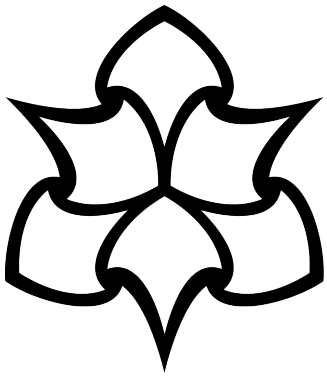

SHORT REPORT

The modes of administration of anabolic-androgenic steroid users (AAS): Are non-injecting people who use steroids overlooked?

By Katinka van de Vena*, Renee Zahnowb, Jim McVeighc , and Adam Winstockd

a Drug Policy Modelling Program, Social Policy Research Centre, UNSW, Sydney, NSW, Australia. Twitter: @KatinkavandeVen and @EnhancementDrug. ORCID: 0000-0003-3026-9978.
b School of Social Science, University of Queensland, St Lucia, QLD Australia. Twitter: @ReneeZahnow. ORCID: 0000-0001-5796-9443.
c Public Health Institute, Liverpool John Moores University. Twitter: @mcveigh_jim.
d Director Global Drug Survey, Kings College London. Twitter: @GlobalDrugSurvy.
*Corresponding author Email: k.vandeven@unsw.edu.au

Abstract

Introduction: There is increasing public health concern about the use of anabolic-androgenic steroids (AAS). Understanding of drug use patterns and practices is important if we are to develop appropriate risk-reduction interventions. Yet, much remains unclear about the modes of administration adopted by AAS users.

Methods: We used data from a sub-sample of participants from the Global Drug Survey 2015; males who reported using injectable or oral AAS in their lifetime (n=1008).

Results: Amongst our sample, approximately one third (35.62%) reported using only injectable AAS during their lifetime while 35.84% reported using only oral, with less than one third (28.54%) using both.

Conclusion: These findings suggest there may be a sub-population of individuals who only use AAS orally. Needle and syringe programs (NSPs) are currently the primary point of health service engagement; forming the main healthcare environment for medical and harm reduction advice on steroids. Yet, NSP-based resources are unlikely to reach or be appropriate to those who do not inject AAS. While there is a general need for health services to be more accessible when it comes to AAS use, non-injectors are an overlooked group that require attention.

Keywords

Performance and image enhancing drugs; PIED; IPED; anabolic-androgenic steroids; AAS; Global Drug Survey; needle and syringe programs; harm reduction

Words: 2,580

1. Introduction

While prevalence surveys suggest lifetime use of anabolic-androgenic steroids (AAS) and other performance and image enhancing drugs has remained relatively low over time, there is a growing body of evidence which suggests that the use of these substances is widespread across the globe (Sagoe, Molde, Andreassen, Torsheim, & Pallesen, 2014). Of particular concern is the use of AAS among young men (Home Office, 2017). There are various short- and long-term health harms associated with the use of AAS (Pope et al., 2014); non-prescribed AAS use is now a recognised public health concern (McVeigh, Evans-Brown, & Bellis, 2012).

People use AAS orally and via injection. Many individuals use both modes of administration during the same time-period (cycle) while others may shift from one mode to the other as their AAS using career progresses. Typically, a person's first experience using steroids, regardless of whether mode of administration is oral or injecting, occurs before the mid- to late-twenties (Begley et al., 2017). The onset of oral consumption of AAS is likely to be slightly earlier than the onset of the use of injectable substances. In some cases participating in certain sports (particularly power sports), negative body image and psychological disorders (e.g. body image disorders) may precede initiation of AAS use (Sagoe, Andreassen, & Pallesen, 2014). Use of legal sport supplements is also an important predictor of AAS use within fitness and sport contexts (Boardley & Grix, 2014). Yet, much remains unclear regarding patterns of AAS use, particularly our knowledge of typical patterns in modes of AAS administration is limited to specific sub populations of people who use AAS; i.e. oral or injection first, or simultaneous use of both forms of AAS. Given the link between modes of administration and health risks associated with AAS use, identifying various patterns of administration is vital to inform appropriate harm reduction strategies.

