a motivation for using, for some this played a key role in their decision making to start AAS use:

*after 42 years became impossible train hard, stay lean and have a decent libido
(Matteo,47,Italy,{Q})*

For others already considering AAS use, the potential positive impact on their own testosterone levels was the final justification for self-medication to overcome symptoms of naturally low testosterone:

I ... took a blood test in a private lab just to see if I was even healthy enough to try it and I found out that my ...natural testosterone levels were ...just on the borderline of being flagged for being too low...it was actually probably the last little bit of justification I needed to try it (Asi,28,USA,{I})

For some it was not a justification to start using but a reinforcement to use based on studies about anti-ageing effects:

*I already made my mind up that I would take performance enhancing drugs for powerlifting, but ... why I wanted to try it, was sort of the promising research that I read about testosterone replacement therapy and ...how it can affect men my age.
(Alvin,36,UK,{I})*

Increased libido as a motivation for re-starting AAS use

This motivation was also to restart, with change from the initial motivation e.g., for competition, using AAS in cycles, and undertaking post-cycle therapy, to a more complex one linked to low testosterone, which then led into a blast and cruise cycle [where use is continuous but with changes between high and low doses (Sagoe et al., 2015) for example:

I stopped steroids I was, I felt bad, run down... I was tired... I wasn't sexually attractive to her... that's when I went to the doctor and talked about testosterone replacement therapy... I went back on the TRT dose to make myself kind of be [sic] normal level of testosterone and my doctor would prescribe me like 120 milligrams of testosterone cypionate a week ...I felt good again I had energy and stuff like that... so I continued with that but then every once in a while, you know I would want to do a show, or body building so I would run those cycles again (Lee,43,USA,{I})

Lee's motivation changed over time; now it is linked to his emotional well-being and that he could access TRT from his doctor. However, when he wants to compete, he would top up with non-prescribed AAS.

Experiences of increased libido and sexual function related to AAS use.

Participants were asked to self-describe the benefits of AAS use and any positive unintended effects. The highest reported effects, unsurprisingly, aligned to the top motivations for use: increase in strength (n=43), followed by muscle building (n=42). However, the third most referenced positive unintended effect was increased libido/sexual performance (n=27), (despite being only the seventh motivating factor). Moreover, nearly half (n=54/128) noted improved sexual performance; most mentioned 'sex drive' or 'libido' or evocative phrases such as: 'more stamina in bed', 'always horny', and 'rock hard erections'. Several interviewees discussed the positive impact that the increased libido had on their lives, both when single or in a relationship:

Differences in stuff like ...increase of sex drive and ...I would say improved quality of life... it definitely affected er, my relationship positively in terms of my sex drive going back to normal, or whatever I think normal should be. (Alvin,36,UK,{I})

I'd say a positive there is no better feeling...it's amazing, ...Who wouldn't want to feel like an 18-year old lad who looks good all the time, who has got like the sex drive of a Greek God? (Andrew,25,UK,{I})

Similarly, on sexual performance:

I don't want to sound crude or anything but the libido, while you're blasting is insane. I could probably have sex five times a day and when I'm not blasting and I'm on the TRT doses, ...once a day once every couple of days is all right

(Lewis,37,USA,{I})

One added how they managed their increased libido by having sex and saw this as beneficial:

Increased libido managed by more sex with wife, not a negative but a positive though

(Ray,39,NZ,{Q})

Although this theme details that libido was predominantly a positive benefit of use, it is worth noting that three participants found the intensity of the increased libido a negative side-effect, e.g.

Constant persistent distractingly high libido (Niall,25,Canada,{Q})

For some the motivations for use had changed and motivation to continue using AAS, or return to it after a long hiatus, was now driven by a desire to maintain their sex drive. There were a variety of different reasons expressed (Table 5).

(Table 5 near here)

Experiences with physicians regarding libido changes and hypogonadism

Within this sub-theme, there emerged a further sub-theme regarding participants' experiences of seeking help. Several US participants spoke of having a medical diagnosis for low testosterone and had testosterone prescribed by a doctor. One US participant expounded the benefits of being able to access support via a private online clinic and his frustration with a lack of empathy from medical professionals:

they have a niche in serving people who feel, men, who feel kind of frustrated and underserved because they're hypogonadal symptoms are dismissed by their doctors ...you're over 40, ...your dick is not supposed to work the way it did when you were 25, what do you expect? Just live with it, dude, and the guys ...say no, that's not good enough. I'm not going to not have sex with my boyfriend, or my girlfriend, or my wife, or my husband ...I'm... not 92. (Hugo,53,USA,{Q})

UK participants also reflected on doctors' failure to provide helpful treatment and their lack of specific knowledge:

Doctors should have a far better understanding of AAS use, and even their views on TRT can be quite shocking. (Colin,21,UK,{Q})

Many participants felt doctors did not take the potential side-effects of low testosterone seriously and there was an expressed desire for professionals to acknowledge and be more open about the psychological effects:

I wish UK in general would actually be a bit more open, ...doctors in America ... are a lot more open minded and they actually do...take into account how the actual patient feels and stuff like that. (Powel,34,UK,{I})

Those participants not offered help because their testosterone ranges were viewed as normal turned to self-medication:

I went to my local GP office and got myself a testosterone test when I was about 29/30... he referred me to ... [endocrinologist]and he basically told me that I was normal even though I had a lot of depressive symptoms ...I was like fuck you then I will just do it myself. (Powel,34,UK,{I})

This focus on 'normal ranges' was referenced more than once. Some commented that the medical ranges for natural testosterone levels were not sensible, believing that the ranges were erroneous and suggesting they were measured across all age ranges which meant 20-year-olds were compared with men over 60. Isaac proposed a potential solution:

On the basis of full panel hormone tests, I am within the normal range for testosterone levels for a man of my age, but the normal range isn't normal. It includes 'normal' test levels for men between the age of 18-80...I do know my body well, I have put it through immense strain over the years and I do believe my test levels are below what is normal for me... I do think there is some therapeutic value in taking hormonal readings from 18 and 21-year-old men to evaluate their test' [testosterone] levels later in life, it would make decisions on administering TRT much easier for doctors rather than having them bound by the 'normal' range. (Isaac,42,UK,{I})

Another participant felt so strongly about the negative effects of low testosterone:

I truly believe that every male should get on testosterone replacement therapy after a certain age as directed by their doctor. (Sam,36,USA,{Q})

