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"Injecting yourself there is stigma around it; taking a few tablets is not too bad, is it?": understanding perceptions and preferences of anabolic-androgenic steroid route of administration

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Abstract

Background Anabolic androgenic steroids (AAS) are administered via injectable and oral route of administration (ROA). Each ROA carries a distinct set of challenges and risks; however, scarce qualitative research has focused on why people who use AAS select one ROA over another.

Aim This study aims to explore the perceptions and preferences underpinning the decision behind ROA.

Method Ten semi-structured interviews were conducted with people from the UK who use AAS.

Findings The findings demonstrate that participants had four primary initiation patterns: exclusive use of orals, exclusive use of injectables, and a transition from orals to include injectables or injectables to orals. Factors underpinning drug ROA included: stigma; risk; fear; convenience; efficacy; knowledge of drugs and their desired effects; health; motivations for use; and experience, including number of cycles completed. Each of these factors contributed to differences within the choice underpinning drug ROA.

Recommendation With needle and syringe programs being the primary public health intervention for AAS consumers in the UK, oral-only consumers likely experience a lack of critical support services. We suggest future harm reduction strategies consider ways to engage oral-only AAS consumers, especially considering their comparatively lower prioritization of health concerns.

Keywords Image and performance enhancing drugs, Needle and syringe programs, Harm reduction, Stigma, Route of drug administration, Anabolic steroids

Introduction

Drugs can be administered via a range of different methods, including but not limited to, oral ingestion (e.g., swallowing, drinking, chewing etc.,) injectable (e.g., intramuscularly, intravenously etc.,), and inhalation (e.g., smoking, snorting etc.,) (see [4, 45]). Each specific route of drug administration (ROA) carries distinct risks and benefits, something that shapes drug use patterns and choices. For example, people who inject drugs are at

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higher risk of infection from bloodborne viruses, HIV, overdose, and dependence when compared with people who only use oral drugs [45]. These differences in risk influence not only individual choices but also broader patterns of drug use, including transitions between different ROAs.

Importantly, ROA is not fixed, and people can change ROA during their use of drugs. Young et al. [73] outlines for people who use illicit prescription opioids, individuals sometimes change ROA, with people transitioning from oral ingestion of opioids to injectables. Various factors contribute to the *choice* of ROA and have been separated under 'individual' and 'social and ecological' factors [73]. At the individual-level, unemployment, homelessness, school dropout and early onset of substance use are influential factors within the transition between ROA. At the social and ecological level, perceived social support, social pressures, geographic proximity to suppliers, drug markets, ease of access and drug availability, social norms associated with typical ROA, referred to 'site ecology,' and the 'cost-effective' nature of drugs, which simply means the best effects for the least money, are influential factors within the transition between ROA [21, 45, 73]. These patterns of transition between ROA underscore the complex interplay between individual circumstances and the wider social and ecological factors that influence drug use.

It is against the backdrop that scholars have argued that ROA has significant implications for public health responses and harm reduction initiatives [21, 45, 73]. Much of the literature focusing on ROA from a public health perspective has explored this within the context of illicit and prescription substances used for non-medical purposes, which is less generalizable to substances such as anabolic-androgenic steroids (AAS), a group of image and performance enhancing drugs (IPEDs).

Image and performance enhancing drugs

IPEDs are used by athlete and non-athlete populations to enhance performance as well as appearance [12]. AAS constitute one subcategory of IPEDs and were once restricted within subsections of the population (e.g., bodybuilders) [31]. Global lifetime prevalence of AAS is estimated at 6.6% for men [60, 61] and 4% for women [51, 52, 55, 56]. Further, Pope et al. [57] have reported that between 2.9 and 4 million Americans have used AAS. More recently, in the UK, Hope et al. [28] estimated that approximately 447,000 men had recently used AAS. Collectively, these estimates underscore the size of this public health issue.

AAS are linked to a range of both immediate and long-term adverse effects, which manifest physically and psychologically. Immediate physical effects encompass conditions such as acne, scarring, and hair loss in males, among others [7, 23]. Psychological effects include, anxiety, mood disorders, increased aggression, and depression [11, 48, 49]. Prolonged AAS usage is often associated with damage to vital organs such as the liver, brain, and heart [57, 36].

People who use AAS typically administer them through oral or injectable ROA or a combination of both [8, 19, 74]. While some AAS are available exclusively in liquid preparations (e.g., Testosterone Enanthate (see [41])), or exclusively available in tablet forms (e.g., methandienone 'Dianabol', (see [32])), leaving AAS communities with no choice between ROA, other AAS are available to use via either ROA (e.g., Methylandrostenediol Methandriol (see [42])). Importantly, specific harms are associated with ROA. For example, injectable ROA has been associated with increased infection risk [27] and oral ROA has been associated with increased liver and kidney issues [62, 72]. These harms are distinct to ROA, something that underscores the need for tailored interventions. However, scarce social scientific research has examined the perceptions and preferences of ROA amongst people who use AAS.