Data on AAS use is generally collected via ethnographic work (Christiansen, Vinther, & Liokaftos, 2017; Underwood, 2017; van de Ven & Mulrooney, 2017) and surveys (Begley et al., 2017; Zahnow et al., 2018) within needle and syringe programs (NSPs) or gym/bodybuilding settings. Even with the limited diversity in recruitment samples, variation in motivations for use and associated health risk behaviours have been identified (van de Ven et al., 2018; Zahnow et al., 2018). For example, the use of steroids by older men may be motivated by anti-ageing aims (Begley et al., 2017; Evans Brown, McVeigh, Perkins, & Bellis, 2012), while police personnel may use AAS for recovery and/or strength purposes (Hoberman, 2005; Hoberman, 2017).

In contrast to the variability in motivations for using AAS, harm reduction responses tend to be limited to advice delivered through NSPs. Given individuals who use AAS report low levels of trust in medical professionals and a reluctance to seek advice or health care from doctors (Pope, Kanayama, Ionescu-Pioggia, & Hudson, 2004), in regards to their substance use, it is not surprising that NSPs are noted as their main source of healthcare (e.g. see Iversen, Hope, & McVeigh, 2016). While NSPs are an important avenue for AAS users to obtain credible information, these programs are primarily designed to deliver services to injecting drug users, such as distributing injecting equipment and promoting safe injecting practises. These services are neither relevant nor attractive to oral users of AAS who do not inject drugs. As such, a subset of people who use AAS may not be in contact with any form of intervention or health service provider. A better understanding of different drug use patterns may therefore provide new insights for planning harm reduction interventions and other public health initiatives aimed at AAS users. We will therefore explore patterns of AAS use in a sample of people declaring the use of psychoactive drugs derived from the Global Drug Survey (GDS). The GDS may be a valuable source to study this drug-using population as data on AAS use is generally collected via NSPs or gym/bodybuilding settings and this study therefore provides unique insights into the routes of administration of AAS users.

2. Methods

Design and Measures

The Global Drug Survey (GDS) is an online, anonymous survey designed to capture in-depth information about the use of alcohol, tobacco and illicit substances. Since its inception in 2009 the GDS has been conducted annually. It is actively promoted via social networking sites such

as Twitter, Facebook and Reddit for a period of 1–2 months from its launch in mid-November each year. Here we use data from the GDS 2015, which was collected between November 2014 and January 2015 from around the world. A total of 89,509 responses were completed during this time. The GDS survey is self-completed on a self-nominating basis. Other publications provide details on the design, utility and limitations of the GDS (Barratt et al., 2017). In this study we are interested in a sub-sample of the GDS; males who reported using injectable or oral AAS in their lifetime (n=1008). Demographics and prevalence of lifetime use (ever used) of a large number of substances including AAS were collected (see also Zahnow, McVeigh, Ferris, & Winstock, 2017). In addition, we assessed the average age of first use and modes of administration including oral, injection or simultaneous use of both forms of AAS.

Analysis

Data were processed and analysed using Stata 14.0. Continuous variables were summarized with means and standard deviations while categorical variables were presented in frequencies and percentages. Student t-tests and Pearson's chi-square were used to determine statistical significance between groups. We employed logistic regression analysis to examine whether the odds of injecting AAS at first use, compared to using AAS orally at initiation, was associated with demographic characteristics, age first used AAS, prior use of other psychoactive substances and two indicators of lifestyle behaviours; frequency of exercise and frequency of binge drinking. We adopted a stepwise method to first estimate the effects of demographic and drug use variables in Model 1 then assess the impact of adding two lifestyle variables in Model 2. The impact of the addition of variables was assessed using the Likelihood Ratio Test. All statistical tests were two tailed and significance level was set at 0.05.