Reduced libido, sexual function and fertility after AAS cessation

The first two themes focussed on positive effects of use. However, the third related to the negative impact on the libido and sexual function of stopping AAS use. Negative psychological and physiological aspects on sexual health, i.e. loss of sex drive, sexual performance and negative impact on mood were all reported as a result of stopping AAS use:

I came off and ...foolishly enough I thought I'd be okay. ... about three months after ...I started to experience some sexual dysfunction and I was ... what is this...? Have I drunk too much caffeine or something? ...because I couldn't keep an erection ..., so then I was ...what can I do? (Peter,24,UK,{I})

Low Sex drive, not being able to cum [sic] (Amir,21,Greece,{Q})

I didn't fancy any woman nothing like [sic] it was like below zero trust me...I think for me as a man, when I've got my missus, you know you need to copulate ...at least a few times a week it is mentally even worse because if you tried... to wake him up properly to start doing it, so that was like even more depressing (Lawrie,27,UK,{I})

For others the focus was less on the loss of libido but more on avoiding feeling unmanly:

Coming off a large cycle ...you feel like a girl. You want to cry at everything, as stupid, as it sounds, not cry but you feel a little bit emotional... you really feel like shit. (Andrew,25,UK,{I})

when you're lacking that libido it's, you sort of feel demasculinised

(Peter,24,UK,{I})

Participants managed the negative effects in different ways, one mentioned Viagra, whereas, others avoid effects of stopping use by moving away from using in cycles to instead using a ‘blast and cruise’ regime (like Lee) or dropping to a continued low dose, e.g.:

I will stay on for the rest of my life, for me therefore it is the right decision ...it is a roller coaster if you are cycling... I would probably sooner stop than continue cycling.

(Robert,Spain,34,{I})

Since the age of 37, I have used continuously as a method of avoiding withdrawal/post use experience (Isaac,UK,42,{Q})

Moreover, reasons for previously stopping use (but using again mid-life) was so they could start a family, and one younger participant had taken action to avoid potential infertility:

I've banked viable sperm samples at a cryogenic facility so that children can be a possibility in the future. (Asi,USA,28,{Q})

Discussion

The results showed increased libido as a benefit of use by 90% of participants and the qualitative data identified four interlinked themes: increased libido as a motivation for starting/re-starting AAS use; increased libido/sexual performance as a beneficial effect; mixed experiences with physicians regarding libido changes and hypogonadism, and reduced libido, sexual function and fertility after AAS cessation. Reasons for AAS use included

mitigating the effects of aging particularly linked to virility, and the qualitative data showed motivations for use changed over time.

Overall the types and complexity of motivations were aligned with current evidence (Bates, Begley, et al., 2019; Kimergård, 2015). However, one of the reported motivations for using AAS was higher than previous studies (Fomiatti et al., 2019; Hildebrandt et al., 2007). Ip et al. (2011) noted that increased sex drive or sexual function was not a common reasons for use and in our study it was not predominantly the reason to initiate use but was a final rationalisation. Similar to Hildebrant et al.'s (2006) study, our participants talked of the positive impact of the increase in libido and linked this to improved quality of life. Moreover, this study echoes previous studies in its finding that stopping AAS use can cause a decrease in libido (Armstrong et al., 2018; Smit & de Ronde, 2018) and in line with other studies (Greenway & Price, 2018) our data showed changes in motivation for use over time. One reason for this return to use was experiencing physical and psychological effects of lowered testosterone levels as a result of aging or ASIH. As such, it sheds light on the role that virility has on decisions to continue or re-start.

A socio-ecological approach is helpful in exploring the influence of individual factors such as masculinity (Bates, Tod, et al., 2019). One possible explanation of some of the motivations for and changes in AAS use is through the lens of masculinity. Dominance, achievement, and sexual and sporting prowess are consistently associated with western ideals of hegemonic masculinity (Trenoweth & Lynch, 2008). Hegemonic masculinity, first coined by Connell (1987), refers to the dominant masculine ideals of a culture at a given time (Brown, 2016). Our participants are all from high-income countries and dominant within western culture is the concept of masculinity as linked to a mesomorphic frame (Kanayama et al., 2012), and this muscularity can be seen as one aspect of hegemonic masculinity within western culture.

Walker and Joubert (2011) found that AAS users' constructs of masculinity linked to muscularity, working hard, not giving up, being physically strong, and looking like a man. The internalisation of the traditional male gender role can play a part in men's desire for an ideal body (Gattario et al., 2015). Discussions on masculinity focus on sexual appetite and muscle, embodied in part, the seductiveness of power and strength (Marcos et al., 2015). For those who have internalised such hegemonic views of masculinity, AAS could be a way of achieving a number of goals.

In this study, some side-effects of discontinuing use, such as anxiety, becoming more emotional and loss of libido, linked to characteristics that were deemed less masculine. This is similar to Fomiatti et al. (2019) who noted these effects were negatively associated with femininity, and as such considered unacceptable. Such negative associations could lead men to self-medicate, as masculinity, although historically benefitting men has positioned men in certain ways, and has exerted a variety of pressures on them (Buchbinder, 2010: p33).

An internalisation of hegemonic masculinity could explain, in part, why some participants saw a need to use AAS as a form of TRT, to overcome the loss of virility that they experienced potentially due to aging or ASIH. One paradox of AAS use is the desire to improve wellbeing with a substance that impacts fertility (Mossman & Pacey, 2019). Many participants were aware of this and one had even taken precautions by having his sperm frozen. For many in mid-life, potential concerns about fertility are potentially reduced, as they may already have children. In this study, some participants felt that cycling was something that they were no longer prepared to do as the side-effects of being off cycle were unbearable and so chose to use low levels of testosterone continually and there was a difference found between the number of people using AAS in cycles who chose 'increase my sex drive as a motivation' and those who did not have that reason for use. Although it could

be argued that using low doses is less harmful than using the supra-physiological doses, which many use to gain muscle quickly; using a continual low dose goes against expert advice as regular long breaks between cycles can help to reduce the side-effects (Rowe et al., 2016). Low testosterone has an anti-depressant effect (Walther et al., 2019). Perhaps depression compounded by the psychological effects from experiencing low libido leaves some men feeling less manly. Men are less likely to engage in health services than women (Addis & Mahalik, 2003; Smith, James et al., 2006), are more likely to self-medicate for depression, and prefer collaborative action-centred problem-solving (Seidler et al., 2016). Hegemonic masculinity could be a reason for this behaviour (Keohane & Richardson, 2018; Mckim, 2017). Even when men seek help, they are more likely to under-report their symptoms, and this bias also impacts medical professionals as they are also subject to the same societal biases around men's behaviour. This could make them less likely to diagnose depressive symptoms in men than women (D. T. Smith et al., 2018). The preference for self-help over engagement with health services is reflected in this study with participants using testosterone as TRT, Viagra to aid sexual function and the seeking of information from AAS user fora (Harvey et al., 2019).

