Intrasexual Competition as a potential influence on Anabolic-androgenic steroid use initiation

Abstract

An estimated 293,000 people living in the UK have used Anabolic-androgenic steroids. However, there is currently no intervention to reduce usage available in practice, or academic circulation throughout the UK. This study aimed to test a novel hypothesis that increased levels of intrasexual competition may play an important influential role in the use of AASs. Significantly higher levels of intrasexual competition were evident in users compared to non-users but only in the novice group (0-2 years' experience). The research provides evidence for intrasexual competition potentially influencing AAS use but only during the initial stages of usage.

Introduction

Anabolic-androgenic-steroids (AAS) are synthetic derivatives of testosterone, the primary sex hormone responsible for the development of typically male characteristics. AAS function by increasing the rate of protein synthesis within the muscle tissue, consequently increasing the rate of muscle repair and muscle growth. Household survey data provides the most accurate and reliable estimates for AAS use in the general UK population. The British Crime Survey (2010) reported 226,000 people living in the UK 'ever' having used AAS in 2009-2010, with 50,000 people having used in the past year, and 19,000 in the past month. Furthermore, this data collection method discovered a statistically significant increase in the percentage of AAS users from the years 2003/2004 to 2013/2014 (Crime Survey for England and Wales, 2014). The responses collected in 2014-2015, estimate 293,000 people having used AAS in their lifetime, compared to 73,000 in the past year, a considerable increase from 2010 (Crime Survey for England and Wales, 2015). This most recent available report of prevalence further estimates 66,000 people aged 18-24 ever having used these drugs, with 30,000 people having used in the

past year. Alarmingly, these figures are likely to be underestimates given that many users belong to a culture who are reluctant to divulge their use to 'outsiders' (The Advisory Council for the Misuse of Drugs, 2010). In addition, users are likely to be difficult to reach through a household survey, given the high proportion of time spent in the gym. According to Pope & Kanayama (2012), around 2–6% of men in many Western industrialized countries have used AAS.

Household survey data, whilst likely to be underestimates, provides strong evidence for an increase in AAS use. Research conducted within substance use services also provides evidence for an increase in usage. For example, Hoare & Flatley (2008) reported a 20-fold increase in the number of people using needle and syringe exchange services for AAS use between 1991 and 2006. Furthermore, Josie Smith, Public Health Wales, appearing on ITV Wales News (2015) reported the findings of a 50% increase between 2012 and 2014, of people seeking help for AAS use. It was reported that 10, 000 people called the Wales Drug and Alcohol Helpline in 2014 seeking advice. In comparison to earlier research, the Advisory Council for the Misuse of Drugs (2010) outlined 250-350 people called the "Frank" helpline in relation to AAS between 2003-2007/08.

The growing use of AAS is evident despite the potential physiological and psychological side effects. Research has associated the use of supraphysiologic doses with reduced fertility (Bonetti et al., 2008; De Souza & Hallak, 2011), cardiac arrhythmia (Achar et al., 2010), hypertension (Urhausen et al., 2004), cardiomyopathy (Amsterdam, Opperhuizen & Hartgens, 2010), dyslipidemia (Hartgens et al., 2004; Bonetti et al., 2008), liver toxicity (Bonetti et al., 2008; Amsterdam, Opperhuizen & Hartgens, 2010), hypomania (Thiblin and Petersson, 2004), increased aggression (Thiblin and Petersson, 2004), and depression (Talih, 2007). Furthermore, Kanayama, Hudson & Pope (2010) explain AAS users as emerging and growing rapidly post

1980's, therefore the adverse long term side effects, particularly cardiovascular effects, will soon begin to be exhibited, with larger and more systematic studies of side effects imminent.

Current attempts to control the use of AAS are limited to reducing the potential for harm in users, which are based around the principle of safe injecting, and handling of these substances. These interventions operate within needle and syringe exchange programmes throughout the UK, and provide users with safe, sterile equipment for injecting. No current treatment or prevention interventions are currently available for users of AAS, or even those considering initiating use (Aled Diplock, Drug Aid, Personal Communication, 2015). Whilst reducing the spread of blood-borne viruses is essential for a contemporary public health approach to recreational needle use, it is evident that the current demand for treatment and prevention programmes throughout the United Kingdom, which extends beyond harm reduction, is non-existent within current government policy. Furthermore, evidence demonstrating users to be potentially injecting contaminated substances, suggests a harm-reduction strategy may already be compromised (Kimergård, 2014). Central to a lack of treatment or prevention programmes within UK government policy is a lack of theory which can be used to provide recommendations on how to approach this growing problem and for example research aimed at identifying those more vulnerable to AAS usage.