3. Results

Age of first AAS use

The final analytic cohort comprised 1008 men who reported using AAS and at least one other psychoactive drug during their lifetime. The average age of the sample was 32.07 years (SD=11.41). The majority were employed (71.72%) and had engaged in post-secondary school education (75.8%). The average age of first use of AAS was 23.59 years (SD=9.02). There was a significant difference in the average age of first AAS between men who initially used AAS orally compared to those who used by injection; the average age of first use of injectable AAS was 24.33 years (SD=8.18) indicating that those who injected at first use tended to be older than those who used orally. The mean age of first use of other psychoactive substances among men who used steroids was significantly lower than age of first use of AAS (mean=16.9 years, SD=5.22). This reflects age of first drug use reported in the broader male GDS sample (see Table 1). In terms of other psychoactive substances, the drug used most commonly by men who used AAS was cannabis (lifetime use: 90.8%), followed by 'other' drugs[1] (75.06%), cocaine (61.30%) and/or MDMA (58.56%).

PLEASE INSERT TABLE 1 HERE

Modes of Administration

[1] Other drugs include ketamine, nitrous, GHB, GBL, PCP, hallucinogens, solvents, paint and glue.

Amongst our sample of men who use AAS and other psychoactive substances we found a relatively even split between oral use and intra-muscular injection. Approximately one third (35.62%) of the men in our sample reported using only injectable AAS during their lifetime while 35.84% reported using only oral AAS in their lifetime. Less than one third (28.54%) of the sample reported using both injectable and oral AAS within their lifetime. Of those who used both modalities the majority reported initial use of both oral and injectable AAS at the same age (n=179, 69.38%) (see Table 2). Transition between modes of administration, either from injecting to oral use of AAS or from oral AAS to injecting, occurred among approximately 30% of individuals who reported using both injectable and oral AAS in their lifetime. Amongst those who did not initiate both oral and injecting AAS at the same time, those who injected AAS for the first time *after* they started using AAS orally, took an average of 2.69 years to adopt the modality while those who started out using injectable AAS took an average of 3.81 years to take up oral use (see Table 2). The difference between time to transition was not statistically significant (t=-1.26, ns).

PLEASE INSERT TABLE 2 HERE

4. Discussion

In this study we found that the majority of AAS users reported using a single mode of administration for AAS; either oral (35.84%) or injection (35.62%). This was surprising given the high prevalence of 'stacking', polydrug use (Sagoe et al., 2015), and the simultaneous use of both forms of administration (Begley et al., 2017), noted among the AAS-using population. While research notes a general reluctance among users of AAS to engage with health services (Zahnow et al., 2017), NSPs in the UK and Australia report the proportion of clients who use AAS has increased in recent years. NSPs are a primary source of clean injecting equipment (e.g. Dunn, Henshaw, & McKay, 2016; McVeigh, Beynon, & Bellis, 2003); other sources include friends, pharmacies, online and social suppliers (Kimergård, 2015; van de Ven & Mulrooney, 2017). However, here we highlight a group who do not use injection as a mode of administration. These non-injecting AAS users (oral-only), who also use psychoactive drugs that are less commonly associated with injecting, are unlikely to engage with NSPs restricting their access to drug harm minimization and medical advice. This oral-only using group may therefore never come into contact with harm reduction information, advice and referrals regarding AAS use or any other form of drug use, or not until a late stage of their drug using career when/if transition to injecting AAS use occurs. Transition from oral to injecting AAS use occurs approximately 3 years after the initial experience with AAS. Delayed intervention in drug abuse is associated with greater adverse effects, dependence and risky patterns of use (Modesto-Lowe, Petry, & McCartney, 2008; Stockings et al., 2016). While oral-only users are not exposed to injection-related risks of blood-borne virus, oral AAS use may be associated with a number of adverse health effects, with liver toxicity particularly being an issue (Niedfeldt, 2018). It is therefore important for future studies to explore why people engage in oral-only use (e.g. requires less planning in sourcing equipment) and to explore the barriers to accessing healthcare services for this specific group.