TRT is a medical treatment for both hypogonadism and low testosterone levels (Carrasquillo et al., 2018; Moon & Park, 2019), and has been recommended as part of a treatment regime for hypogonadism as a result of AAS use (Rahnema et al., 2014). However, when diagnosing hypogonadism there is confusion amongst both patients and clinicians (Surampudi et al., 2012) complicated by other comorbid conditions masking symptoms. There is disagreement around the benefits of using replacement testosterone to medicate for low testosterone; one study showed that 21% of men taking prescribed testosterone did improve their libido

(Straftis & Gray, 2019). Moreover, a systematic literature review of prescribed testosterone for low testosterone found no evidence in randomised clinical trials for positive impact on mood, sexual function or consistent effect on libido (Huo et al., 2016). However, AAS users reliance on ‘broscience’ is well documented (Bilgrei, 2018; Harvey et al., 2020; Havnes et al., 2019; Havnes & Skogheim, 2020), therefore it is likely they will pay more attention to advice from within fora, which is pro-use. Moreover, confirmation bias (Klayman, 1995) suggests that when seeking evidence-based information more attention will be paid to information that confirms their beliefs.

There is always a need for a note of caution when seeking experiences from specific sub-groups as their opinions are likely to be biased, self-serving, and fed by the discourse within the sub-culture. For example, more than one user noted that medical professionals were unsympathetic to the (perceived or actual) negative psychological effects of low testosterone and advocated for a better delineation of ‘normal’ ranges. This suggestion, that all men have their testosterone levels checked at a certain age, may be more about wanting parity with women, who traditionally have experienced less bias from the medical profession when seeking support for depressive symptoms (Norman, 2004; D. T. Smith et al., 2018). Moreover, it also brings with it a range of more practical challenges such as the cost of resourcing such support and overcoming such aforementioned barriers as men’s reluctance to seek support and desire to find their own solutions to problems.

The medical model currently followed by health practitioners may not consider wider issues faced by users. For example, a recent editorial on TRT suggests that medical practitioners

should focus on the body's recovery of serum testosterone levels rather than subjective symptoms; moreover, if subjective symptoms aren't improving, patients are encouraged to be more self-aware (Moon & Park, 2019). AAS users in this study spoke of subjective downsides, and that self-medicating is the only thing that makes a difference particularly to mood. They also spoke of dissatisfaction with the medical ranges and felt a more individualised approach was needed when it came to treatment.

Medical professionals need to recognise the psychological issues that men bring (Doyal, 2001) and interestingly, when dealing with users who have AAS-induced hypogonadism, Rahnema and colleagues (2014) recommended that the regime is tailored to individual needs and that professionals consider motivations for AAS use. Moreover, those concerned about the impact of AAS on sexual function were more likely to seek out advice from medical professionals (Zahnow et al., 2017). Consequently, users' experiences of medical professionals are important as they could impact on users receiving the right levels of support particularly as AAS users often have taken time to read academic research (Harvey et al., 2020; Lader, 2016). This means they will have knowledge of, and potentially pay more attention to, studies that show how TRT can counter depression (Bassil et al., 2009) and improve libido (Straftis & Gray, 2019). Some in this study had stopped thinking of themselves as AAS users as they were just using 'testosterone' a type of self-medication .

The use of a socio-ecological model, which considers social norms around masculinity and AAS use (Bates, Tod, et al., 2019) is relevant when working with men seeking for help for emotional symptoms that they may perceive as resulting from low testosterone, including the

psychological impact of being told that your testosterone levels are low but are within 'normal' testosterone ranges and how this could impact on one's quality of life. Current services are a long way off meeting the needs of the wide range of AAS users (Underwood, 2019) and there is a need to develop a greater understanding of the health and wellbeing issues that affect men who use AAS (Moore et al., 2019).

Implications of the Study

This study has shown that a key issue for many people using AAS is the actual or perceived effects of having low testosterone levels, and understanding their motivations for use and concerns are important to help provide appropriate support and treatment (Greenway & Price, 2018; Griffiths et al., 2018), which has implications for health and social care professionals and those providing harm minimisation services. This study has shown that motivations for using AAS are complex and the potential for the unexpected positive benefits of AAS use to reinforce and potentially supersede initial motivations for use. It has shown, in line with previous studies, that AAS users doubt the AAS knowledge of medical professionals (Cohen et al., 2007; Skårberg et al., 2008), and here more specifically the impact low testosterone and reduced libido has on a man's quality of life. Zahnow, McVeigh, Ferris, & Winstock (2017) argue that professionals should undertake wider conversations with users about well-being and mood. We concur and advocate for a need to broach the subject of libido and sexual function linked to impact on emotional well-being. A key area for further research is men who start or continue to use AAS in later life to mitigate the impact of aging on their sex lives. Thus, further research is needed into the impact of 'subjective side-effects' of low testosterone particularly relating to low mood and loss of libido and the association with masculine identity. Furthermore, this study as with other studies (Cohen et al., 2007; Skårberg et al., 2008) has highlighted the distrust many AAS users have for the medical

profession and that negative perceptions of professionals' views on low testosterone, whether actual or perceived, may impact on men's health seeking behaviours and their decision to self-medicate using AAS. Therefore, consideration should be given as to how professionals can build trust within this community. This study did not explore on the impact of use and libido in relation to partners of AAS users. However, our study shows that male AAS users have a desire to maintain an active sex life and this could impact negatively or positively on the partners of AAS users, consequently this is a potential area for further research. A novel finding from this research was that one participant found his constantly high libido distracting and a number of participants selected libido as both positive and negative side-effect of use. Therefore, this could be a potentially interesting avenue for further research.