Theoretical framing

Existing data show that people who inject drugs face a heightened risk of experiencing drug-related harms compared to their non-injecting counterparts [24, 30]. This increased vulnerability is rooted in various environmental, social, and individual factors surrounding injecting drug use [58], hindering their access to health-promoting services, including harm reduction initiatives (e.g., supervised consumption rooms) [59]. These disparities can represent health inequities, reflecting avoidable discrepancies in service and resource access that influence health outcomes [64]. However, this is not to say that drug use via oral ROA is safe, rather there exists distinct differences between drug-related harms and ROA [45]. One of the key drivers on these disparities is stigma, which can adversely affect decisions to seek healthcare among people who use drugs [68].

Goffman's [22] perspective defines stigma as a social construct that is enacted through social interactions, where behaviours and attributes are deemed acceptable and expected based on societal norms. Recent approaches consider stigma as a social process shaped by the social context, as well as by social, economic, and political power dynamics [66]. In this way, stigma perpetuates social inequities by reinforcing the division between socially devalued and socially valued attributes [43]. A less explored injecting drug cohort which experiences stigma are those who use AAS [14, 39, 50].

Ultimately, people who use AAS often face societal stigma related to their drug use [14, 39]. Interestingly, we believe there are additional degrees and nuances to this stigma, where some people who use AAS may perceive the ROA as a factor influencing the level of stigma they experience. For example, injecting AAS might be associated with being viewed as 'junkie' [48, 49] as opposed to people who use tablet AAS. However, in the case of AAS, as opposed to injecting drug use more broadly [18], there is a potential for increased harms to some internal organs (e.g., liver) when they are not injected, highlighting a complex interplay between stigma and harm potential in this specific context of drug use. Moreover, harm reduction services have historically been designed around the needs of people injecting opioids or stimulants, leaving those who use AAS to adapt guidance not built for them. This lack of tailored support fosters misinformation, increasing risks tied to injection practices, substance sourcing, and long-term health management. We sought to interrogate this unique context more fully in the current study.

The current study

Although survey data has examined ROA, there is scarce existing qualitative research on the preferences and perceptions underpinning ROA within the AAS community. The quantitative data available exploring the use of IPEDs in the UK (see [5, 10, 39]) demonstrate people typically administer drugs through both ROA but more frequently initiate drug use through oral ROA before transitioning to injectable preparations [10, 48]. Those who initiate AAS use through oral ROA typically do so at a younger age [10, 39]. ROA though intramuscular injection has been associated with the formation of scar tissue, infection, and the transmissions of infectious diseases [27, 38]. Oral ROA has been associated with greater liver toxicity when compared with injectables [62, 72], and the health effects are further exacerbated when alcohol or other drugs are consumed [39, 57]. As a response to AAS-related harm, various harm reduction interventions have been established (see [44]).

Within the UK, the most notable type of intervention is Needle and Syringe Programs (NSP) and while service provision differs [33], the provision of clean and disposal of used needles and syringes is the primary function of these services. Due to their primary goal to support people who inject drugs, however, NSP 'overlook' people who exclusively use oral AAS [71]. Therefore, the aim of this study was to explore the ROA preferences among people who use AAS through qualitative interviews.

Method

Ethical approval was granted by Swansea University research ethics committee (2019/021). Informed consent was attained after participants received information sheets stipulating the purpose and aims of the research. Information sheets included participants' right to withdraw from the interview at any point should they wish to do so. Participation was granted on the basis that these individuals remained anonymous. Important support information and contact details were provided to all participants.

Data collection took place between January 2019—August 2019 and was conducted by the first author. Participants were eligible to be included in this study if they had used AAS and were over the age of 18. All participants (n = 10) identified as male, lived in the UK and were between the age of 28–38 at the time of data collection.

Recruitment was achieved via purposeful and later snowball method. Initial contacts were accessed through the gym, where the first author trained and was a member. Through his personal use of the gym and resistance training, the first researcher was culturally embedded within gym and bodybuilding communities, sharing training environments and cultural norms. Though AAS communities are notoriously difficult to reach, the researcher leveraged his sociocultural capital to access and communicate with this population, something that underpinned the recruitment process. To assist this process, the researcher intentionally recruited gym members who he knew had used/were using AAS, based upon previous rapports he had built within these communities. Participants were later asked to provide the contact details of additional people who were relevant to the study aims and scope.

Interviews were semi-structured and included open-ended questions. Interview guides were constructed after an initial review of the literature was conducted. This included a search on Google scholar for literature published between 2009 and up to 2020. Key words included: 'harm reduction' and 'steroids', and 'risk'. Key literature included van de Ven et al., [71], which specifically focused on ROA. Researcher positionality (see [63]) further assisted the identification of key literature, with embedded knowledge of the gym, nutritional supplements, IPEDs, and academic literature. This facilitated the research process, granting researchers elevated knowledge and understanding to identify key articles. One common interview guide was developed for all interviews. Examples of the interview questions included: Which drug ROA do you use? Why would you use one ROA over another? Do you perceive one ROA to be safer than the other? What barriers do you perceive there to

be when ROA is considered? Cultural awareness and acquired knowledge of the gym and bodybuilding subcultures facilitated the researcher to speak freely with interviewees.