Furthermore, although bloodborne viruses (BBVs), such as HIV, hepatitis B and hepatitis C, are an issue of concern among this population (Hope et al., 2013; van de Ven et al., 2018), AAS users tend to have lower levels of BBVs compared to other psychoactive drug users. Adding to this, levels of sharing or reuse of injecting equipment, which is a significant risk factor for BBV transmission, is much lower amongst user amongst this population when

compared to those injecting psychoactive drugs (Larance, Degenhardt, Copeland, & Dillon, 2008). This is not to say that educating AAS users about safe injection practises is not important but due to health services being largely delivered through NSPs this seems to be the only focus of attention. Yet, recent research indicates that AAS users report having other personal health priorities and needs, such as better access to medical and clinical advice, general health monitoring, post-cycle therapy and referrals for endocrinologists and psychologists, that are currently not being met (Griffiths, Henshaw, McKay, & Dunn, 2017; Kimergård & McVeigh, 2014; Tighe, Dunn, McKay, & Piatkowski, 2017). A wider range of interventions and health services are therefore needed; not just to ensure that non-injecting users are reached but also to address the wider range of medical services important to people who use AAS.

Although NSPs offer services to AAS users, even experienced drug workers report to have minimal, if no knowledge at all to meet the needs of users (Dunn, McKay, & Iversen, 2014; Kimergård & McVeigh, 2014) and specialised services, such as the SWEAT program in the UK and the Steroid Education program run by Kay Stanton in Australia, are marginal. In addition, although strategies to minimize risks associated with the use of AAS - through both oral and injection modes of administration – have been reported in the last decade (Bates et al., 2017; Kimergård & McVeigh, 2014), research is yet to establish the merit of these approaches empirically. The absence of a clear evidence-base has resulted in inconsistent education and advice for AAS users. Although there is a general need for health services that target those who use AAS, to be more accessible, engaging and well-informed, non-injectors face additional barriers to obtaining harm reduction advice from a medical source. We suggest future research should focus on evaluating, targeted public health strategies that involve the AAS using community in all of their development. Given that peer-to-peer information sharing (both online and face-to-face) is high amongst steroid users (Tighe et al., 2017; van de Ven & Mulrooney, 2017), engaging with and involving steroid communities in designing and implementing harm reduction interventions could prove a fruitful strategy to spread evidence-based health information on a large scale. Programs focussed on harm reduction need to go beyond injecting related risks to provide advice on how to use more safely, recognising adverse effects early, and facilitating engagement with healthcare.

There are several limitations to our study. Firstly, steroid use in our dataset refers to lifetime drug use with a sample that has a mean age of 32. As such, while many AAS users only inject or use orally, it may be that throughout their lifetime users will transition to other modes of administration or simply stop using before adopting an additional mode of administration. The sample employed in this study is comprised of people who have declared their use of psychoactive drugs in the GDS and have also stated the use of AAS at some point in their lifetime. While generalising results to other sub-groups of AAS users such as athletes and bodybuilders is not warranted, this study provides unique insights into a group of people using AAS that are typically not studied. The survey seeks participants from across 174 countries worldwide, 58 of which are represented in the AAS using sub-sample employed here. However, due to small numbers from individual countries we could not control for international variation in ease of access to oral/injection AAS, culture of drug use and/or drug policies or legislation.

Conclusion

The risk of adverse health implications from using AAS depends on various factors; one of them being the mode of administration. Our data illustrates a population of AAS users who

tend to stick to one mode of administration - either oral or injectable steroids. Given the dominant approach to providing services and advice for people who use AAS is through NSPs, there is a need to better understand the propensity for oral use *only* and develop avenues for reaching this sub-population of users. Given that risks associated with AAS use can be reduced through strategies that are unrelated to safe injecting, such as shorter cycles and limited dosages and reduction of polypharmacy, it is important to develop strategies to disseminate this information systematically to AAS users and potential users outside of NSPs.

Contributors

All authors contributed to and have approved the final manuscript.

Conflict of interest

The Global Drug Survey is a commercial entity, which is owned by one of the authors of this publication (Adam Winstock).