Muscle Dysmorphia and Anabolic Androgenic Steroid use

The leading theoretical explanation for AAS use considers it to be a self-initiated remedy to an underlying body image disorder, Muscle Dysmorphia (MD). MD defines a pattern of pathological thinking about a specific aspect of body image, whereby an individual is preoccupied by the degree of muscularity they possess (Pope et al., 1997). As a clinical definition MD is a subcategory of body dysmorphic disorder, although focused on dissatisfaction with muscularity, rather than overall body image (Leone, Sedory, & Gray,

2005). Individual sufferers often make potentially harmful behavioural choices in an attempt to reduce symptoms, such as excessive physical exercise, extreme diet practices, potentially harmful supplement intake, and the use of AASs, whilst also socially excluding themselves (Pope et al., 2005; Pope, Khalsa & Bhasin, 2016). It has been identified that over 100,000 individuals could meet the diagnostic criteria for MD in the US general population, with its expression also extending to child and adolescent experimental samples (Pope, Phillips, & Olivardia, 2000; Cohane & Pope, 2001; Ricciardelli & Williams, 2016). Recent investigations concerning the prevalence of MD, estimate the disorder to affect around 5.9% of people in the general western population (Bo et al., 2014).

There is considerable evidence that MD is associated with the use of AAS, although evidence for how this relationship manifests itself is currently inconclusive (Rohman, 2009; Mitchell et al., 2016). Kanayama et al. (2003; 2006; Babusa & Tury, 2013) discovered users of AAS to display substantially higher symptoms of MD than non-users, which became prominent in men with a long history of abuse. Pope and Kanayama (2012) extend that whilst many attributes showed little association with AAS use, conduct disorders and body-image concerns showed strong associations. The immediate question which stems from this associative evidence is the degree to which MD precipitates or perpetuates the use of AAS, or if AAS themselves function neurologically to perpetuate symptoms of MD. Cole et al. (2003) found an increase in symptoms of MD for both current and former users of AAS, when compared to a control group of non-using bodybuilders. Collier (2011) extended this finding with the discovery that no differences in MD were evident between current and former users. These findings promote the hypothesis that symptoms of MD remain stable, throughout and long after the use of AAS, suggesting the substances to not have a perpetuating effect on the disorder itself. The emphasis therefore still pivots on whether MD functions as a precipitating or perpetuating factor.

Anabolic Androgenic Steroid use and Disordered Behaviour

In rejection of a theory based solely on the causality of MD, it is argued that AAS use is a mere expression of a broader range of problem behaviours (Whichstrom & Pederson, 2001; Hallgren et al., 2015). The authors implicate AAS use as only secondarily associated with sport and eating disorders, due to its high association with other problem behaviours, such as cannabis use and aggressive-type conduct problems. There is considerable supportive evidence that AAS use is strongly associated with the use of other illicit drugs, and problem behaviours (e.g. fighting, suicide attempt and risky driving behaviour) (Kanayama et al. 2003; Miller et al., 2002; Pipet et al., 2014). The available evidence suggests that AAS use mirrors other problem behaviours during the early stages of usage, and that these problem behaviours can be appropriately defined as risk factors (Pope and Kanayama, 2012).

The current theory provides an inconsistent understanding of why AAS use occurs. The muscle dysmorphia theory and conduct problem explanation, whilst both supported by considerable evidence, are fundamentally contradicting. The muscle dysmorphia explanation proposes a behavioural response to an underlying body image disorder, whereas the conduct problem theory argues that AAS use reflects the expression of broad behavioural issues. Furthermore, the conduct explanation suffers a fundamental limitation as it assumes that AAS use is an adolescent problem, and fails to address how usage manifests itself into and throughout adulthood. Furthermore, this approach fails to explain why AAS are used in sports such as athletics, and why they are so heavily relied upon in physique competitions such as bodybuilding. Both examples rely heavily on extreme self-discipline which directly opposes a description of problematic misconduct behaviour. Following this major limitation, this explanation may be more appropriate in explaining a process which precipitates AAS use, although it fails in explaining the long term use of these substances, and their consequential use in isolation from other problem behaviours. In comparison, a theory grounded solely on the basis of pathological cognitions towards body image also suffers notable limitations. The

wealth of evidence associating AAS use with poly-drug use, and a pattern of problematic behaviours, suggests usage to be more complex than a sole strive to reduce body image preconceptions.

