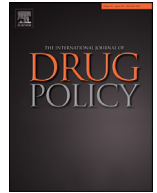




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Research paper

Testing the boundaries: Self-medicated testosterone replacement and why it is practised

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ABSTRACT

Background: Testosterone is used therapeutically in medical settings. Non-prescribed testosterone use is typically illegal, described as ‘enhancement’ or ‘doping’, and considered a problem. However, research has found that some non-prescribed testosterone use may be therapeutic (i.e. self-medication). Little is known about testosterone self-medication. It has been noted among individuals who use image and performance enhancing drugs (IPEDs), but never systematically explored.

Approach: This paper describes the findings of a 4-year ethnographic study in online forums and social media groups frequented by people who use IPEDs. It focusses on 31 men who used enhancement doses of testosterone, but who described some of their testosterone use as ‘testosterone replacement therapy’ (TRT). In particular, it focuses on the 26 (84%) of these individuals who self-medicated TRT. Data was analysed thematically (using NVivo) in order to answer the question: ‘how and why is testosterone self-medicated?’. Using Bacchi’s (2016) problematization approach to policy analysis, this paper also asks, ‘what happens to the ‘problem’ of non-prescribed testosterone use if such use is therapeutic?’.

Findings: Self-medicated TRT was found to be very similar to TRT as practised in medical contexts. Self-medication was often practised because of an inability to access testosterone through health practitioners (who were either reluctant or unable to prescribe). However, some individuals were found to prefer self-medication because of price, ease of access, reliability of supply, and because health practitioners were perceived as lacking expertise regarding testosterone use.

Conclusion: By documenting the therapeutic use of testosterone outside of medical settings, this paper calls into question previous conceptualisations of all illicit testosterone use as ‘abuse’, and the utility of the repair/enhancement dichotomy as a foundation for discussions of drug use. It suggests that in some cases the problem may not be non-prescribed testosterone use *per se*, but policies that prevent access to medical treatment.

Background

Testosterone is the primary sex hormone in males, and is produced in the gonads (and in the ovaries of females). It is responsible for the development of the male reproductive tissues as well as increased muscle growth and masculinising characteristics such as facial hair growth. Synthetic testosterone is also produced in the pharmaceutical industry, as well as in illicit laboratories, and is used therapeutically and for enhancement purposes. Testosterone use entails numerous risks. All use of testosterone results in anabolic-androgenic steroid-induced hypogonadism which is ‘the functional incompetence of the testes with

subnormal or impaired production of testosterone and/or spermatozoa due to administration of androgens or anabolic steroids’ (Tan & Scally, 2009:723). Anabolic-androgenic steroid (henceforth, ‘steroid’) use is now the most common cause of hypogonadism (Coward Robert et al., 2013). Other risks of testosterone include worsening symptoms of benign prostatic hypertrophy, liver toxicity, hyperviscosity, erythrocytosis, worsening untreated sleep apnea and/or severe heart failure (Bassil, Alkaade & Morley, 2009).

When the risks of testosterone use are deemed by policy makers to be outweighed by its benefits, testosterone use is sanctioned by law. At this point in history testosterone use is only legal in many countries if it

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is prescribed by a medical practitioner. Medical practitioners base decisions to prescribe testosterone on what they consider a therapeutic need, a need for healing or restoration of health. Therapeutic uses include the treatment of those with symptoms of testosterone deficiency, such as the loss of muscle and bone mass, depressed mood, and decreased libido (Barbonetti, D'Andrea & Francavilla, 2020). There is good evidence to suggest that as men age, their serum testosterone levels decrease, and there is general agreement that testosterone replacement therapy (TRT) can have beneficial health outcomes, including preventing conditions related to low levels of testosterone such as osteoporosis (Corona, Torres & Maggi, 2020).

Testosterone is also used for enhancement purposes. That is, testosterone can be used 'to improve human form or functioning beyond what is necessary to sustain or restore good health' (Juengst, 1998:29). Testosterone is used as an enhancement by those who desire an increase in strength, muscularity, and the ability of the body to recover from exercise. Use of testosterone without medical prescription is prohibited mainly in competitive sport, but also in some recreational sport (van de Ven & Mulrooney, 2017a) because of the advantage it confers. When testosterone is used for enhancement purposes it is usually grouped together with other similar compounds and termed 'anabolic-androgenic steroid (AAS) abuse', or 'doping'.

Non-prescribed use of testosterone is illegal in most Western countries, presumably because policymakers deem: (1) the benefits of testosterone use to be outweighed by the risks if there is not a therapeutic need; and/or (2) that enhancement use poses a risk to society e.g. in terms of 'cheating'. Bacchi (2016) proposes a Foucault-influenced 'What's the Problem Represented to be? (WPR) approach' to policy analysis. In accordance with Michel Foucault's idea of biopolitics, where state apparatuses have the power and responsibility to control the very principles of life and physical embodiment, she suggests that problems do not sit outside of policy processes waiting to be solved, but rather are constituted (i.e. brought into existence through practice) within policies (Bacchi, 2016). This is what Foucault would have called a 'technology of the self'; a means of constructing an individual body and self in a world controlled by biopower (Gutman, Hutton, Foucault, & Martin, 1988). Taking this approach, we can see that within testosterone policy non-prescribed testosterone use is constituted as a problem. This paper asks what becomes of this problem if non-prescribed use is therapeutic, that is, if testosterone is self-medicated?