During data collection, preliminary analysis was conducted. This allowed for reflexivity and adaptation of the semi-structured interview guide questions, with participants contributing towards developed insights [9]. This meant the interview guide was adapted as the interviews progressed, allowing the researcher to focus on specific points of interest. While this was an exploratory study that focused on IPED use, ROA and risk, the process of research adaptivity and reflexivity allowed researchers to focus on emerging facets within each of the interviews. Interviews were conducted over the phone or on Zoom/Skype and transcribed manually by the first author.

Importantly, data collection and analysis drew upon the notion of lived-living experience (see [53]), where researchers leveraged inside knowledge through identified peer researchers on the team (TP) to attain deeper understanding of community norms and behaviours. This enriched the research process and granted deeper understanding throughout the research project.

Once data collection was complete and the interviews had been transcribed, data were input into NVivo 12 for analysis. Data was analyzed through a lens of critical realism (CR), where data and discussion were shaped by an understanding that the social world is theory-laden rather than theory-determined [20].

CR acknowledges the existence of a real social world that can be explored through philosophy and social science [17], but also recognises that not all knowledge holds the same degree of accuracy in reflecting reality [20]. Multiple layers of reality are said to exist, with CR providing scope to understand 'how' and 'why' events occur at and across various levels [26]. CR helps us begin to understand these different layers and how they exist and allows for the development of theories that vary in their approximation to truth. The production of theory occurs through rational judgment of social events, which are underpinned through the identification of causal mechanisms with social phenomena [2]. Distinct from the natural world, social structures are activity dependent. Causal mechanisms, therefore, occur through and are understood across empirical phenomena, underscoring their relevance for scientific inquiry [20]. Focusing on explanation and causal analysis over descriptive detail, provides a robust framework for the analysis of social problems and proposes various and informed solutions for societal change.

This research envisions that shifts in societal attitudes (e.g., stigma) and policies is key when addressing IPED use and improving harm reduction strategies. The underpinning importance of CR, therefore, rests in the fact that it allows researchers to critically engage with participants' knowledge and experiences, drilling down to their deeper meaning, whether they can be observed or not.

Coding primarily followed a flexible (i.e. 'directed') approach [29], where codes were initially derived from the literature and the data, but remained adaptable, allowing for adjustments, and the development of additional codes. Related to points of ambiguity and contention, the researchers consulted as a team to iron out any concerns. Text was coded, followed a deductive process and were refined through the existing model or theory. Drawing on Maxwell's [34], realist approach, codes were established and included, 'stigma,' 'risk,' and 'fear,' which aligned with critical realism concepts. Due to the nature of the deductive coding process, codes were expanded and through the second phase of coding, informed by critical realism, where codes were systematically reorganized into thematic categories, including 'convenience,' 'efficacy,' and 'morality'. This process, as a whole, enhanced theoretical engagement beyond mere empirical descriptions, fostering a more nuanced understanding of the dataset.

Results

The characteristics of the participants are presented in Table 1. Age when interviewed, age of drug onset, name(s) of drug used, route of drug administration and number of drug cycles

Having provided an overview of the participants included within this investigation, we next focus on ROA. We spilt the results section into three subsections: (1) people who exclusively use oral AAS; (2) people who exclusively use injectable AAS; and (3) people who use both injectable and oral AAS. For the final category, we draw a distinction between ROA. That is for people who initiate AAS with orals and later transition to include injectable preparations, and for people who initiate AAS with injectables and later transition to include oral preparations.

People who exclusively use oral AAS

Within the current investigation, participants outlined the use of AAS via two distinct ROAs: (1) oral compounds; and (2) injectable preparations. Within this first section, we identify and examine the responses of participants (Jay, Troy, Justin and Dug) who exclusively used AAS through oral ROA.

Simplicity and convenience

When asked about his use of AAS and his decision to use orals over injectable preparations, Jay outlined the

Table 1 Participant characteristics

P	Age	Use age	Substance	Inject/oral	No. of cycles
1	29	19	Testosterone [enanthate] HCG [Human Chorionic Gonadotropin] HGH [Human Growth Hormone] Dianabol [Metandienone]	Both—orals first	4
2	28	19	Pro-Hormone [SD-matrix] Dianabol [Metandienone]	Oral	2
3	29	22	Testosterone (propionate, cypionate, enanthate) Masteron [Drostanolone] Equipoise [Boldenone] Anavar [Oxandrolone] Winstrol [Stanozolol] Dianabol [Metandienone] T-3 [Triiodothyronine] Aromatase inhibitor HCG [Human Chorionic Gonadotropin] Nolvadex [Tamoxifen] Clomid [Clomifene]	Both—injectables first	10 +
4	31	19	Pro-hormone [SD-matrix] Anavar [Oxandrolone]	Oral	3
5	29	20	Testosterone [propionate]	Injectable	2
6	28	25	Dianabol [Metandienone] Nolvadex [Tamoxifen]	Oral	2
7	29	20	Testosterone [propionate, cypionate, enanthate] Anavar [Oxandrolone] Clenbutrol Pro-Hormones T3 [triiodothyronine] Nolvadex [Tamoxifen]	Both—Oral first	10 +
8	28	20	Anavar, [Oxandrolone] Winstrol [Stanozolol]	Oral	2
9	29	28	Testosterone [enanthate]	Injectable	1
10	38	29	Testosterone [propionate, cypionate, enanthate] HGH [Human Chorionic Gonadotropin] Trenbolone [19-nortestosterone] Dianabol [Metandienone] Winstrol [Stanozolol]	Both—Injectables first	4