References

Barratt, M.J., Ferris, J.A., Zahnow, R., Palamar, J.J., Maier, L.J., & Winstock, A.R. (2017). Moving on From Representativeness: Testing the Utility of the Global Drug Survey. *Subst Abuse, 11*, 1178221817716391. doi:10.1177/1178221817716391

Bates, G., Begley, E., Tod, D., Jones, L., Leavey, C., & McVeigh, J. (2017). A systematic review investigating the behaviour change strategies in interventions to prevent misuse of anabolic steroids. *J Health Psychol*, 1359105317737607. doi:10.1177/1359105317737607

Begley, E., McVeigh, J., Hope, V., Bates, G., Glass, R., Campbell, J., . . . Smith, J. (2017). *Image and Performance Enhancing Drugs: 2016 National Survey Results* Retrieved from Liverpool, UK: http://ipedinfo.co.uk

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. doi:10.1080/2159676X.2013.766809

Christiansen, A.V., Vinther, A.S., & Liokaftos, D. (2017). Outline of a typology of men's use of anabolic androgenic steroids in fitness and strength training environments*. *Drugs: Education, Prevention and Policy, 24*(3), 295-305. doi:10.1080/09687637.2016.1231173

Dunn, M., Henshaw, R., & McKay, F.H. (2016). Do performance and image enhancing drug users in regional Queensland experience difficulty accessing health services? *Drug Alcohol Rev, 35*. doi:10.1111/dar.12363

Dunn, M., McKay, F.H., & Iversen, J. (2014). Steroid users and the unique challenge they pose to needle and syringe program (NSP) workers. *Drug Alcohol Rev, 33*. doi:10.1111/dar.12085

Evans Brown, M., McVeigh, J., Perkins, C., & Bellis, M.A. (2012). *Human enhancement drugs. The emerging challenges to public health*. Liverpool: North West Public Health Observatory.

Griffiths, S., Henshaw, R., McKay, F.H., & Dunn, M. (2017). Post-cycle therapy for performance and image enhancing drug users: A qualitative investigation. *Performance Enhancement & Health, 5*(3), 103-107. doi:https://doi.org/10.1016/j.peh.2016.11.002

Hoberman, J. (2005). Dopers in Uniform: Cops on Steroids. Retrieved from https://thinksteroids.com/articles/dopers-uniform-cops-steroids/

Hoberman, J. (2017). *Dopers in Uniform: The Hidden World of Police on Steroids*. US: University of Texas Press.

Home Office. (2017). *Crime Survey for England and Wales: Year Ending September 2017*. UK: Office for National Statistics.

Hope, V.D., McVeigh, J., Marongiu, A., Evans-Brown, M., Smith, J., Kimergård, A., . . . Ncube, F. (2013). Prevalence of, and risk factors for, HIV, hepatitis B and C infections among men who

inject image and performance enhancing drugs: a cross-sectional study. *BMJ Open, 3*(9). doi:10.1136/bmjopen-2013-003207

Iversen, J., Hope, V.D., & McVeigh, J. (2016). Access to needle and syringe programs by people who inject image and performance enhancing drugs. *Int J Drug Policy, 31*, 199-200. doi:10.1016/j.drugpo.2016.01.016

Kimergård, A. (2015). A qualitative study of anabolic steroid use amongst gym users in the United Kingdom: motives, beliefs and experiences. *J Subst Use, 20*. doi:10.3109/14659891.2014.911977

Kimergård, A., & McVeigh, J. (2014). Variability and dilemmas in harm reduction for anabolic steroid users in the UK: a multi-area interview study. *Harm Reduction Journal, 11*(1), 19. doi:10.1186/1477-7517-11-19

Larance, B., Degenhardt, L., Copeland, J., & Dillon, P. (2008). Injecting risk behaviour and related harm among men who use performance- and image-enhancing drugs. *Drug Alcohol Rev, 27*. doi:10.1080/09595230802392568

McVeigh, J., Beynon, C., & Bellis, M.A. (2003). New challenges for agency based syringe exchange schemes: analysis of 11 years of data (1991–2001) in Merseyside and Cheshire, United Kingdom. *Int J Drug Policy, 14*. doi:10.1016/s0955-3959(03)00141-5

McVeigh, J., Evans-Brown, M., & Bellis, M.A. (2012). Human enhancement drugs and the pursuit of perfection. *Adicciones, 24*(3), 185-190.