Self-medication

Self-medication occurs when an individual independently treats their own health problems without the assistance of a health practitioner. Drug use without the benefit of health practitioner supervision may place people who use drugs at increased risk of harm as a result of incorrect self-diagnosis, delays in seeking medical advice when needed, infrequent but severe adverse reactions, dangerous drug interactions, incorrect manner of administration, incorrect dosage, incorrect choice of therapy, masking of a severe disease, and risk of dependence and abuse (Ruiz, 2010). Furthermore, self-medication may result in harm to the public. For instance, self-medication with antibiotics contributes to antimicrobial resistance worldwide (Lescure, Paget, Schellevis & van Dijk, 2018). However, the benefits of self-medication include allowing patients to take responsibility for their own health, and building confidence in their ability to do so, thereby promoting self-empowerment (Ayalew, 2017). Practices of self-medication can increase access to medication, reduce demand and pressure on physicians and pharmacists, and reduce health expenditure (Ruiz, 2010).

The term 'self-medication' is generally used in two ways. Firstly, 'self-medication' is a term that is used to describe those who consciously treat health problems by using medicines without medical supervision. In this instance the term 'self-medication' is used to describe 'the use of medicinal products by the consumer to treat self-recognised disorders or symptoms' (Bowen et al., 2000:9). Secondly, the 'self-medication

hypothesis' is a psychological explanation of the comorbidity between mood and anxiety disorders and substance use (Khantzian, 1985; 1997). According to this hypothesis, illicit drug use does not begin for therapeutic reasons but rather 'individuals discover that the specific actions or effects of each class of drugs relieve or change a range of painful affect states' (Khantzian, 1997:231). Drugs serve as coping mechanisms to deal with the difficult symptoms associated with mood and anxiety disorders (Turner, Mota, Bolton & Sareen, 2018). The self-medication hypothesis has been posited with regards to, for example, heroin, cocaine, benzodiazepines, cannabis and opioids (e.g., Chutuape & de Wit, 1995; Eiroa-Orosa, Giannoni-Pastor, Fidel-Kinori & Argüello, 2016; Khantzian, 1997).

While most self-medication is with over-the-counter (i.e. non-prescription) medicines (e.g. Eaves, 2015; Skarstein, Lagerlöv, Kvarme & Helseth, 2018; Amoako, Richardson-Campbell & Kennedy-Malone, 2003), prescription drugs, such as opioids, sedatives, and stimulants are also self-medicated (Campbell et al., 2015; Hulme, Hughes & Nielsen, 2019; Turner et al., 2018). Self-medication behaviours are complex and people self-medicate for a variety of reasons, including to cope with feelings of depression or anxiety (Turner et al., 2018), self-management of chronic non-cancer pain (Campbell et al., 2015), and the self-management of opioid withdrawal symptoms (Larance et al., 2019).

Research on non-prescribed testosterone use has focused on enhancement use. Indeed, most individuals who use testosterone without medical supervision do so for enhancement reasons (Begley, McVeigh & Hope, 2017; Cohen, Collins, Darks & Gwartney, 2007). However, testosterone is also used therapeutically without medical supervision. For instance, it is used for transitioning purposes by transmen (Metastasio, Negri, Martinotti & Corazza, 2018), and in order to regain weight by people recovering from heroin use (Cornford, Kean & Nash, 2014). However, it seems likely that most non-prescribed testosterone use for therapeutic reasons occurs among people who use IPEDs. For example, in a UK study, 7.8% of males who consume IPEDs ($N = 512$) reported that they used these drugs for hormone replacement reasons (Begley et al., 2017). Furthermore, a community-led survey (r/roids Unofficial Census) which was completed by 897 people who use steroids found that 11% ($n = 81$) were self-medicating to treat low testosterone. While this practice has been noted, there has been no in-depth exploration, and thus how and why people practise self-medicated TRT has remained unknown.

Testosterone use without medical supervision involves black market testosterone. Sometimes pharmaceutical grade testosterone is available through the black market; however, black market testosterone (or AAS) is typically illicitly produced. Although adulteration is quite uncommon, research has shown that black market AAS products are produced in unhygienic conditions, incorrectly dosed (commonly underdosed, but sometimes over-dosed), and frequently contain a steroid other than the one they are purported to contain (Graham et al., 2009; Thevis et al., 2008); Tircova, Bosakova and Kozlik, 2019). Despite both consumers and illegal sellers of AAS employing various tactics in an attempt to minimise the risks of obtaining or selling poor-quality AAS (van de Ven & Koenraadt, 2017; van de Ven & Mulrooney, 2017b), testing black market AAS products is the only way to ascertain the quality of AAS and this is not always accessible, affordable and/or practicable.

Given these risks, it is crucial that we understand why individuals are practising self-medicated TRT rather than accessing TRT through the medical system. This paper poses the question 'how and why is self-medicated TRT practised?' To answer this question, we explore a group that is known to practise self-medicated TRT: people who use IPEDs. While people use IPEDs (including testosterone) for enhancement purposes, a sub-set of these people will also use testosterone therapeutically for replacement reasons. Thus, people who use IPEDs provide an opportunity to explore the relationship between therapeutic and enhancement uses of testosterone. Therefore, in addition to how and why individuals practise self-medicated TRT, we also ask the question 'what is the re-

relationship between self-medicated TRT and enhancement use of testosterone?.