simplicity of orals meant he decided to use them rather than injectable AAS, '*taking tablets was just a lot easier to do*'. The simplistic nature of oral ROA was a clear motivating factor to use oral AAS rather than injectables. Indeed, the process of removing oral preparations from either a blister pack or a pill bottle, and swallowing these tablets takes far less knowledge, understanding and planning when compared with the use of injectable preparations. For injectable preparations, people need to store liquid preparations in the appropriate conditions (e.g., for water-based solutions, these should be refrigerated and kept in a sealed container, but differences exist for oil-based preparations, for example, which should not be refrigerated, but rather kept at room temperature, as cooling causes the oil to thicken), purchase and acquire needles and syringes, physically breaking through the skin to administer the product and maintain and ensure cleanliness of injecting equipment and the injection site. This underscores distinct differences between oral and injectable ROA and provides clear evidence as to why oral ROA might be deemed '*easier*' when compared to injectables.

Dug further highlights the simplicity of orals to be a decisive factor when choosing between ROA, '*It is just easier to take a tablet. You do not have to think about it, you just put it in your mouth and swallow. It is little hassle*'. For Dug, the use of oral AAS appeared less complicated than injecting, with less planning and preparation necessary. Dug did not have to think long or hard about his use of oral AAS, something that was inherent to this choice of ROA. Oral ROA, therefore, aligned with an element of convenience and was deemed to be less hassle and more straightforward when compared with injectable ROA. For Dug, this simplicity afforded him greater freedom, appeared less restrictive and burdensome and provided strong justification to use oral rather than injectable AAS.

Though some participants valued the perceived simplistic nature of oral ROA, concerningly, due to the perceived simplicity of orals, Troy did not fully consider the health implications of his drug use. This was directly related to their ease of use, and the lack of preparation and planning required. Troy outlined, '*When I was 19 years old, I did not know what I was taking, I am not going to lie to you.*' For Troy, who knew little about AAS, the decision to use orals rather than injectable preparations appeared straightforward, with a lack of knowledge, coupled with the simplicity of oral ROA, underpinning his decision. While oral ROA required less understanding, planning and preparation than injectables, the accessibility of oral AAS in pill form significantly reduced the perceived need for Troy to engage in extensive contemplation concerning the potential repercussions of his AAS use. This meant he overlooked the harms associated with AAS, something that was underscored by the *simple* nature of oral ROA.

For Justin, oral AAS were an easier ROA that required less knowledge and planning than when compared to using injectable AAS, '*I did not really know what I was doing, so I think if I went into injectables I could have experienced some problems.*' Justin lacked essential knowledge about injecting and decided to use what he perceived to be an easier and less complicated ROA. This decision was underpinned by specific apprehensions associated with the perceived problematic nature of injecting, with heightened perceptions of error, risk and subsequent harm attached to injectable ROA. Nonetheless, although Justin acknowledged injectable AAS could be less harmful than orals, '*I know injecting might be better for you if you get it right,*' he decided to go ahead and use orals, *'but that was not something I was willing to do.*' In doing so, Justin's response outlines shades of reluctance related to his choice of ROA. While Justin demonstrated an understanding of risk and harm, and highlighted that injectables are perhaps *safer* than orals, he decided to use the ROA that he felt more confident with, underscored by the perception that less negative health harms could arise.

Perceptions that injectable AAS are safer than oral AAS appeared to stem from the notion that orals AAS are more toxic to your liver. Research underscores such perceptions [62, 72], with evidence supporting the notion that oral AAS are associated with increased liver toxicity. However, these perceptions overlook the various and significant harms associated with injectable ROA, which include risk of infection [38, 40]. Nonetheless, similar perceptions of risk and harm were echoed by Jay, '*But if you do your research, you will probably find out that needles [injecting] are probably safer if you do it properly.*' This response further underscores the notion that an understanding of risk related to ROA can be overlooked in favor of convenience. Jay, much like Justin, recognized that injectable preparations might carry less risk if administered correctly when compared with oral compounds. However, both participants noted the distinct complexities associated with injectable AAS, something that meant they favored an 'easier' ROA. This distinction highlights that some participants made a calculated decision, weighing up health risks versus convenience, with the latter providing more salience.