Strengths & limitations

To our knowledge this paper is one of the first to explore users' thoughts on libido and sexual performance as a reason for continued AAS use. One strength is that the participants' motivations are congruent with those found in current literature. This paper has not examined the other side-effects of low testosterone linked to mood, and other physical harms, and therefore acknowledges that continued AAS use may also be driven by other desires to address these side-effects. This study may not represent all types of AAS users; however, the range of motivations between the participants suggests a level of diversity and that suggests the questions raised concerning the effects of low testosterone and the requirement to self-medicate warrant further investigation. As data were self-reported, participants may have under-reported the severity of side-effects or need for support because of shame or fear that such studies may mean an increase in attention from authorities into steroid use, which could negatively influence the legal situation. There is a potential bias towards TRT as some participants were recruited via a TRT Facebook group. This study acknowledges that there may be geographical/legal differences regarding access to TRT dependent on country of

residence. There is also the potential that the use of AAS for libido and sexual function was under-reported in the interviews, as interviewees may have been reluctant to discuss or raise such issues with a female interviewer. Despite the limitations this study sheds light on (1) the importance of the impact of AAS use on the libido and the repercussions for many users and (2) why people choose to self-medicate with AAS rather than seeking support from professional services.

Conclusion

Increased libido can impact on men's motivation to continue or re-start using AAS. The effects of aging, particularly the side-effects of lowered testosterone, can impact men's self-esteem, regarding their sense of self and masculine identity and this could lead them to choose to self-medicate with AAS. Professionals, whether they be providers of harm reduction services or health workers need to consider the motivations for use and impact of perceived or actual low testosterone on a man's mental and emotional wellbeing. There needs to be improved understanding for both professionals and AAS users that some of the emotional impact of use might stem from a person's views of virility aligned to their internalisation of masculine identity. Further investigation is warranted on both the impact on libido as a driver for continuing use and AAS use as a self-medication TRT.

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References

- Addis, M. E., & Mahalik, J. R. (2003). Men, Masculinity, and the Contexts of Help Seeking. *American Psychologist*, 58(1), 5–14. <https://doi.org/10.1037/0003-066X.58.1.5>
- Armstrong, J. M., Avant, R. A., Charchenko, C. M., Westerman, M. E., Ziegelmann, M. J., Miest, T. S., & Trost, L. W. (2018). Impact of anabolic androgenic steroids on sexual function. *Translational Andrology And Urology*, 7(3), 483–489. <https://doi.org/10.21037/tau.2018.04.23>
- Baggish, A., Weiner, R., Kanayama, G., Hudson, J., Lu, M., Hoffmann, U., & Pope Jr., H. (2017). Cardiovascular Toxicity of Illicit Anabolic-Androgenic Steroid Use. *Circulation*, 135(21), 1991.
- Barbosa Neto, O., da Mota, G. R., De Sordi, C. C., Resende, E. A. M. R., Resende, L. A. P. R., Vieira da Silva, M. A., Marocolo, M., Côrtes, R. S., de Oliveira, L. F., & Dias da Silva, V. J. (2018). Long-term anabolic steroids in male bodybuilders induce cardiovascular structural and autonomic abnormalities. *Clinical Autonomic Research*, 28(2), 231–244. <https://doi.org/10.1007/s10286-017-0470-2>
- Bassil, N., Alkaade, S., & Morley, J. E. (2009). The benefits and risks of testosterone replacement therapy: a review. *Therapeutics and Clinical Risk Management*, 5, 427–448.
- Bates, G., Begley, E., Tod, D., Jones, L., Leavey, C., & McVeigh, J. (2019). A systematic review investigating the behaviour change strategies in interventions to prevent misuse of anabolic steroids. *Journal of Health Psychology*, 24 (11), 1595–1612. <https://doi.org/10.1177/1359105317737607>
- Bates, G., & McVeigh, J. (2016). *Image and Performance Enhancing Drugs: 2015 Survey Results* (Vol. 1, Issue July). <http://www.ipedinfo.co.uk/resources/downloads/2015>

National IPED Info Survey report.pdf

Bates, G., Tod, D., Leavey, C., & McVeigh, J. (2019). An evidence-based socioecological framework to understand men's use of anabolic androgenic steroids and inform interventions in this area. *Drugs: Education, Prevention and Policy*, 26(6), 1–9.

<https://doi.org/10.1080/09687637.2018.1488947>

Begley, E., McVeigh, J., & Hope, V. (2017). *Image and Performance Enhancing Drugs: 2016 National Survey Results*. http://www.wales.nhs.uk/sitesplus/documents/888/IPED_report_2017_FINAL.pdf

Biernacki, P., & Waldorf, D. (1981). Snowball sampling: Problems and techniques of chain referral sampling. *Sociological Methods & Research*, 10(2), 141–163.

Bilgri, O. R. (2018). Broscience: Creating trust in online drug communities. *New Media and Society*, 20(8), 2712–2727. <https://doi.org/10.1177/1461444817730331>

Boardley, I. D., & Grix, J. (2014). Doping in bodybuilders: A qualitative investigation of facilitative psychosocial processes. *Qualitative Research in Sport, Exercise and Health*, 6(3), 422–439. <https://doi.org/10.1080/2159676X.2013.766809>

Bond, P., Llewellyn, W., & Van Mol, P. (2016). Anabolic androgenic steroid-induced hepatotoxicity. *Medical Hypotheses*, 93, 150–153.

<https://doi.org/10.1016/j.mehy.2016.06.004>

Boyatzis, R. E. (1998). *Transforming qualitative information: Thematic analysis and code development*. SAGE Publications.

Braun, V., & Clarke, V. (2012). Thematic analysis. In H. Cooper, P. M. Camic, D. L. Long, A. T. Panter, D. Rindskopf, & K. J. Sher (Eds.), *APA handbook of research methods in*

psychology, Vol 2: Research designs: Quantitative, qualitative, neuropsychological, and biological. (pp. 57–71). American Psychological Association.

<https://doi.org/10.1037/13620-004>

Brown, J. A. (2016). The Superhero Film Parody and Hegemonic Masculinity. *Quarterly Review of Film and Video*, 33(2), 131–150.

<https://doi.org/10.1080/10509208.2015.1094361>

Buchbinder, D. (2010). A Grand illusion: Masculinity, “Passing” and Men’s Health. In B. Gough & S. Robertson (Eds.), *Men, masculinities and health: critical perspectives* (pp. 30–44). Palgrave Macmillian.

Carrasquillo, R., Chu, K., & Ramasamy, R. (2018). Novel Therapy for Male Hypogonadism. *Current Urology Reports*, 19(8), 63. <https://doi.org/10.1007/s11934-018-0816-x>

Chyka, P. A. (2003). Health Risks of Selected Performance-Enhancing Drugs. *Journal of Pharmacy Practice*, 16(1), 37.