Modesto-Lowe, V., Petry, N.M., & McCartney, M. (2008). Intervening early to reduce developmentally harmful substance use among youth populations. *Med J Aust, 188*(8), 494-495.

Niedfeldt, M.W. (2018). Anabolic Steroid Effect on the Liver. *Current Sports Medicine Reports, 17*(3), 97-102. doi:10.1249/jsr.0000000000000467

Pope, H.G., Kanayama, G., Ionescu-Pioggia, M., & Hudson, J.I. (2004). Anabolic steroid users' attitudes towards physicians. *Addiction, 99*(9), 1189-1194. doi:10.1111/j.1360-0443.2004.00781.x

Pope, H.G., Wood, R.I., Rogol, A., Nyberg, F., Bowers, L., & Bhasin, S. (2014). Adverse Health Consequences of Performance-Enhancing Drugs: An Endocrine Society Scientific Statement. *Endocrine Reviews, 35*(3), 341-375. doi:10.1210/er.2013-1058

Sagoe, D., Andreassen, C.S., & Pallesen, S. (2014). The aetiology and trajectory of anabolic-androgenic steroid use initiation: a systematic review and synthesis of qualitative research. *Subst Abuse Treat Prev Policy, 9*, 27. doi:10.1186/1747-597x-9-27

Sagoe, D., McVeigh, J., Bjornebekk, A., Essilfie, M.S., Andreassen, C.S., & Pallesen, S. (2015). Polypharmacy among anabolic-androgenic steroid users: a descriptive metasynthesis. *Subst Abuse Treat Prev Policy, 10*, 12. doi:10.1186/s13011-015-0006-5

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. *Ann Epidemiol, 24*(5), 383-398. doi:10.1016/j.annepidem.2014.01.009

Stockings, E., Hall, W.D., Lynskey, M., Morley, K.I., Reavley, N., Strang, J., . . . Degenhardt, L. (2016). Prevention, early intervention, harm reduction, and treatment of substance use in young people. *The Lancet Psychiatry, 3*(3), 280-296. doi:https://doi.org/10.1016/S2215-0366(16)00002-X

Tighe, B., Dunn, M., McKay, F.H., & Piatkowski, T. (2017). Information sought, information shared: exploring performance and image enhancing drug user-facilitated harm reduction information in online forums. *Harm Reduction Journal, 14*(1), 48. doi:10.1186/s12954-017-0176-8

Underwood, M. (2017). Exploring the social lives of image and performance enhancing drugs: An online ethnography of the Zyzz fandom of recreational bodybuilders. *International Journal of Drug Policy, 39*, 78-85. doi:https://doi.org/10.1016/j.drugpo.2016.08.012

van de Ven, K., Maher, L., Wand, H., Memedovic, S., Jackson, E., & Iversen, J. (2018). Health risk and health seeking behaviours among people who inject performance and image enhancing drugs who access needle syringe programs in Australia. *Drug and Alcohol Review*. doi:10.1111/dar.12831

van de Ven, K., & Mulrooney, K.J.D. (2017). Social suppliers: exploring the cultural contours of the performance and image enhancing drug (PIED) market among bodybuilders in the Netherlands and Belgium. *International Journal of Drug Policy, 40*, 6-15. doi:10.1016/j.drugpo.2016.07.009

Zahnow, R., McVeigh, J., Bates, G., Hope, V., Kean, J., Smith, J., & Campbell, J. (2018). Identifying a typology of men who use anabolic androgenic steroids (AAS). *International Journal of Drug Policy, 8*(55), 105-112.

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. doi:10.1177/0091450917694268