Concealment and stigma

Stigma regarding ROA shaped perceptions and behaviors. As Justin highlighted, stigma associated to injecting determined his decision to use oral AAS, '*I think injecting yourself, there is stigma around it, it is not a nice thought, whereas taking a few tablets each day, it is not too bad, is it?*'. Stigma associated with injecting partly stems from the use of illicit drugs (e.g., heroin), which large parts of society condemn and look down upon. Stigma is something reinforced through derogatory labels (e.g., "junkies" and "crack heads") and has been said to limit the uptake of NSP engagement [14]. Within the current investigation, perceptions of stigma influence ROA, and underscore potential risk. Justin went on to detail how he attempted to conceal his drug use, *'I was living at home with my parents, orals were easy to keep in the house, zero hassle and easy to hide from my family.*' Not only is stigma evident and associated with injecting but Justin attempts to conceal his AAS use altogether. While this aspect of stigma is distinct from ROA, it implies his family would disapprove of his AAS use more generally. Although AAS are legal to use in the UK, a narrative of harm driven by the media has contributed to the diffusion of stigma to spread into and within wider parts of society (see [37]). For Justin, stigma meant he wanted to keep his drug use hidden from his family, and selected the ROA which afforded him the most secrecy, keeping his AAS use underground and out of sight.

Fear and dislike

Dug and Jay highlighted their fear and dislike associated with needles to underpin their decision to exclusively use oral AAS. Dug outlined, '*I do not like needles, yeah, I simply do not like needles.*' These concerns provided enough weight to steer Dug away from injecting AAS, a response and behavior that overlooked the various risks and benefits associated with either ROA. The emotion of disklike, therefore, holds significance when ROA is considered, with negative emotions attached to injectable ROA and which outweigh other thoughts and feelings.

In an additional response, Jay outlined the emotion of fear to shape his choice of ROA, '*to be honest, the idea*

[injecting] scared me.' Fear should be understood as a complex feeling which is often associated with an element of danger and risk and is sometimes assumed upon appraisal, that something bad might happen. Though resources exist to educate people how to inject AAS correctly (see [50]), for Jay, deep-rooted fear appeared to shape his decision to use tablets rather than injectable preparations, with increased perceptions of risk attached to injectable ROA.

Moral justification

Alongside various other factors, for Dug, oral compounds appeared to be more easily justified when compared with injectable preparations. Dug outlined what underpinned this perception:

> *'If I had a steroid tablet and a steroid injectable, I would look that two very differently even if they are the same thing. If you are injecting stuff into your body I see it as more extreme than taking a simple tablet and swallowing it. With injections you are taking a needle and sticking it into your body and directly putting into your system, whereas taking steroid tablets just feels like you are taking a supplement almost, so mentally taking a tablet or drinking some powder does not feel like you are doing anything wrong because it is going down orally but when you inject directly, well it is a bit extreme.'*

The availability of AAS in oral preparations appeared to reduce the perceived seriousness of drug consumption behavior, with oral AAS considered indifferent to nutritional supplements, which can be consumed through the same ROA. This perception has serious consequences, with individuals perhaps more willing to use AAS and overlook potential harms. Dug provides further insight, '*They were just tablets, I have vitamin tablets, it was just another tablet. Tablet form is fine.*' By drawing a direct comparison between AAS and nutritional supplements, specifically vitamins, Dug convinced himself that due to the ROA, that is consuming oral AAS and vitamins through the same ROA (i.e., orally) that he was doing little wrong, justifying his actions as indifferent. Though nutritional supplements and AAS are both legal to use in the UK, substances falling in each of these distinct categories carry distinct risks and benefits. Indeed, this type of framing is problematic and harbors powerful connotations which ought to be addressed to ensure people understand and are aware of such differences.

People who exclusively use injectable AAS

Within this second section, we identify and examine the responses of participants (Joe and Pete) who exclusively used AAS through injectable ROA. This category is distinct from the previous, who exclusively used oral AAS.

Health focus

Within the first subtheme, Joe noted a clear concern for health shaped his choice of ROA, evidenced through his response to the question "why did you decide to use injectables over orals?". Joe stated, '*Yeah, because to my knowledge orals can be quite liver toxic and injectables are far safer for your liver'*. This health-conscious response shares similarities to the previous group (people who exclusively used oral AAS), who drew upon similar lines of understanding, that oral AAS can be toxic for vital organs. However, where these groups differ (people who exclusively use oral AAS versus people who exclusively use injectable AAS), is the prioritization of health, with Joe's response demonstrating that he selected an ROA based upon principles grounded in health-related motives, unlike the previous group, who decided simplicity over health was a better option for them..

While health-based justifications were evident throughout responses from both Joe and Pete, this is not to say that both participants were comfortable or confident when injecting. Pete outlines:

> *'Yeah, I was really nervous, really nervous. I always told myself that I would not use steroids, but my mind changed, and I got to a point where I decided to use them [anabolic steroids]. The first time I did it [inject] was really nerve wracking.'*

Nervousness stemmed from inexperience associated to injecting practices, risks and the possible harms associated with the use of AAS through this specific ROA. Indeed, apprehension associated with this ROA appeared well founded considering the experience of Pete:

> *'I jabbed [injected] my glute [gluteus maximus] first of all, it went in and it was really easy, but the second jab [injection] the next morning, I had a bit of a scare. I got up after doing it [injecting] and I think I hadn't drunk any water yet and I was in a state of just waking up and I went into the bathroom, I push it [the needle] in to my glute and I think it shocked my system. I did not inject the oil, and I pulled it [the needle] back out and I went really dizzy and my vision started to go bright and everything. I think that was down to shock, so from then on, I started to jab [inject] my deltoid [shoulder]. I definitely felt really nervous before doing it [injecting] though.'*

Inexperience and a lack of knowledge meant Pete struggled to administer AAS correctly, something which underscored nervousness and shaped how and where Pete injected himself. Switching between

various injection sites, Pete searched for an appropriate location on his body to administer AAS without harming himself. In doing so, this response demonstrates a clear lack of confidence associated with this ROA, underpinning nerves, apprehension and concern. Importantly, Pete's narrative highlighted difficulties specific to this ROA and reiterates previous responses concerned with the simplicity of orals.