Cohen, J., Collins, R., Darkes, J., & Gwartney, D. (2007). A league of their own: demographics, motivations and patterns of use of 1,955 male adult non-medical anabolic steroid users in the United States. *Journal of the International Society of Sports Nutrition*, 4(1), 12. <https://doi.org/10.1186/1550-2783-4-12>

Connell, R. . (1987). Gender and Power: Society, the Person, and Sexual Politics. *Bulletin of Science, Technology & Society*, 8(4), 445. <https://doi.org/10.1177/027046768800800490>

Coward, R. M., Rajanahally, S., Kovac, J. R., Smith, R. P., Pastuszak, A. W., & Lipshultz, L. I. (2013). Anabolic Steroid Induced Hypogonadism in Young Men. *Journal of Urology*, 190(6), 2200–2205. <https://doi.org/10.1016/j.juro.2013.06.010>

- Creswell, J. W. (2009). *Research design: qualitative, quantitative, and mixed method approaches*. Sage Publications.
- de Souza, G. L., & Hallak, J. (2011). Anabolic steroids and male infertility: a comprehensive review. *BJU International*, *108*(11), 1860–1865. <https://doi.org/10.1111/j.1464-410X.2011.10131.x>
- De Wever, B., Schellens, T., Valcke, M., & Van Keer, H. (2006). Content analysis schemes to analyze transcripts of online asynchronous discussion groups: A review. *Computers and Education*, *46*(1), 6.
- Doyal, L. (2001). Sex, gender, and health: the need for a new approach. *British Medical Journal (Clinical Research Ed.)*, *323*(7320), 1061–1063.
- El Osta, R., Almont, T., Diligent, C., Hubert, N., Eschwège, P., & Hubert, J. (2016). Anabolic steroids abuse and male infertility. *Basic and Clinical Andrology*, *26*(1), 2. <https://doi.org/10.1186/s12610-016-0029-4>
- Fomiatti, R., Latham, J. R., Fraser, S., Moore, D., Seear, K., & Aitken, C. (2019). A ‘messenger of sex’? Making testosterone matter in motivations for anabolic-androgenic steroid injecting. *Health Sociology Review*, *28*(3), 323–338. <https://doi.org/10.1080/14461242.2019.1678398>
- Gattario, K. H., Frisé, A., Fuller-Tyszkiewicz, M., Ricciardelli, L. A., Diedrichs, P. C., Yager, Z., Franko, D. L., & Smolak, L. (2015). How is men’s conformity to masculine norms related to their body image? Masculinity and muscularity across Western Countries. *Psychology of Men and Masculinity*, *16*(3), 337–347. <https://doi.org/10.1037/a0038494>
- Greenway, C. W., & Price, C. (2018). A qualitative study of the motivations for anabolic-

androgenic steroid use: The role of muscle dysmorphia and self-esteem in long-term users. *Performance Enhancement and Health*, 6(1), 12–20.

<https://doi.org/10.1016/j.peh.2018.02.002>

Griffiths, S., Henshaw, R., McKay, F. H., & Dunn, M. (2016). Post-cycle therapy for performance and image enhancing drug users: A qualitative investigation. *Performance Enhancement and Health*, 5, 103–107. <https://doi.org/10.1016/j.peh.2016.11.002>

Griffiths, S., Jacka, B., Degenhardt, L., Murray, S. B., & Larance, B. (2018). Physical appearance concerns are uniquely associated with the severity of steroid dependence and depression in anabolic–androgenic steroid users. *Drug and Alcohol Review*, 37(5), 664–670. <https://doi.org/10.1111/dar.12688>

Grogan, S., Shepherd, S., Evans, R., Wright, S., & Hunter, G. (2006). Experiences of Anabolic Steroid Use: In-depth Interviews with Men and Women Body Builders. *Journal of Health Psychology*, 11(6), 845. <https://doi.org/10.1177/1359105306069080>

Hakansson, A., Mickelsson, K., Wallin, C., & Berglund, M. (2012). Anabolic androgenic steroids in the general population: User characteristics and associations with substance use. *European Addiction Research*, 18(2), 83–90. <https://doi.org/10.1159/000333037>

Hanley Santos, G., & Coomber, R. (2017). The risk environment of anabolic–androgenic steroid users in the UK: Examining motivations, practices and accounts of use. *International Journal of Drug Policy*, 40(New Psychoactive Substances and Human Enhancement Drugs), 35–43. <https://doi.org/10.1016/j.drugpo.2016.11.005>

Hansma, P., Diaz, F. J., & Njiwaji, C. (2016). Fatal Liver Cyst Rupture Due to Anabolic Steroid Use. *The American Journal of Forensic Medicine and Pathology*, 37(1), 21–22. <https://doi.org/10.1097/PAF.0000000000000218>

- Hartgens, F., Rietjens, G., Keizer, H. A., Kuipers, H., & Wolffenbuttel, B. H. R. (2004). Effects of androgenic-anabolic steroids on apolipoproteins and lipoprotein (a). *British Journal of Sports Medicine*, *38*(3), 253–259.
- Harvey, O., Keen, S., Teijlingen, E. van, & Parrish, M. (2019). Support for people who use Anabolic Androgenic Steroids: A Systematic Scoping Review into what they want and what they access. *BMC Public Health*, *19*(1), 1024. <https://doi.org/10.1186/s12889-019-7288-x>
- Harvey, O., Parrish, M., Teijlingen, E. van, & Trenoweth, S. (2020). Support for non-prescribed anabolic androgenic steroids users: a qualitative exploration of their needs. *Drugs: Education, Prevention and Policy*, 1–10. <https://doi.org/10.1080/09687637.2019.1705763>
- Havnes, I. A., Jørstad, M. L., & Wisløff, C. (2019). Anabolic-androgenic steroid users receiving health-related information; Health problems, motivations to quit and treatment desires. *Substance Abuse: Treatment, Prevention, and Policy*, *14*(1), 1–13. <https://doi.org/10.1186/s13011-019-0206-5>
- Havnes, I. A., & Skogheim, T. S. (2020). Alienation and Lack of Trust Men Who Struggle to Cease Anabolic-Androgenic Steroid Use. *Journal of Extreme Anthropology*, *3*(January). <https://doi.org/https://doi.org/10.5617/jea.7046>
- Hildebrandt, T., Langenbucher, J., Carr, S., Sanjuan, P., & Park, S. (2006). Predicting intentions for long-term anabolic-androgenic steroid use among men: A covariance structure model. *Psychology of Addictive Behaviors*, *20*(3), 234–240. <https://doi.org/10.1037/0893-164X.20.3.234>
- Hildebrandt, T., Langenbucher, J. W., Carr, S. J., & Sanjuan, P. (2007). Modeling population

heterogeneity in appearance- and performance-enhancing drug (APED) use:

Applications of mixture modeling in 400 regular APED users. *Journal of Abnormal Psychology*, *116*(4), 717–733. <https://doi.org/10.1037/0021-843X.116.4.717>

Huo, S., Scialli, A. R., McGarvey, S., Hill, E., Tügetimur, B., Hogenmiller, A., Hirsch, A. I., & Fugh-Berman, A. (2016). Treatment of Men for “Low Testosterone”: A Systematic Review. *PLoS ONE*, *11*(9), 1–46.