Intrasexual Competition and Anabolic Androgenic Steroid use

Recent qualitative research in the area has identified that young adult men progressed through a clear transition period whereby their motives for using AAS changed from an external desire to compete with other men within a competitive bodybuilding environment, to more internalised body image preoccupations (Harris, Dunn & Alwyn, 2016). This finding may imply an additional factor, Intrasexual competition, which may influence the decision to initiate AAS usage that has previously been overlooked. Intrasexual competition is defined as the competition with same sex individuals for access to individuals of the opposite sex (Rosvall, 2011). Darwin (1871) theory of sexual selection proposed the importance of characteristics which enhance or enable reproductive capability even if this negatively impacts upon an individual's survival prospects. Trivers (1972) expanded on the work of Darwin to include the specific driving factors by which sexual selection operates. Trivers outlined that the parental investment (PI) a member of a sex contributes to their offspring reflects the direction in which sexual selection operates for that species. Trivers theory therefore suggests that as human males invest less in offspring compared to females (although significantly more than other mammalian species) they should develop a mating strategy characterised more so by competition with other males for access to higher investing females. This competition can theoretically enhance male fitness or reproductive success and explains the minor though significant sexual dimorphism in our species and the fact that aggression is more pronounced in reproductively active (younger) males (Wilson & Daly, 1985). Buss (1988) highlights a wealth and breadth of other empirical evidence which supports the fundamentals of both Darwin (1871) theory of sexual selection, and Trivers (1972) PI theory.

The Current Study

The current study proposes a well-established theory of the natural world to explain a contemporary problem for modern humans, particularly men. This study proposes increased intrasexual competition as a potential contributory factor, which predisposes men to the use of AAS in western cultures, whereby muscularity is widely and increasingly endorsed as a desirable characteristic. This study aimed to examine the extent to which users and non-users of AAS differ in levels of intrasexual competition, to explore levels of intrasexual competition between AAS users with varying usage experience, and to investigate how levels of intrasexual competition vary between non-AAS using bodybuilders with varying bodybuilding experience.

Method

Participants

The sample consisted of 122 predominately young working class males recruited from two bodybuilding dedicated gyms in South Wales, one city based and one rural based. The sample included 76 users (current and lifetime) and 46 non-using (never used AAS) bodybuilders. The inclusion criteria required participants to be frequent bodybuilders as measured by exercising for a minimum of three times per week. This criterion was justified as being critical for the desirability of AAS to become apparent by the regular exposure to a highly pressured competitive environment, such as exists within a bodybuilding gym. Participants were not restricted to being competitive bodybuilders *per se* as the sample included those whose primary bodybuilding motivation was to use anaerobic weight resistance training to enhance physical fitness, physical appearance, or sporting achievement that requires increased muscle size and strength. This is justified as intrasexual competition is associated with AAS use in all of the population groups outlined above.

Measures:

Categorical measures were collected via four questions:

1) **Motivation**

Motivation towards bodybuilding was measured by asking participants 'What is your main reason for exercising?' Participants could select from four options: 'Physical appearance', 'Physical Fitness', 'Sport', 'Strength', or 'Other, please state'.

2) **Bodybuilding Experience**

Bodybuilding experience was measured using the question 'For how long have you exercised regularly? (a minimum of 3 times per week)'. Participants had the option of selecting: '0-2 years', '3-5 years' or '6+ years'.

3) **User vs Non-user**

The research categorised users and non-users by asking participants to answer either 'Yes' or 'No' to the question 'Have you used anabolic steroids?'. This categorical measure was explicitly chosen rather than 'Do you use anabolic Steroids?' or 'Are you currently using Anabolic Steroids?', to help eradicate the complications of participants who may be cycling AAS, or experiencing withdrawal. Recent qualitative research has highlight both to be common experiences of AAS users in this environment (Harris, Dunn & Alwyn, 2016).

4) **AAS-use Experience**

Experience with AAS was categorised with the question: 'If so, for how long have you used anabolic steroids?'. Participants had the option of selecting: '0-2 years', '3-5 years' or '6+ years'.