Injecting harms

Overtime, however, Pete explained how he became more comfortable injecting AAS, with his nervousness subsiding as he grew in confidence garnered through experience. Pete outlined this progression, *'I thought about it [injecting] a lot and it is a big thing to do, but I think after doing it [injecting] a few times you start to get used to it'.* Though Pete was nervous when he initiated AAS use through injectables, he learnt through doing, and developed his craft over time and through experience. Exposure to injecting practices gradually diluted concerns associated with injecting apprehension and built Pete's confidence as he became more knowledgeable about the drugs he used and how they were administered. Notably, however, Pete experienced harm towards the end of his AAS cycle, underscoring the complexities associated with injectable ROA.

Pete outlined:

> *'Also, towards the end of the cycle, when I was injecting, I built up a lot of scar tissue under my skin on my deltoid [shoulder] so when I was injecting, the needle wasn't penetrating the skin, it became quite painful to inject, I would have to force it [the needle] in, it really was an unpleasant experience. I really would have to force the needle through the skin, to break through the scar tissue and reach the muscle. Even with a sharp needle, even with quite a bit of force, I was struggling to break through the scar tissue. I'm not sure what I had done, maybe the area wasn't suitable anymore, I think I had penetrated it so many times that the scar tissue had built up too much. Because I had that episode with my glute, I was too scared to put it [the needle] in there. To be honest, that is why I stopped. I still have some oil left to inject, I didn't finish the cycle, I finished it early because I couldn't bare the thought of forcing the needle through the skin. There was quite a lot of bleeding when I took the needle out, I think my deltoid [shoulder] muscle became quite sensitive and as I was pushing the needle through, my deltoid [shoulder] muscle was jumping, it was as if I was hitting a nerve, it was a really unpleasant feeling. For those reasons, I ended up calling it a day, like I say, I still have a syringe left with the oil in it, in my draw, ready to jab [inject], but I just stopped the cycle there and then. Maybe if I had known I would have gone through that before, then again, I might have reconsidered.'*

Pete's response provides firsthand evidence of the complications he experienced during his first cycle. Although Pete was 28 years old at the time of drug onset, his inexperience contributed to his experience of harm. These complications were directly associated to ROA, with Pete's inexperience underscoring some of the harms he encountered when attempting to inject himself. These concerns reiterate why some people will never use injectable AAS, as pushing a needle through their skin exposes them to potential harm. These risks underpin perceptions that oral AAS seem like an *easier* alternative, with injecting complications driving some people away from this ROA.

People who use both oral and injectable AAS

In the previous two sections, participants outlined their use of AAS via one of two distinct ROAs: (1) oral; or (2) injectable. Within the final section, we identify and examine the responses of the remaining four participants who outlined the use of AAS via both ROAs. Importantly, for participants who outlined the use of AAS via both ROAs, participants reported using AAS via one ROA prior to the other. Accordingly, we break the final section into two sections, reflecting this distinction, and the transition between ROAs. We begin with: (1) people who initiate AAS through injectable and later transition to include orals; and (2) people who initiate AAS through orals and later include injectables.

People who initiate AAS through injectables and later include orals

Related to ROA, two participants (Jon and Barry) initiated AAS use through injectables and later transitioned to include oral compounds. Importantly, both participants self-identified as aspiring competitive bodybuilders.

Experience and understanding

Jon was arguably one of the most informed and knowledgeable participants within our sample. Though age is an important factor when risk is considered, experience and how well ingrained individuals are within gym culture appeared to be a significant factor that has the potential to inform behaviours and steer individuals away from harm. Kimergård & McVeigh, [33] note that communication and support networks imbedded within

specific gyms play a vital role when harm reduction is considered—something that might also inform ROA.

Jon initiated AAS through injectables, '*when I started, I used testosterone on its own because there is so much research on it. It was the classic, 500mg per week*'. This response outlined clear reasoning behind Jon's choice of ROA, with existing research and evidence supporting his primary justification. Unlike previous participants, Jon's response did not rest on emotion (e.g., fear, dislike etc.,) but rather (bro) science (see [70]), which underpinned and highlighted the distinct nature of participants responses related to ROA. Indeed, Jon prioritized both efficacy and safety, and selected injectable AAS based upon informed choices.