Ip, E. J., Barnett, M. J., Tenerowicz, M. J., & Perry, P. J. (2011). The Anabolic 500 survey: characteristics of male users versus nonusers of anabolic-androgenic steroids for strength training. *Pharmacotherapy*, *31*(8), 757–766.
<https://doi.org/10.1592/phco.31.8.757>

Ip, E. J., Barnett, M., Kim, J., Wei, H., Perry, P., & Tenerowicz, M. (2010). Women and anabolic steroids: an analysis of a dozen users. *Clinical Journal of Sport Medicine*, *20*(6), 475–481. <https://doi.org/10.1097/JSM.0b013e3181fb5370>

Jones, L., Bates, G., Bellis, M., Beynon, C., Duffy, P., Evans-Brown, M., Mackridge, A., McCoy, E., & McVeigh, J. (2011). *A summary of the health harms of drugs* (Vol. 2016). Centre for Public Health. <http://www.nta.nhs.uk/uploads/healthharmfinal-v1.pdf>

Joubert, H. (2014). *Considering anabolic androgenic steroid use in relation to non-substance related diagnostic categories with special emphasis on eating disorders. A review.*

Kafrouni, M. I., Anders, R. A., & Verma, S. (2007). Hepatotoxicity Associated With Dietary Supplements Containing Anabolic Steroids. *Clinical Gastroenterology and Hepatology*, *5*(7), 809–812. <https://doi.org/https://doi.org/10.1016/j.cgh.2007.02.036>

Kanayama, G., Hudson, J., DeLuca, J., Isaacs, S., Baggish, A., Weiner, R., Bhasin, S., & Pope Jr., H. (2015). Prolonged hypogonadism in males following withdrawal from

anabolic–androgenic steroids: An under-recognized problem. *Addiction*, *110*(5), 823–831. <https://doi.org/10.1111/add.12850>

Kanayama, G., Hudson, J., & Pope Jr., H. (2009). Features of men with anabolic-androgenic steroid dependence: A comparison with nondependent AAS users and with AAS nonusers. *Drug and Alcohol Dependence*, *102*, 130–137. <https://doi.org/10.1016/j.drugalcdep.2009.02.008>

Kanayama, G., Hudson, J., & Pope Jr., H. (2012). Culture, Psychosomatics and Substance Abuse: The Example of Body Image Drugs. *Psychotherapy & Psychosomatics*, *81*(2), 73–78.

Kanayama, G., & Pope, H. G. (2018). History and epidemiology of anabolic androgens in athletes and non-athletes. *Molecular and Cellular Endocrinology*, *464*, 4–13. <https://doi.org/10.1016/j.mce.2017.02.039>

Kasikcioglu, E., Oflaz, H., Umman, B., & Bugra, Z. (2009). Androgenic anabolic steroids also impair right ventricular function. *International Journal of Cardiology*, *134*(1), 123–125.

Kelley, K., Clark, B., Brown, V., & Sitzia, J. (2003). Good practice in the conduct and reporting of survey research. *International Journal for Quality in Health Care*, *15*(3), 261–266. <https://doi.org/10.1093/intqhc/mzg031>

Keohane, A., & Richardson, N. (2018). Negotiating Gender Norms to Support Men in Psychological Distress. *American Journal of Men's Health*, *12*(1), 160–171. <https://doi.org/10.1177/1557988317733093>

Kicman, A. T. (2008). Pharmacology of anabolic steroids. *British Journal of Pharmacology*, *154*(3), 502.

- Kimergård, A. (2015). A qualitative study of anabolic steroid use amongst gym users in the United Kingdom: Motives, beliefs and experiences. *Journal of Substance Use, 20*(4), 288–294. <https://doi.org/10.3109/14659891.2014.911977>
- Klayman, J. (1995). Varieties of Confirmation Bias. *Psychology of Learning and Motivation, 32*, 385–418. [https://doi.org/10.1016/S0079-7421\(08\)60315-1](https://doi.org/10.1016/S0079-7421(08)60315-1)
- Krippendorff, K. (1980). Validity in Content Analysis. *Computerstrategien Für Die Kommunikationsanalyse, 69–112*. http://repository.upenn.edu/asc_papers/291
- Lader, D. (2016). *Drug misuse: findings from the 2015/16 Crime Survey for England and Wales* (Issue Statistical Bulletin (July)). https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/462885/drug-misuse-1415.pdf
- Lusetti, M., Licata, M., Silingardi, E., Reggiani Bonetti, L., & Palmiere, C. (2015). Pathological changes in anabolic androgenic steroid users. *Journal of Forensic and Legal Medicine, 33*, 101–104. <https://doi.org/10.1016/j.jflm.2015.04.014>
- MacKenzie Bryers, H., van Teijlingen, E., & Pitchforth, E. (2014). Advocating mixed-methods approaches in health research. *Nepal Journal of Epidemiology, 4*(5), 417–422.
- Marcos, J. M., Avilés, N. R., Del Río Lozano, M., Cuadros, J. P., & Del Mar García Calvente, M. (2015). Performing masculinity, influencing health: A qualitative mixed-methods study of young Spanish men. *Global Health Action, 8*(1), 1–11. <https://doi.org/10.3402/gha.v6i0.21134>
- Maycock, B., & Howat, P. (2005). The barriers to illegal anabolic steroid use. *Drugs: Education, Prevention & Policy, 12*(4), 317–325. <https://doi.org/10.1080/09687630500103622>