This study adds to our understanding of cultures of self-medication as outlined in recent studies on medicines (Van Hout, 2014) and psychoactive drugs (Hearne, Grund, Van Hout & McVeigh, 2016). The aim of this paper is to document the practice of self-medicated TRT among people who use IPEDs, and the reasons given for this practice. This paper focuses on those who describe their use of testosterone as 'TRT' regardless of whether they could be demonstrated to meet the clinical criteria for low testosterone, or whether testosterone replacement is the best, or only, therapeutic option for them (indeed none of the authors is qualified to make such judgments). It describes how low testosterone is defined and treated from the testosterone consumers' perspective, which while generally aligning with the medical perspective on these issues, sometimes departs from it.

Approach

Studying self-medicated TRT presents three challenges. Firstly, those who self-medicate TRT are a marginal group. Not only are they marginalised within society because of their underground drug use, but they are also a minority within those who use testosterone, as the majority use it for enhancement purposes. Anthropologists give voice to marginalised communities of drug consumers and provide counter discourses, or oppositional accounts, of drug issues (Klein, 2012). By taking a community perspective, anthropologists can discover and examine subgroups within drug-using communities. Thus, anthropological methods are well suited to this study of a marginal group (those who self-medicate TRT) within a marginal group (those who use underground testosterone).

Secondly, self-medicated TRT is not sanctioned by medicine or law. That is, it is an underground practice that while not illegal in all countries, is not socially acceptable, and thus tends not to be discussed openly. Therefore, accessing those who self-medicate with testosterone poses a challenge. Anthropologists immerse themselves in the communities they study through ethnographic methods, particularly participant observation, and build trust and rapport with members. The first author (MU) has been immersed in online IPED-using communities for the last four years and has gained access to closed online groups where self-medicated TRT is openly discussed.

Finally, we know virtually nothing about self-medicated TRT and thus there is no empirical foundation to inform research. Any research on self-medicated TRT is necessarily exploratory. Ethnographic research involves observation of, and participation in, the everyday lives of those under study, rather than under conditions created by the researcher such as surveys or experiments (Hammersley, 2016). Thus, it is perfectly suited for exploratory research. Ethnographic methods allow for serendipitous discovery (Rivoal & Salazar 2013), and indeed the practice of self-medicated TRT was not the initial focus of the research but was a minority practice discovered during a study of IPED use.

The findings reported in this paper are one aspect of an online ethnography (Boellstorff et al., 2012) focused on how and why IPEDs (including testosterone) are used, approved by the University of Queensland Human Research Ethics Committee (approval number 2,017,000,117). The first author participated in and observed online enhancement communities in social media and forums, particularly focusing on recreational bodybuilders among whom the majority of IPED use occurs (Begley et al., 2017; Cohen et al., 2007; Pope et al., 2014). These groups were dominated by men and whilst a few were open to the public, most were closed groups that require membership. Over the last four years working in these communities the first author has observed thousands of online interactions between people who use IPEDs, and interacted with hundreds of individuals who use IPEDs. She has had in-depth and ongoing communication with 38 people who use IPEDs (hereafter referred to as 'participants') all of whom were male and aged between 21 and 56 years (average 33.6 years). Given the online na-

ture of the research the sample was international and participants were from Australia ($n = 18$), the United States ($n = 12$), the United Kingdom ($n = 3$), Canada ($n = 2$), Germany ($n = 1$) and India ($n = 1$).

Ten participants discussed TRT; five who self-medicated with black market testosterone, and five of whom were prescribed testosterone by a doctor. However, when the first author came across the practice of self-medicated TRT among participants she decided to search for pre-existing discussions in online groups and initiate discussions herself in order to better understand the practice. This allowed her to add the voices of another 21 men who self-medicated TRT. Thus, in total, this paper is based on the accounts of 31 men who describe some of their testosterone practice as 'TRT' (the remainder of their testosterone use they deemed 'enhancement'), 26 of whom practice self-medicated TRT.

All the data collected from one-on-one and group interactions were entered into NVivo, a qualitative analysis software which aids the coding and retrieval process. The data was coded thematically. The second and third author assisted with the final stages of the analysis and the write-up of the findings. In this paper we describe the findings with some verbatim quotes to illustrate (identified by the type of data e.g. 'forum comment' or by a pseudonym in the case of participants) with no correction of spelling or grammar. We then describe the implications of the findings for understanding and practice.

Findings

Self-medication may be necessary, or preferred over medical supervised TRT, for a variety of reasons. As this study was conducted in online IPED-using communities all individuals described in this paper used enhancement doses of testosterone in addition to their TRT dose. Thus, the section concludes with a discussion of the relationship between TRT and enhancement use of testosterone.

What is self-medicated TRT?

Bodybuilders describe self-medicated TRT as non-prescription TRT, typically using black market testosterone, but sometimes with pharmaceutical grade testosterone acquired through the black market. Self-medicated TRT, as described by bodybuilders, is very similar to medically prescribed TRT in terms of dosing, with typical TRT doses between 125 and 200 mg/week. These doses of testosterone are termed 'TRT doses' or 'physiological doses' by people who use IPEDs. None of the participants used the term 'TRT' to refer to testosterone use that exceeded 200 mg per week; instead, testosterone at doses higher than 200 mg was termed 'enhancement'. To be termed 'TRT', testosterone needed to be used in order to address a perceived lack of testosterone. All who discussed TRT in forums and in interviews stated that they had verified that their testosterone was low through testing.

A year and a half ago, my wife had more testosterone than me. I was at, like, four or five for a couple of weeks and I think the highest it went was 10. Which is like a 100-year-old man level [Chris].