Dependent measure

Intra sexual competition levels were measured using the Intrasexual competition scale (Buunk & Fisher, 2009)(See Appendices 1). This 12-item scale measures the degree to which one views confrontation with same-sex individuals, especially in the context of acquiring

contact with the opposite-sex. The scale was developed simultaneously in the Netherlands and Canada, and proved to be sex neutral with a high degree of cross-national equivalence. Participants could indicate on a 5-point scale how much statements about their intrasexual competition tendency were applicable to them (1=not applicable at all, 5=very much applicable). Examples are: 'I can't stand it when I meet another man who is more attractive than I am', and 'I wouldn't hire a very attractive man as a colleague'. Cron-bach's alpha=.83, M=3.30 (SD=.78). The intrasexual competition scale was chosen as a result of considerable empirical support demonstrating it to be a valid measure of intrasexual competition (i.e. Ponzi et al., 2015; Arnocky et al., 2014; Buunk & Massar, 2012; Buunk & Fisher, 2009; Lereya et al., 2014).

Method of Analysis:

A two-way between subjects ANOVA was conducted with factors of AAS use and bodybuilding experience. AAS use had two conditions: user (current and lifetime) and non-user (never used AAS) and bodybuilding experience had three conditions: 0-2years, 3-5years and 6+years. Additionally, a between subjects one way ANOVA was run with the factor AAS use experience, which had 3 conditions: 0-2years, 3-5years and 6+years

Results:

Data was collected from n=76 users (current and lifetime users) and n=46 non-users (never used AAS) with varying levels of training experience (see Fig 1. below) and for users, with varying lengths of usage experience (see Fig 2. below).

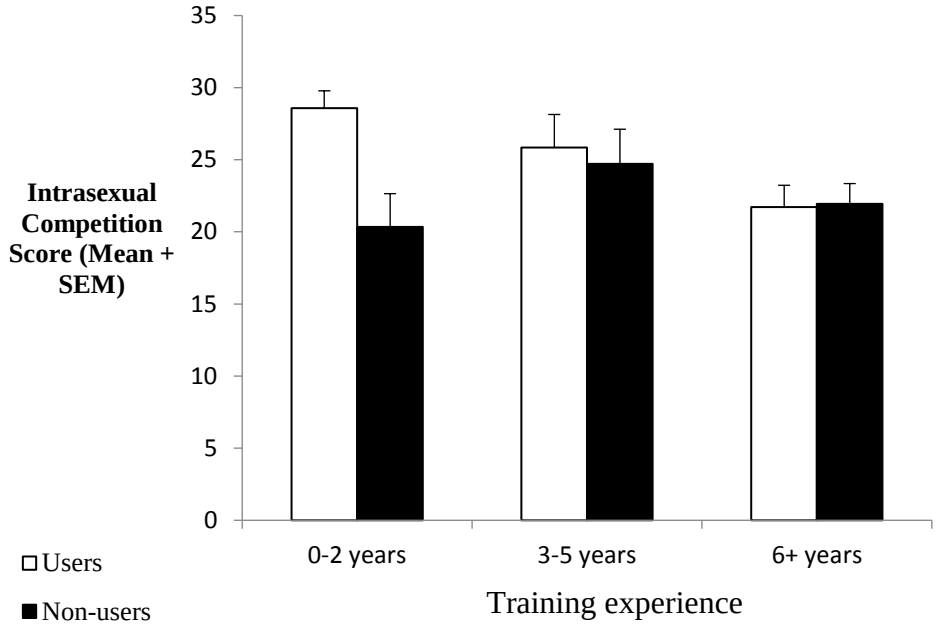

Figure 1. Showing mean Intrasexual competition scores for users and non-users of AAS across years of Training experience. Values = Mean ±SEM.

Analysis 1

Data was subjected to statistical analysis using a 2-way Between-subjects ANOVA with a between factor of anaerobic training duration (0-2 years, 3-5 years and 6+ years) and a between factor of steroid use (user/non-user). Results showed no significant main effect of training duration, however a significant main effect of steroid use [$F_{1,116}$ =4.12, p<.05, partial η^2 = .03] and a training duration x steroid use interaction was reported [$F_{2,116}$ =3.37, p<.05, partial η^2 = .05]. The first simple main effect analysis showed no significant difference in intra-sexual competition scores across the 3 training duration periods for non users, however, a significant difference was observed for users [$F_{2,116}$ =5.50, p<.001, partial η^2 = .08]. Pairwise comparisons showed that intra-sexual competition was higher for steroid users with 0-2 years training experience compared to those with 6+ years training experience (p<.001) only. The second simple main effect analysis revealed significantly higher levels of intra-sexual competition in users compared to non-users but only in those with bodybuilding experience of between 0-2 years [$F_{1,116}$ =10.78, p<.001, partial η^2 = .08] i.e. novices.