Bodybuilding dreams

As the interview continued, Jon detailed his transition to include oral AAS, '*I then added Masteron [drostanolone] and Winstrol [stanazolol] in, all for different effects*'. The transition to include oral compounds underscored the notion that Jon was following a specific protocol, which was structured and designed to achieve specific results. This directly linked to Jon's motivation for using AAS, who was an aspiring bodybuilder. Knowledge of AAS and their potential effects was clear, as Jon outlined how he used orals, '*I tend to run [use] orals for far shorter just because they have bigger impacts on your lipid profile, your liver enzymes and blood pressure*'. Jon's response detailed how and why he used oral AAS, with clear knowledge and understanding related to AAS health harms. With clear rationale provided, we can see how ROA is considered, and why one ROA might be selected over or in combination with another. Notably, Jon's response is in stark contrast to people who exclusively used oral AAS, who were focused on convenience, simplicity and ease of use. With complex drug protocols combining both oral and injectable ROA, and with greater planning and preparation required, it is clear to see why and how this can shape perception of risk and behavioural outcomes related to ROA.

Rejecting harms

Harm and the perception of risk was a defining feature when ROA was considered. However, throughout his interview, Barry rejected the notion that AAS represented significant health risks:

> *'When I got to that point of first jabbing [injecting], I was aware of so many people who were doing it and had been doing it for so long, and I knew have had no adverse health effects, that I was already starting to doubt how bad these things [anabolic steroids] were for you.'*

Immersed in an environment where drug use was commonplace, Barry questioned the problematic nature of these substances, with perceptions of risk seemingly diluted through shared spaces where AAS were used and openly discussed. These perceptions contributed to Barry's choice of ROA, where he overlooked the health harms associated with 'jabbing' and rejected potential health risks, suggesting they had been exaggerated. Collectively, this underscores how the environment shapes and contributes to an understanding of risk.

People who initiate AAS through orals and later include injectables

In this final section we examine the responses of Dave and Tom. Both participants initiated AAS through oral compounds and later transitioned to include injectable preparations. Here, we provide insight and understanding related to ROA and specifically, related to the transition between ROA.

Confidence through exposure

Of the two participants who began with oral tablets and later transitioned to include injectable preparations, it was clear that they followed a path which was a gradual progression towards injecting. Dave outlined orals as a good place to 'start', *'obviously if you have never tried steroids and you want to start off on something, oral steroids are a good starting point. You might feel a little boost and you will see little results.'* This response demonstrates a clear progression from a perceived 'softer' ROA to a perceived 'harder' ROA. For Dave, oral AAS carried less perceived risk when compared with injectable AAS. Thus, oral compounds provided a solid platform for Dave to develop his craft and to understand the drugs he used. Learnt through 'doing,' Dave garnered knowledge, experience and confidence, and gradually built towards the transition from oral compounds to injectable preparations. This staged approach towards injectable ROA underscores apprehension, with Dave not wanting to jump in at the 'deep' end, deciding that oral AAS were a good 'starting point.'

As Dave gained experience through his use of AAS, his outlook shifted, with injectable ROA offering greater perceived health benefits. Continuing with his response, Dave outlined:

> *'I now mainly take injectable steroids, the reason for that being is the toxins. Any steroids will have toxins whether its injectable or tablet, but the liquids [injectables] are a lot less toxic to your liver and kidneys when compared to tablets.'*

This response demonstrates a gradual shift from the use of oral compounds to injectable preparations—with

Dave becoming more aware of the drugs he used and their potential effects on his body. This transition was underscored by knowledge and experience, with health-based learnings developed overtime and through doing. This shift occurred through experience, with Dave learning over the course of ten AAS cycles. Indeed, the transition between ROA ought to be recognized together with the influential nature of experience and time using AAS, with greater time, experience and exposure, granting people greater opportunities for change and transition between ROA.

Age and (in)experience

Similarly, Tom outlined how his use of AAS shifted over time, with his decision to transition from oral tablets to injectable preparations evident within his response to the question "why did you start using oral compounds and shift to injectables?":

> *'I think because I didn't really know much about it [anabolic steroids], I didn't do much research about it [anabolic steroids] at all. I didn't consider that there would be health risks, it wasn't something I considered at all' [...] 'When I first used them [anabolic steroids], I did not think it was a big issue.'*

Tom, who was 19 years old when he first used AAS, overlooked the harms associated with ROA, when he first initiated AAS use. Initially he was drawn towards oral AAS as they required little thought, planning or preparation, a response that reflects participants in the first group (people who exclusively used oral AAS), and did not consider which ROA carried more or less risk. Lack of consideration is problematic when we consider the harms associated with AAS, however, Tom's concern and acknowledgment of health risks grew as he progressed through his use of AAS and as he gained chemical capital. Importantly, Tom's response underscores the notion that oral compounds might provide people with a false sense of reassurance, meaning they fail to seek to understand the possible health consequences associated with AAS. Again, these concerns were also reflected in the first group (people who exclusively used oral AAS), who overlooked harms due to the simplistic nature associated with ROA, which were comparable to nutritional supplements and vitamins.

Discussion

The current data provide novel evidence for the preference among people who use AAS to initially opt for oral compounds. This observation aligns with existing research [48], and further underpins the notion that some people who use AAS will never inject such drugs. This has implications for public health responses as well as harm reduction interventions, with NSPs one of the main points of contact for this community [33]. With people who use oral AAS unlikely to require the services offered at NSPs, due to their choice of ROA, they will miss out on vital information and engagement opportunities with healthcare professionals, as highlighted by van de Ven et al. [71]. Similar parallels can be draw from the work Speed et al. [65], who suggest that supervised consumption services are directed towards people who inject drugs, and that additional research is required to ensure improved health outcomes for people who consume drugs through oral ROA. This gap in service provision highlights the need for tailored harm reduction approaches that address the unique needs of those who use oral AAS, ensuring they receive relevant information and support despite not utilising traditional NSP services.