While some of those who self-medicated TRT did not meet the criteria for medically prescribed TRT, they experienced their testosterone as low enough to warrant treatment.

The 'normal range' is not broken down by age. It's anyone from 18–70 years old. So, if you are 40 and at the lowest of normal, in my unprofessional broscience¹ opinion that's not normal. This is why I TRT on my own. I was at the low end of normal 5 years ago at 35 years old. You just do what's right for you and be sure to monitor blood [forum comment].

Although blood testing is the only way to be able to test for low testosterone, participants also used other indicators in order to verify their suspicion that they had low testosterone, such as low energy levels, reduced libido, and feelings of depression. Blood testing is also used during self-medicated TRT (and enhancement use of testosterone) in order to check various health indicators including hormone levels, kidney

and liver function, lipids, gonadotrophins, and iron, in an effort to verify that their testosterone use is not causing harm. Self-medicated TRT is, by definition, not medically supervised so individuals face problems accessing the blood testing they desire. As a result, many order blood-work through private companies who provide pathology requests, and (after the blood is tested) basic results (whether levels are normal, high or low) but generally do not give medical advice. It is then up to the individual to extrapolate from the results how effective their testosterone use has been, if any problems are arising, and, if so, how to rectify these problems. Often, they turn to online bodybuilding forums to help with this extrapolation.

All participants who used the term ‘TRT’ to describe their testosterone use stated that their testosterone was low *before* they began using enhancement doses of testosterone. Thus, their low testosterone was not due to their enhancement use. Others whose low testosterone *resulted from* enhancement tended to use the term ‘cruise’ (see below) to describe their lower, maintenance doses of testosterone (typically 200 mg per week) taken between their periods of enhancement dosing (termed ‘blasts’).

Why self-medicate?

There were numerous reasons given for self-medicating with testosterone including problems accessing prescribed TRT, and the perceived benefits of self-medication over medically supervised use. Underlying many accounts of self-medicated TRT was the experience of depression.

I mean when my T was low, I was more on the side of depression, like I was a lot more depressed. But then as soon as I hopped on gear [steroids] I felt like a million bucks; I'd wake up with a smile on my face, I couldn't wait to get out and do things, and it overall made my life better. ... If I hadn't self-medicated I would be dead. I would have killed myself because of the mental depression [Chris].

Self-medicating TRT was experienced as relieving depression and as allowing them to reduce or stop using anti-depressants:

Was on 150 mg desvenlafaxine, since [self-medicated] TRT have dropped to 50 mg. Looking to get off completely one day [forum comment].

Was on a SSRI for depression and once I started a self medicated TRT dose I was able to get off the SSRIs. My issue was low T essentially I feel coupled with a little bit of hereditary mental illness however since a couple of Dr's didn't think the T was the issue (test levels between 5–7 n/mol) I was put on some pretty mild SSRIs. After being on 150 mg [of testosterone] a week (puts me in the middle or normal test range) I don't feel like necking myself [committing suicide] every month [forum comment].

Depression was attributed to low testosterone levels and thus testosterone replacement was sought in order to address the depression. While some were successful in having TRT prescribed, others were not.

Failure to get testosterone prescribed

As described above, all the individuals who discussed TRT had first verified that their testosterone levels were indeed low. While some met the clinical criteria and were able to get testosterone prescribed, others, with equal or lower testosterone levels could not. Clinical decisions seemed inconsistent and were described as subjective (‘it depends on the doctor’ [forum comment]), and some participants visited many health professionals in an effort to have TRT prescribed. For example, one participant had previously been prescribed TRT but had great difficulty finding another health practitioner willing to prescribe after moving interstate. Participants stated that not all clinical decisions were based on clinical facts, and suggested other factors that may play a role. For instance, readiness to prescribe hormone replacement therapies was posited as gendered.

it's a much easier path for women to receive this sort of treatment as opposed to men [Stephen].

They also suggested that ease of access was in part determined by the country of residence, and therefore the healthcare system the doctor was part of:

In America, any clinic will happily give you a full testosterone replacement therapy protocol. In Australia, you have to fight tooth and nail for it and if you can get TRT, you are lucky because it means your doctor is open about it, because you can't just walk into any GP and have low testosterone and them be happy to give it to you. They'll make you jump through hoops just to speak to an endocrinologist to be able to even think about getting on it [Sebastian].

The Australian Medical Board has very little interest in men's health and hormonal health ... Many steroid users who are self-medicating with substances purchased from the underground market are doing so out of sheer desperation, because they've exhausted all other avenues of getting proper treatment for their medical condition [forum comment].

Many of the participants and forum members described a need to self-medicate because doctors refused to prescribe TRT:

I know a number of guys that have put themselves on UGL [underground lab] TRT and trying to manage their condition themselves, because their doctors were so unwilling to help [forum comment].

I think you'll find that almost everyone on here [the particular forum] is self-medicating. Not because they are all irresponsible jerks, but because properly produced pharmaceutical grade steroid medications are almost impossible to obtain here in Australia. This is due to a variety of factors, one of which is that 99.9% of doctors and Endocrinologists are literally terrified about prescribing TRT, terrified to the extent of completely shutting the door on men's health [forum comment].

Researcher question: *Have you self-medicated with underground testosterone to manage or fix your own low testosterone, rather than seeking medical help or treatment?*

Consumer response: *‘...rather than seeking medical treatment...?’ you realise there are almost no options for medical treatment right? [forum comment].*

Some individuals would prefer to use testosterone under medical supervision and suggested increasing the accessibility of testosterone.