Analysis 2

Analysis revealed that intra-sexual competition levels differed statistically across duration (0-2 years, 3-5 years and 6+ years) of steroid exposure [$F_{2,121} = 4.72$, $p<.05$, partial $\eta^2 = .09$]. Post-hoc tests showed that intra-sexual competition was significantly more pronounced between participants with 0-2 years and 3-5 years AAS experience compared to participants with 6+years experience ($p<.05$ and $p<.01$ respectively).

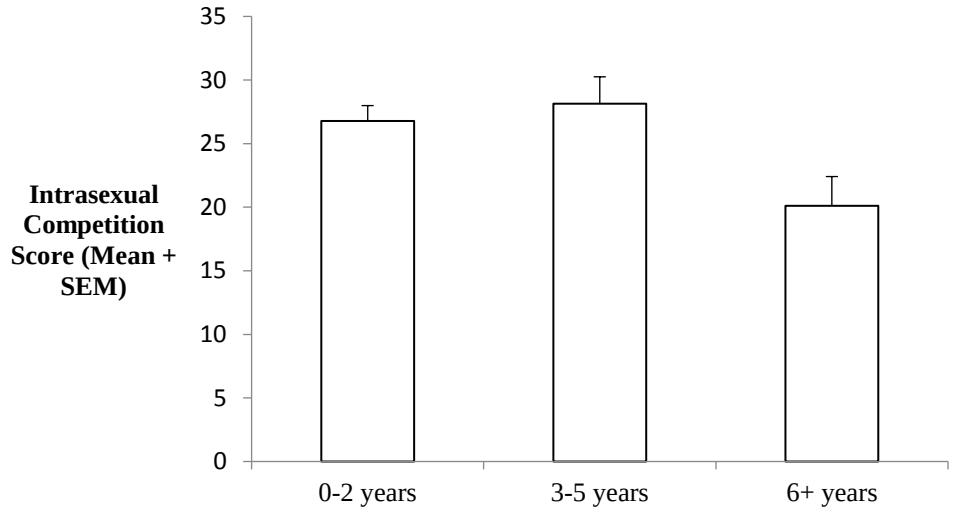

Figure 2 Showing mean Intrasexual competition scores for users of AAS across years of AAS use experience. Values = Mean ±SEM

Discussion

The aim of the current research was to examine the extent to which users and non-users of AAS differ on levels of intrasexual competition, to explore levels of intrasexual competition between users with varying usage experience, and to investigate how levels of intrasexual competition differ between a control group (non-using bodybuilders) with varying lengths of bodybuilding experience. The analysis revealed a statistically significant difference in levels of intrasexual competition between users and non-users of AAS, whereby users displayed increased levels compared to non-users irrespective of training experience, however this

difference was driven specifically by higher intrasexual competition in the novice group (0-2 years training experience). When comparing users with varying degrees of bodybuilding experience, lower levels of intrasexual competition were reported in those with 6+ years experience compared to novices. No significant difference in levels of intrasexual competition between non-AAS using bodybuilders with varying bodybuilding experience was reported. The results also showed that among AAS users, inexperienced users (0-2years) and moderately experienced users (3-5years) presented significantly higher levels of intrasexual competition than highly experienced users (6+years).

Two notable discoveries stem from these findings. Firstly, users have higher levels of intrasexual competition as they initiate bodybuilding, and second, experienced users display lower levels of intrasexual competition than less experienced users. These findings may suggest that personality factors pertaining to natural levels of competition dictate or at least influence AAS usage as differences between users and non-users are only evident in the early stages of training in a competitive environment. Paradoxically differences between users and non-users in intrasexual competition appear to dissipate the longer an individual is exposed to a competitive gym environment. Furthermore, the research provides evidence that intrasexual competition may not play a role in the perpetuation of AAS usage, with users decreasing in levels of intrasexual competition as they gain experience with both AAS use and bodybuilding itself. The diminution of competitiveness over time within a competitive environment context could be explained with referral to two phenomena observed in evolutionary and ethological research. The 'young male syndrome' (Wilson & Daly, 1985) posits that risk taking, competitiveness and aggression is more pronounced in young men as these traits helped cultivate a reputation in this age group that would have translated positively into a man's lifetime survival and reproductive success. According to Daly and Wilson (1994, p.277) "Young men are both especially formidable and especially risk-prone because they constitute