For some people in the current investigation, injectable ROA represents a significant psychological barrier associated with stigma, whether this be internalized, perceived or experienced. Similar parallels surrounding individuals who engage in drug injection, whether male or female, has been well-documented in intravenous drug use settings [43, 64], limiting harm reduction service efficacy. These concerns also exist for people who use AAS specifically [14, 37], shaping the willingness of people to engage with NSPs. In the context of AAS and ROA, stigma may, in turn, encourage and influence people to use oral AAS which, over time, can have pronounced effects on vital organs such as the liver and kidneys [3, 57, 62]. With oral compounds advertised over social media platforms (e.g., Instagram) [15, 46] and with 'IPED influencers' discussing the use of these drugs on platforms such as YouTube [16], it is possible that younger and less informed people might be encouraged to use such drugs.

Alongside stigma, fear of needles has been identified within medical settings, with some patients refusing treatment due to this emotion (see [35]). In a systematic review and meta-analysis on the fear of needles, prevalence estimates suggest 20-30% of young adults fear needles, with fear decreasing as age increases [35]. Such data holds relevance within the current study, with fear of needles underscoring the decision of some people to use oral AAS. Fear, therefore, should be considered within public health responses for AAS communities as the emotion has the potential to shape ROA and subsequent health harms.

In drawing the evidence together, we agree with van de Ven et al. [71] that additional responses ought to be considered for people that use oral AAS, with current public health responses falling short. With Turnock et al., [69], further identifying the growth of the 'private sector for IPED harm reduction,' there is a clear need to protect

this population and strengthen harm reduction efforts more generally. These initiatives should encompass comprehensive education and awareness programs which address the potential health risks associated with oral ROA, provide guidance on safer consumption practices, and outline avenues for people to access assistance and support, to help bridge the current gap in public health responses.

Previous investigations dictate that the utilization of AAS is typically characterized by a deliberate approach that prioritizes health considerations (e.g., [13, 74]), in contrast to the more casual and health-unrelated consumption of some other substances. Individuals who engage in AAS use share a common objective of optimizing the effectiveness of these substances, necessitating a degree of attention to health-related factors such as nutrition, physical activity, and sleep [51, 52, 55, 56]. While the extent to which individuals emphasize health aspects may vary [13], there is invariably a foundational level of health consciousness, however minimal, that can serve as a starting point for harm reduction engagement regarding oral AAS. In practical terms, this approach could manifest in recommendations emphasizing more frequent health assessments, with a specific focus on monitoring liver and kidney function [25]. It may also involve advocating for more regular and extended breaks from IPED and AAS use, to facilitate the recovery of these vital organs. Additionally, discussions may revolve around contemplating the overall duration of IPED usage and its potential implications for long-term wellbeing and longevity. If an individual using IPEDs intends to engage in prolonged usage patterns, it might be worthwhile to consider exploring injectable options; we acknowledge this is a rather 'radical' method of harm reduction but fits with discourse from peers with lived-living experience in this space [47–54].

Limitations

The current study is limited to a small sample of participants within the UK, all of whom identified as male. Thus, the narratives presented throughout this paper represent a snapshot of the experiences and perceptions of those participants. Importantly, how experienced participants were should also be noted, with greater experience (e.g., number of cycles, accumulated time using AAS), contributing to ROA and the transition between oral/injectable or injectable/oral AAS.

Conclusion

ROA is a factor that shapes usage trajectories and health-based outcomes for people who use AAS and other IPEDs. Distinct harm related to ROA, whether oral compounds or injectable preparations, underscores the need for adaptable approaches within the field of harm reduction specific to these drugs. Publicly funded harm reduction services, such as NSPs, are currently inadequate and risk overlooking a subset of people who exclusively use oral AAS. These services already face challenges with engaging IPED consumers and addressing issues around literacy, but the failure to capture people who use oral AAS adds another layer of concern. Stigma is one of the clear defining features that limits the current uptake of NSPs and is also something that underscores ROA for people who use AAS. As a consequence, this group misses crucial opportunities for face-to-face interactions with healthcare professionals, which limits their access to vital harm reduction information and support. As a result, these individuals remain underserved, further exacerbating gaps in harm reduction outreach and care. Thus, we call for additional research within this space, specifically, to better understand the use of oral AAS, to support this community and address their growing and diverse needs. This approach should draw upon the concept of stigma, seek to understand its nuances within the context of ROA, and provide tailored resources, support and guidance, which directly addresses this identified area of concern.

Supplementary Information

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Additional file 1.

Author contributions

LC, TP and MD: Writing, Original Draft, Writing, Review & Editing, Conceptualization and situating research. Methodology, Investigation, Formal analysis. LC: Data collection

Data availability

No datasets were generated or analysed during the current study.

Declarations

Competing interests

The authors declare no competing interests.

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