Making steroid medication more prescribable [sic] and more legitimately accessible will reduce the public health risk drastically and allow for genuine people seeking genuine medical treatment to be given the proper medicine they need to live a normal, healthy and happy life without the fear of legal recourse [forum comment].

Instead of prescribing testosterone, in some cases health professionals treated the symptoms of low testosterone.

I was prescribed Zoloft (anti-depressant SRI) to treat low testosterone. Yes, you read that correctly. I was prescribed an anti-depressant to treat low testosterone levels. Instead of treating the root cause of the problem which was low testosterone, I was given a treatment for one of the symptoms that having low testosterone brings which was major depression [forum comment].

For some, self-medication was the only option to treat their low testosterone. Indeed, one health practitioner instructed a participant to self-medicate:

She's [the doctor was], like, you've got to see an endo [endocrinologist]. I'm, like, I've seen three and they're not going to help me. Like, someone has got to help me. Like, I want to take my life. I can't deal with this shit anymore. ... Ended up I saw four GPs, three endocrinologists, and one endo said, I will lose my licence giving it to you, so go do it yourself [i.e. self-medicate][Chris].

By self-medicating these individuals felt they were taking control of their own health, and taking back their lives.

Self-medication as the preferred option

Sometimes self-medication was preferred over prescribed testosterone. The black market was experienced as a much quicker and easier route to obtaining testosterone than the medical system. Furthermore, black market testosterone is typically less expensive than prescription testosterone.

I can't go out of town every week and wait for hour+ just to get a shot. That's actually what brought me into the world of AAS... was searching for a source to get testosterone from [forum comment].

I found an endo [endocrinologist] that wrote me a script for test but after a year co-pays on blood tests every 90 days was killing me \$\$ and then insurance refused to pay for the script so I gave up and did some research and started making my own test from raws. It is easy and very inexpensive and I run my own blood work now. I'm happy! [forum comment].

Black market suppliers were also perceived and experienced as providing more reliable access to testosterone than health practitioners. For instance, many in online enhancement communities noted the 2019 shortage of testosterone cypionate and testosterone enanthate, during which black market testosterone became the only option.

... the sustanon and primoteston shortages have made heaps of guys resort to underground testosterone even though they have completely legit scripts & medical problem. some are lucky and have access to compounded testosterone cypionate [forum comment].

I have used UGL [underground lab] gear [steroids], as TRT when we had a shortage [forum comment].

It is often a combination of factors that make self-medication preferable:

The advantage is mostly in cost and time. Long term trt through an endo would have been blood work every 90 days followed by a dr. appointment a week later for the rest of my life. pita ['pain in the ass']. There is also a concern with being cut off. I know I need to use trt the rest of my life and there is a piece of mind to having my own supply. You never know when the laws will change! [forum comment].

Self-medication is preferred because it is lower cost in terms of money, time and effort, and because the black market is perceived as providing more reliable access to testosterone. Self-medication also allows greater freedom in testosterone use. If testosterone is prescribed by a health practitioner, the practitioner makes the decisions regarding the timing and dosing of the testosterone, and which blood markers will be monitored and when. Sometimes individuals felt that medical decisions were not appropriate:

I went to my family doc years ago to address the problems with TRT and he was only going to give me 50 mg once every 3 weeks, which is obviously stupid. He didnt understand and thought it would just 'supplement' my natural production. ... Even when talking to endocrinologists, some don't understand the need for checking E2 [estradiol] (or other markers) or why the use of HCG [human chorionic gonadotropin] is beneficial for fertility [forum comment].

I was put on TRT a few years ago by my family dr. Unfortunately, he didn't know what he was doing...dude was giving me 400 mg Test E/week in the beginning lol [laugh out loud]. Shut me down good [stopped his natural testosterone production]. Eventually I just did it on my own [self-medicated]. Currently taking 200 Test E/week [forum comment].

He [the general practitioner] basically wrote me a script and that was it, and he never did any follow up blood work except for the initial one to make sure I was in range after about six weeks of starting. When you're on TRT, you need to be checking other things. Obviously, there are

other hormones that testosterone can convert into and give you problems. Estrogen can be an issue to some, DHT [Dihydrotestosterone] can be an issue to some. When he wasn't doing any of these follow up tests with me, I was very sceptical as to the knowledge that the doctor actually had about TRT [Sebastian].

The bodybuilders who discussed TRT often felt more knowledgeable than health practitioners, and thus they felt able to make treatment decisions for themselves. It was this desire for freedom in their testosterone use that informed some decisions to self-medicate. A lack of confidence in health practitioners inspired them to take control of their own health by self-medicating.

As this study was conducted in online IPED-using communities all those on TRT were also taking enhancement doses of testosterone. This enhancement use impacted their preference for self-medication. Enhancement use of testosterone has an impact on various blood markers. Prescription TRT involves bloodwork when the health practitioner sees fit. If the individual wants to hide their enhancement use of testosterone from their health practitioner (as most do for fear of legal consequences, or consequences for health insurance) they would need to time their enhancement use so that it would not be detectable by their health practitioner. That is, the timing of their enhancement use would be dictated by the timing of their bloodwork as ordered by the health practitioner. If the individual self-medicates their TRT they can increase their dose to enhancement levels whenever they desire as their blood levels are not being scrutinised by an outside party.