- Mckim, C. A. (2017). The Value of Mixed Methods Research: A Mixed Methods Study. *Journal of Mixed Methods Research, 11*(2), 202–222.
<https://doi.org/10.1177/1558689815607096>
- McVeigh, J., Bates, G., & Chandler, M. (2015). *Steroids and Image Enhancing Drugs 2014 Survey Results* (Vol. 8, Issue July). CPH, Liverpool John Moores University.
<http://www.ipedinfo.co.uk/resources/downloads/SIEDs Survey report 2014 FINAL.pdf>
- Midgley, S. J., Heather, N., & Davies, J. B. (1999). Dependence-producing potential of anabolic-androgenic steroids. *Addiction Research, 7*(6), 539–550.
<https://doi.org/10.3109/16066359909004404>
- Moon, D. G., & Park, H. J. (2019). The Ideal Goal of Testosterone Replacement Therapy: Maintaining Testosterone Levels or Managing Symptoms? *Journal of Clinical Medicine, 8*(3), 362. <https://doi.org/10.3390/jcm8030362>
- Moore, D., Hart, A., Fraser, S., & Seear, K. (2019). Masculinities, practices and meanings: A critical analysis of recent literature on the use of performance- and image-enhancing drugs among men. *Health: An Interdisciplinary Journal for the Social Study of Health, Illness and Medicine, 2*, 136345931983859. <https://doi.org/10.1177/1363459319838595>
- Moss, H. B., Panzak, G. L., & Tarter, R. E. (1993). Sexual functioning of male anabolic steroid abusers. *Archives of Sexual Behavior, 22*(1), 1–12.
<https://doi.org/10.1007/BF01552908>
- Mossman, J. A., & Pacey, A. A. (2019). The fertility fitness paradox of anabolic-androgenic steroid abuse in men. *Journal of Internal Medicine, 2–3*.
<https://doi.org/10.1111/joim.12884>
- Niedfeldt, M. W. (2018). Anabolic Steroid Effect on the Liver. *Current Sports Medicine*

Reports, 17(3), 97–102. <https://doi.org/10.1249/JSR.00000000000000467>

Norman, J. (2004). Gender Bias in the Diagnosis and Treatment of Depression. *International Journal of Mental Health*, 33(2), 32–43.

Nutt, D. (2012). *Drugs - without the hot air: minimizing the harms of legal and illegal drugs*. UIT Cambridge.

Olrich, T. W., & Ewing, M. E. (1999). Life on steroids: Bodybuilders describe their perceptions of the anabolic-androgenic steroid use period. *The Sport Psychologist*, 13(3), 299–312.

Osborne, J. (2013). *Best Practices in Data Cleaning: A Complete Guide to Everything You Need to Do Before and After Collecting Your Data*. SAGE Publications, Inc.
<https://doi.org/10.4135/9781452269948>

Patton, M. Q. (2013). *Qualitative research and evaluation methods*. (4th ed.). SAGE Publications.

Petersson, A., Bengtsson, J., Voltaire-Carlsson, A., & Thiblin, I. (2010). Substance abusers' motives for using anabolic androgenic steroids. *Drug and Alcohol Dependence*, 111(1–2), 170–172. <https://doi.org/10.1016/j.drugalcdep.2010.04.008>

Pope, H. G., & Kanayama, G. (2012). Anabolic- Androgenic Steroids. In P. Verster, J. Brady, K. Galanter, M. Conrod (Ed.), *Drug Abuse and Addiction in Medical Illness: Causes, Consequences and Treatment* (pp. 251–274). Springer.

Pope Jr., Harrison, Kanayama, G., Hudson, J. I., Deluca, J., Isaacs, S., Baggish, A., Weiner, R., & Bhasin, S. (2015). Prolonged impairment of sexual function associated with anabolic–androgenic steroid abuse: An underrecognized problem. *Addiction*, 110(5),

237. <https://doi.org/http://dx.doi.org/10.1016/j.ijpsycho.2014.08.918>

Pope Jr., HG, Kanayama, G., Athey, A., Ryan, E., Hudson, J., & Baggish, A. (2013). The lifetime prevalence of anabolic-androgenic steroid use and dependence in Americans: Current best estimates. In *American Journal on Addictions* (Vol. 23, Issue 4, pp. 371–377). <https://doi.org/10.1111/j.1521-0391.2013.12118.x>

Rahnema, C. D., Lipshultz, L. I., Crosnoe, L. E., Kovac, J. R., & Kim, E. D. (2014). Anabolic steroid-induced hypogonadism: diagnosis and treatment. *Fertility & Sterility*, *101*(5), 1271–1279.

Rasmussen, J. J., Schou, M., Madsen, P. L., Selmer, C., Johansen, M. L., Hovind, P., Ulriksen, P. S., Faber, J., Gustafsson, F., & Kistorp, C. (2018). Increased blood pressure and aortic stiffness among abusers of anabolic androgenic steroids: potential effect of suppressed natriuretic peptides in plasma? *Journal of Hypertension*, *36*(2), 277.

Rees, C. (2011). *An introduction to research for midwives* (3rd ed.). Elsevier.

Robles-Diaz, M., Gonzalez-Jimenez, A., Medina-Caliz, I., Stephens, C., García-Cortes, M., García-Muñoz, B., Ortega-Alonso, A., Blanco-Reina, E., Gonzalez-Grande, R., Jimenez-Perez, M., Rendón, P., Navarro, J. M., Gines, P., Prieto, M., Garcia-Eliz, M., Bessone, F., Brahm, J. R., Paraná, R., Lucena, M. I., & Andrade, R. J. (2015). Distinct phenotype of hepatotoxicity associated with illicit use of anabolic androgenic steroids. *Alimentary Pharmacology and Therapeutics*, *41*(1), 116–125. <https://doi.org/10.1111/apt.13023>

Rodham, K., & Gavin, J. (2006). The ethics of using the internet to collect qualitative research data. *Research Ethics Review*, *2*(3), 92–97. <https://doi.org/10.1177/174701610600200303>

Rowe, R., Berger, I., & Copeland, J. (2016). “No pain, no gainz”? Performance and image-