the demographic class upon which there was the most intense selection for confrontational competitive capabilities among our ancestors". When consulting the findings of this current study logically those with greater training experience and experience of AAS use are older and physical competitiveness at least would be predictably lower in older populations. Another plausible explanation as to why intrasexual competition diminished with training experience is that growing familiarity and friendship with, and respect for, other gym members could mitigate against intense competition in a gym context. This has parallels with a phenomenon observed in nature referred to as the 'Dear enemy effect' whereby territory owners expend less and less time and energy over time on defensive and aggressive behaviors the more familiar they become with their neighbours. However, aggression toward unfamiliar neighbours remains the same (Alcock, 2009). This latter point could explain why intrasexual competition appears to be higher during the early stages of anaerobic weight training.

The current study provides novel insight into the putative relationship between intrasexual competition and AAS use. Current literature is dominated by two opposing theories of AAS use: muscle dysmorphia theory and conduct/problem theory. Kanayama et al. (2003; 2006) identified users of AAS to display substantially higher symptoms of MD to non-users, which became prominent in men with a long history of abuse. Whereas Collier (2011) revealed no differences in MD to be evident between current and former users. Prior research provides strong evidence that muscle dysmorphia plays a role in the usage of AAS, however a fundamental question remains, of the extent to which symptoms of muscle dysmorphia precipitate or perpetuate the use these drugs. Rohman (2009) insists evidence for how this relationship manifests itself is currently inconclusive (Rohman, 2009).

In opposition to this theory, it is argued that AAS use is a mere expression of a broader range of problem behaviours (Whichstrom & Pederson, 2001). This objection is based on a wealth of evidence associating AAS use with the use of other illicit drugs, and problem behaviours

(e.g. fighting, suicide attempt and risky driving behaviour) (Kanayama et al. 2003; Miller et al., 2002). The available evidence suggests that AAS use mirrors other problem behaviours during the early stages of usage, and that these problem behaviours can be appropriately defined as risk factors (Pope & Kanayama, 2012).

The results of the current study suggest a further factor may play a potential role in the expression of AAS use. This research provides evidence that intrasexual competition interacts with precipitating factors to predispose certain individuals to the use of these substances although no causal direction can be established. The current research provides a further limitation to the argument that AAS use is the result of a mere expression of broad range problem behaviours or a sole body image disorder. The findings indicate a pattern of cognitions which extend beyond a basic conduct disorder or body image preconceptions, whereby young men in particular possess increased preoccupations about competing with same sex individuals, but that these preoccupations diminish with familiarity with AAS and training regimes in a social context. The current study would suggest other high risk behaviours to be a risk factor for AAS, although increased levels of intrasexual competition and potentially symptoms of muscle dysmorphia interact to increase the likelihood of an individual initiating the use of AAS.

Conclusions, Future Directions, and Limitations.

The current findings provide novel evidence that the factors which may function to initiate the use of AAS, may be different to the factors which maintain usage. Furthermore, these novel discoveries highlight an oversimplified theoretical understanding of AAS use which has previously been suggested. A key strength of this research is that it demonstrates the importance of an external variable in motivating bodybuilders to the use of these image enhancing drugs, and also highlights and over-emphasis on internal factors, such as body image pathology or individual conduct problems, by previous research.

The circulating evidence for why millions of individuals are driven towards the use of these highly harmful substance is very much in its infancy. The findings of the current research demonstrate that more research is needed on the precise factors which initiate and perpetuate the use of AAS. Furthermore, it is suggested that such research should focus on both the internal factors such as adolescent conduct problems and body image pathology, but also external factors, such as the intense desire to compete with other individuals as discussed above. Therefore, there is evidently a substantial need for research surrounding the usage of these life-threating substances before the gap between the theory, problem and provision grows even further apart.

The findings and consequent conclusions of the current study may be gender exclusive, given that all of the participants were male. Therefore, the practical implications and propositions may only be applicable to male users. Furthermore, the current study relied wholly on self-report measures of substance use, and intrasexual competition. Therefore, there is the unavoidable limitation of uncertainty for how truthful individuals are when reporting both substance use and emotionally demanding questions. However, conducting the research within the bodybuilding environments of the participants should have endorsed a comfortable environment for participants to disclose substance use. Furthermore, providing a visibly sealed container and strongly endorsing anonymity and confidentiality should have functioned to reduce the limitations of self-report research.

Competing Interests

The authors declare no competing interests.

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