Testosterone replacement and testosterone enhancement

The relationship between therapeutic and enhancement uses of testosterone is complex. Some begin using testosterone to treat low testosterone, but then move on to using enhancement doses of testosterone (i.e. doses of 200 mg per week or more). While it is possible that some individuals may access black market testosterone for TRT reasons and never exceed TRT doses, as this study was conducted in online enhancement communities it did not include any of these individuals. Interestingly, this study found that it was not only self-medicated TRT that lead to enhancement use of testosterone. Those who succeeded in having TRT medically prescribed also made the transition to enhancement use. Those who had TRT prescribed were already immersed in bodybuilding communities prior to starting TRT so their membership in these communities likely facilitated the transition to enhancement use. Prescription TRT was experienced as enhancing bodybuilding progress, thus giving them a taste of what could be achieved with enhancement doses.

While traditionally enhancement use of testosterone involves cycles (alternating periods on testosterone with periods off testosterone to allow natural testosterone production to return), an alternative use pattern, 'blast and cruise' (also described in Underwood (2017)), has gained popularity since the 1990s, and was the use pattern of all those described in this paper. Blast and cruise involves alternating a 'blast' phase during which higher doses of AASs are used, with a 'cruise' phase in which lower doses of AASs are used. Cruising is said to result in less loss of muscular gains than cycling off. 'Cruise' dosages, like 'TRT' doses, are often termed 'physiological doses' as they are said to mimic the body's natural production of testosterone. Indeed, the terms 'cruise dose', 'physiological dose' and 'TRT dose' seem to be often used interchangeably. However, while 'TRT' and 'cruise' doses can be the same, some individuals term doses higher than 200 mg 'cruise doses'. Typically, cruise doses range from 150 to 250 mg per week² so are higher than natural production, and sometimes higher than what is typically a TRT dose (200 mg/week or less). All participants who had started with TRT doses had made the transition to a blast and cruise use pattern (although they used the term 'TRT' rather than 'cruise' to describe the low dose stage of the use pattern). Thus, they transitioned from purely therapeutic use, to what they termed both therapeutic and enhancement use.

Then since I was on TRT and was already training, trying my first blast was just a matter of time [forum comment].

The term 'TRT' appears to be used to describe the treatment of low testosterone levels that precede enhancement testosterone use. However, one participant in this research described artificially manipulating his testosterone levels (which were already low but not low enough to be prescribed testosterone) through steroid use so that he could qualify for TRT treatment.³ He was successful and used the term 'TRT' to describe the testosterone he was prescribed.

Thus, therapeutic replacement of testosterone (whether self-medicated or prescribed) can lead to the enhancement use of testosterone. Enhancement use of testosterone can lead to the necessity for therapeutic treatment with testosterone, and enhancement use is used by some to qualify for TRT. When low testosterone is caused by enhancement use testosterone replacement tends to be termed a 'cruise' rather than 'TRT'.

Discussion

This study is the first to explore the issue of self-medicated TRT. While the ethnographic approach allowed the first description of the practice and motivations for it, it was not able to gauge the prevalence of self-medicated TRT. However, the fact that a minority of individuals who engage in non-prescription testosterone use are self-medicating to treat low testosterone warrants further investigation, especially as they are placing themselves at greater risk than if they accessed TRT through the medical system.

It is obviously preferable for health monitoring to be completed by a health professional rather than a layperson. While those who self-medicated TRT stated that they monitored their health through practices such as blood testing, it remains unclear how well this is achieved as private bloodwork services may not be reliable. While many who use enhancement drugs are well-informed, and some engage with the scientific literature (Underwood, 2019), health professionals are still better placed to monitor health. Therefore, it is crucial that whenever possible those who self-medicate are redirected into the medical system. This paper provides the beginnings of an empirical foundation for redirection efforts.

Efforts to redirect individuals who practice self-medicated TRT into the medical system would face numerous barriers. Researchers exploring what prevents people who use AAS from engaging with health professionals have identified several factors, including a lack of knowledge and experience amongst health professionals (Dennington et al., 2008; Dunn, Henshaw & McKay, 2016; Harvey, Keen, Parrish & van Teijlingen, 2019; Pope, Kanayama, Ionescu-Pioggia & Hudson, 2004), and the fact that many people who use AAS see substance misuse services as inappropriate because they do not consider themselves 'drug users' (Dunn, McKay & Iversen, 2014).

What is self-medicated TRT?

The term 'TRT' appears to be used outside of medical settings in much the same way that it is used in medical settings (e.g. dosing). However, there are several differences between medically prescribed TRT and self-medicated TRT. Firstly, medically prescribed TRT only uses pharmaceutical grade testosterone whereas self-medication may involve illicitly produced testosterone. Secondly, medically prescribed TRT involves the monitoring of health by a health practitioner, whereas self-medication necessitates that the individual be responsible for monitoring their own health (possibly in consultation with other community members), or at least not disclosing the reason they want their health monitored to their health practitioner (thus limiting the practitioner's ability to provide quality treatment). Finally, self-medicated TRT may be conducted by individuals with testosterone levels that do not meet

the current criteria for a formal diagnosis of low testosterone (and therefore could be considered from an outside perspective as not requiring TRT). These differences may increase the potential for harm as they alter the ratio of benefit to risk.

Why self-medicate TRT?