- enhancing drugs, health effects and information seeking. *Drugs: Education, Prevention & Policy*, 24(5), 400–408. <https://doi.org/10.1080/09687637.2016.1207752>
- Sagoe, D., Molde, H., Andreassen, C. S., Torsheim, T., & Pallesen, S. (2014). The global epidemiology of anabolic-androgenic steroid use: A meta-analysis and meta-regression analysis. *Annals of Epidemiology*, 24(5), 383–398. <https://doi.org/10.1016/j.annepidem.2014.01.009>
- Scull, M. T. (2013). Reinforcing gender roles at the male strip show: a qualitative analysis of men who dance for women (MDW). *Deviant Behav*, 34. <https://doi.org/10.1080/01639625.2012.748624>
- Seidler, Z. E., Dawes, A. J., Rice, S. M., Oliffe, J. L., & Dhillon, H. M. (2016). The role of masculinity in men’s help-seeking for depression: A systematic review. *Clinical Psychology Review*, 49, 106–118. <https://doi.org/10.1016/j.cpr.2016.09.002>
- Shaghghi, A., Bhopal, R. S., & Sheikh, A. (2011). Approaches to Recruiting ‘Hard-To-Reach’ Populations into Re-search: A Review of the Literature. *Health Promotion Perspectives*, 1(2), 86–89. <https://doi.org/10.5681/hpp.2011.009>
- Skårberg, K., Nyberg, F., & Engström, I. (2008). The development of multiple drug use among anabolic-androgenic steroid users: six subjective case reports. *Substance Abuse Treatment, Prevention, and Policy*, 3(24), 24. <https://doi.org/10.1186/1747-597X-3-24>
- Smit, D. L., & de Ronde, W. (2018). Outpatient clinic for users of anabolic androgenic steroids: an overview. *The Netherlands Journal of Medicine*, 76(4), 167.
- Smith, James, A., Braunack-Mayer, A., & Wittert, G. (2006). What do we know about men’s help-seeking and health service use? *Medical Journal of Australia*, 184(2), 81–83.

- Smith, D., Hale, B., Rhea, D., Olrich, T., & Collier, K. (2009). Big, Buff and Dependent: Exercise Dependence, Muscle Dysmorphia and Anabolic Steroid Use in Bodybuilders. In L. Katlin (Ed.), *Men and addictions: new research*. Nova Science Publishers.
- Smith, D. T., Mouzon, D. M., & Elliott, M. (2018). Reviewing the Assumptions About Men's Mental Health: An Exploration of the Gender Binary. *American Journal of Men's Health*, 12(1), 78–89. <https://doi.org/10.1177/1557988316630953>
- Straftis, A. A., & Gray, P. B. (2019). Sex, Energy, Well-Being and Low Testosterone: An Exploratory Survey of U.S. Men's Experiences on Prescription Testosterone. *International Journal of Environmental Research and Public Health*, 16, 3261. <https://doi.org/10.3390/ijerph16183261>
- Surampudi, P. N., Wang, C., & Swerdloff, R. (2012). Hypogonadism in the aging male diagnosis, potential benefits, and risks of testosterone replacement therapy. *International Journal of Endocrinology*, 2012. <https://doi.org/10.1155/2012/625434>
- Tan, R. S., & Scally, M. C. (2009). Anabolic steroid-induced hypogonadism - Towards a unified hypothesis of anabolic steroid action. *Medical Hypotheses*, 72(6), 723–728. <https://doi.org/10.1016/j.mehy.2008.12.042>
- Trenoweth, S., & Lynch, J. (2008). Masculinity as a Risk Variable in Physical and Mental Ill-health. In J. Trenoweth, S. and Lynch (Ed.), *Contemporary Issues in Mental Health Nursing*. Wiley.
- UK Home Office. (2018). Drug misuse: Findings from the 2017/18 Crime Survey for England and Wales. In *Statistical Bulletin 14/18* (Issue July). Home Office. <https://www.gov.uk/government/publications/drug-misuse-findings-from-the-2013-to-2014-csew/drug-misuse-findings-from-the-201314-crime-survey-for-england-and-wales>

- Underwood, M. (2019). The unintended consequences of emphasising blood-borne virus in research on, and services for, people who inject image and performance enhancing drugs: A commentary based on enhanced bodybuilder perspectives. *International Journal of Drug Policy*, 67, 19–23. <https://doi.org/10.1016/j.drugpo.2018.11.005>
- Underwood, M., van de Ven, K., & Dunn, M. (2020). Testing the boundaries: Self-medicated testosterone replacement and why it is practised. *International Journal of Drug Policy*, 103087. <https://doi.org/10.1016/j.drugpo.2020.103087>
- van Teijlingen, E., & Hundley, V. (2001). The importance of pilot studies. *Social Research Update, University of Surrey*, 35, 33–36. <https://doi.org/10.7748/ns2002.06.16.40.33.c3214>
- Vassallo, M. J., & Olrich, T. W. (2010). Confidence by injection: male users of anabolic steroids speak of increases in perceived confidence through anabolic steroid use. *Int J Sport Exerc Psychol*, 8(1), 70–80. <https://doi.org/10.1080/1612197X.2010.9671935>
- Walker, D.-M., & Joubert, H. E. (2011). Attitudes of injecting male anabolic androgenic steroid users to media influence, health messages and gender constructs. *Drugs and Alcohol Today*, 11(2), 56. <https://doi.org/10.1108/17459261111174019>
- Walther, A., Wasielewska, J. M., & Leiter, O. (2019). The antidepressant effect of testosterone: An effect of neuroplasticity? *Neurology, Psychiatry and Brain Research*, 32, 104–110. <https://doi.org/10.1016/j.npbr.2019.05.004>
- Yu, J., Hildebrandt, T., & Lanzieri, N. (2015). Healthcare professionals' stigmatization of men with anabolic androgenic steroid use and eating disorders. *Body Image*, 15, 49–53. <https://doi.org/10.1016/j.bodyim.2015.06.001>
- Zahnow, R., McVeigh, J., Bates, G., Hope, V., Kean, J., Campbell, J., & Smith, J. (2018).

Identifying a typology of men who use anabolic androgenic steroids (AAS).

International Journal of Drug Policy, 55, 105–112.

<https://doi.org/10.1016/j.drugpo.2018.02.022>

Zahnow, R., McVeigh, J., Ferris, J., & Winstock, A. (2017). Adverse Effects, Health Service Engagement, and Service Satisfaction Among Anabolic Androgenic Steroid Users.

Contemporary Drug Problems, 44(1), 69–83.

<https://doi.org/10.1177/0091450917694268>

Table 1. Socio-demographic and AAS use characteristics of participants

Table 2: Summary of motivations for use

Table 3: Reasons for use – Comparison with age

Table 4: Positive emotions from using AAS – comparisons with age

Table 5: Reasons to return to or continue to use AAS linked to libido

Figure 1. Countries of residence of participants.

Figure 2: Positive feelings from using AAS

Supplemental material:

1. Questionnaire to explore experiences of AAS use
2. Summary of overall distribution of questionnaire to targeted populations
3. Categories used for the questions
4. List of unique ‘other’ motivations for using AAS and Ethnicity breakdown of all 133 participants (self-described)
5. Descriptive statistical comparison of the those who chose ‘increase my sex drive’ as a motivation for use, and those who did not.