Given the increased risk entailed in self-medication, why do individuals self-medicate rather than access TRT through the medical system? In some cases individuals were refused treatment because they did not meet the criteria for a diagnosis of low testosterone. For these individuals the felt experience of low testosterone warranted treatment and so they treated themselves. The reality is that among health practitioners there is no agreement regarding the thresholds for what constitutes 'low' testosterone (Sansone, Sansone, Lenzi & Romanelli, 2017). A patient with $T < 8$ nmol/L may qualify (Sansone et al., 2017), while in some other countries, such as Australia, the threshold may be lower (Cheng et al., 2018). Increased prescription rates in the United States of America (Tsamatis & Isidori, 2018) have led many to believe that testosterone is being prescribed erroneously or too quickly, before lifestyle factors such as diet and exercise are considered. Decisions regarding testosterone prescription should be based on a solid empirical foundation which is unfortunately lacking. We need to add to the limited rigorously designed studies from which the evidence of TRT is drawn (Barbonetti et al., 2020), if we are to confidently state who should receive such treatment.

Some practised self-medicated TRT because although they did seem to meet the current criteria for low testosterone, they were refused treatment. They stated that clinical guidelines were inconsistently applied, and that in general health practitioners were reluctant to prescribe testosterone. Could there be a gender bias when it comes to hormone replacement as participants suggested? Could the fact that testosterone is perceived as an enhancing drug (whereas 'female' hormones are not) be contributing to the reluctance of health professionals to prescribe it? Inconsistency in prescription practices is due in large part to the fact that there is disagreement regarding when therapy should begin and for whom it can be beneficial (Tsamatis & Isidori, 2018). We need a solid evidence base on which to base guidelines outlining TRT best practice. This would hopefully prevent a health practitioner instructing a patient to self-medicate (as described above) because they felt unable to provide treatment despite identifying a clear need for it. Clearly, it is not only those who are treated with testosterone that would benefit from better informed, clear and standardised guidelines for the prescription of testosterone.

Some practised self-medicated TRT because they saw health practitioners as lacking knowledge and expertise. There is a longstanding tension between people who use steroids and the medical profession, with consumers generally showing a distrust of health practitioners because they are perceived to lack knowledge of these substances, their negative and positive effects, and how to manage use (Dunn et al., 2016; Griffiths, Henshaw, McKay & Dunn, 2017; Pope et al., 2004). Efforts to bridge this divide are in their infancy. For example, Underwood (2019) added the voice of people who use steroids to debates about blood-borne virus prevention. During a recent study focused on developing IPED-focused educational materials for needle and syringe program (NSP) staff, it was noted by both NSP staff and people with lived experience of IPED use, that in order to improve staff-client relations it was crucial to engage people from within the fitness community (particularly those who are well-respected within steroid communities) to act as ambassadors for harm reduction and health services (van de Ven, Boardley, & Chandler, 2020). In this study people with lived experience of IPED use were also involved in the design and delivery of the educational materials. More effort needs to be made to include people who use IPEDs in both research design and health intervention delivery. Indeed, although the involvement of people with lived experience is growing within the general alcohol and other drug

treatment space, such as in the context of medically supervised injection centres (Kennedy et al., 2019) and drug treatment programs (Van Hout & McElrath, 2012), involvement of people who use IPEDs in research and service delivery is generally absent. Building understanding and trust between people who use IPEDs and health practitioners will have numerous benefits such as: (1) increasing the willingness of people who use IPEDs to seek medical advice from, and actively engage with, health practitioners (and researchers), and (2) allowing health practitioners to develop more appropriate care.

Finally, some practised self-medicated TRT because it was less expensive in terms of time, effort and money, and because the black market was perceived as a more reliable source of testosterone than medical suppliers in terms of accessibility. It is possible that subsidies to reduce the cost of TRT could redirect some from self-medication into the medical system. Those who self-medicate TRT feel uncertain about the policy regarding testosterone prescription. They feel that they cannot rely on the medical system to consistently provide them with testosterone. Perhaps there is something to these concerns if recently the black market was able to continue to provide testosterone when the pharmaceutical industry could not.

It needs to be noted that healthcare, legislative and substance use treatment environments vary across the globe, and may impact on efforts to redirect those who self-medicate TRT into medical systems. The national context needs to be a key consideration when addressing the shortfalls of a medical system.

Testosterone: therapy and enhancement

Aspects of the preference for self-medicated TRT among people who use IPEDs could be attributed to the cultural context. In these communities testosterone use is normalised (e.g. see also van de Ven & Mulrooney, 2017b). Indeed, during this study several people who used IPEDs stated that individuals in IPED communities may be too quick to turn to hormonal treatment. However, these criticisms are also levelled at health practitioners, particularly in the United States of America. A solid evidence base needs to inform decisions to artificially manipulate hormone levels, and as this evidence base is largely lacking it is possible that hormonal treatments are being used prematurely or unnecessarily.

It may not only be in IPED using communities that testosterone use is normalised. In this study both self-medicated TRT and medically prescribed TRT were found to be pathways to enhancement. This was also found in the community led survey on the online discussion website [Reddit \(r/roids Unofficial Census 2020\)](#) described above. In this survey respondents were asked for the strongest factor in their decision 'to take gear' [i.e. use AAS]. Six percent ($n = 44$) stated that the strongest factor was 'Low T – doctor prescribed', and 11% ($n = 81$) stated that the strongest factor was 'Low T – self-medication/doctor refused to treat'. Thus, this survey found that a total of 17% of people who use steroids began their use with TRT. It seems that any TRT (self-medicated or prescribed) normalises the use of exogenous testosterone and thus opens the door to enhancement use. Future research should explore pathways from TRT to enhancement, and the impact of self-medication on decisions to enhance. Common sense would suggest that the step from self-medicated TRT to enhancement testosterone use would be easier to take as it only involves an increase in dosage of the black market testosterone one is already acquiring, whereas going from medically supervised TRT to enhancement use involves entry into the black market. But we do not know if self-medication leads to more enhancement use, and whether prescription TRT may prevent some individuals from progressing to enhancement doses of testosterone.

Traditionally TRT is prescribed according to a medical model concerned with addressing deficits and repairing health - i.e. a negative view of health as freedom from illness or impairment. Under these circumstances the boundary between repair and enhancement is relevant as medicine is only concerned with repair. This boundary is defined and defended through language. When testosterone is used in medical set-

tings for therapeutic reasons it is simply referred to as 'testosterone'. However, if these same compounds are used outside of a medical setting they tend to be referred to as 'anabolic-androgenic steroids (AAS)', and motivations for use are presumed to be centred on enhancement. As is the case with other drugs, the medical use of testosterone is referred to simply as 'testosterone use', whereas non-prescribed use of testosterone is deemed 'AAS abuse' (or in the case of other substances used for enhancement, 'IPED abuse'). 'Abuse' is a term that is frequently used to describe non-prescribed use of a drug (Hughes, McElnay & Fleming, 2001). However, if individuals who meet clinical criteria for low testosterone are refused treatment by medical professionals and thus perform self-medication with testosterone in much the same way as it is prescribed, one must question whether this should be deemed drug 'abuse'. Our assumptions that all non-prescribed use of testosterone is enhancement use has blinded us to possible therapeutic motivations. Therefore, therapeutic applications of testosterone as practised outside of medical settings warrant academic attention.

There is some suggestion that the repair/enhancement dichotomy is also relevant to those who use testosterone outside of medical settings. The terms 'blast' and 'cycle' are used to describe enhancement use and to set it apart from therapeutic use. The term 'TRT' appears only to be used by people who use IPEDs whose low testosterone levels preceded enhancement use. It appears that those whose low testosterone results from enhancement use prefer the term 'cruise', perhaps tacitly acknowledging that their low testosterone is self-inflicted. However, this study was exploratory and based on a relatively small sample of people who use testosterone. Furthermore, it only included individuals who were currently using enhancement doses of testosterone. How the repair/enhancement boundary is experienced and described by those who use testosterone without prescription warrants further investigation as it may help to understand their decision making. For example, it remains unclear if when individuals cease enhancement use and are left with low testosterone whether 'cruise' doses become redefined as 'TRT'? If low doses of testosterone are not coupled with enhancement doses do the therapeutic aspects of use become emphasised?

The trend towards continuous use of testosterone and other steroids ('blasting and cruising' – as described above) is a cause for concern. Understanding of the impact of this continual use of testosterone is in its infancy, but there is evidence to suggest that blasting and cruising causes more harm than cycling (Rowe, Berger & Copeland, 2017) and has the potential for impairing a return to normal gonadal function. Thus, with the increased popularity of blasting and cruising we are likely to see a greater need for TRT in the future. The traditional steroid use pattern, 'cycling', demonstrated a concern for the return of natural testosterone production. Does the increased popularity of the blast and cruise use pattern indicate that the body's ability to repair itself has become less important to consumers who are increasingly comfortable with relying on pharmaceutical repair strategies?

When testosterone is used outside of medical contexts it is used for much more than restoring health. It is also used as a coping mechanism for dealing with mood disorders, particularly depression. The use of substances to cope with feelings of depression is not unique to testosterone and it has been well-described in the literature that this is a common coping strategy. For example, in a 2018 narrative review ($N = 22$) it was found that the prevalence of substance misuse with alcohol and/or drugs among those with mood or anxiety disorders ranged from 21.9% to 24.1% (Turner et al., 2018). There is some evidence that testosterone has a role in anxiety and depression in men (Fischer, Ehlert & Amiel Castro, 2019; McHenry, Carrier, Hull & Kabbaj, 2014), and that testosterone therapy in older men can result in slightly improved mood and depressive symptoms (Matsumoto, 2019). However, the exact underlying neurobiological mechanisms are unclear, and there is some concern that there has been a rise in off-label testosterone prescribing for conditions which may not warrant it (Irwig et al., 2020). The fact that self-medication with testosterone is conducted in order to treat depression suggests that it may be useful to apply the self-medication

hypothesis (described above) to some non-prescribed testosterone use.

This study found that some self-medicated TRT may be aimed at optimisation rather than restoration. This is not unique to testosterone as, for example, there is evidence of microdosing psychedelic drugs for both therapeutic reasons and to enhance mood, creativity and cognition (Johnstad, 2018), the use of prescription stimulants (e.g. Ritalin) to enhance performance in the workplace or in academic study (Hupli, Didžiokaitė & Ydema, 2016), and the consumption of (prescription) drugs to enhance sexual activity (Drysdale et al., 2020). However, what is problematic is that legal and medical discourses currently function as the two dominant discourses pertaining to drugs, which generally label the recreational use of licit and illicit drugs by healthy individuals as 'abuse'. Personal accounts of drug use that do not conform to these dominant discourses are generally attributed to the person engaging in denial, rationalisation, justification, intellectualisation, or minimisation (Kiepek, 2016). Yet, this 'narrative of harm' fails to consider questions around the relative nature of harms and to weigh such risks against the pleasures and benefits derived from using licit and illicit drugs (Mulrooney, van de Ven, McVeigh & Collins, 2019). Indeed, although some individuals will experience negative effects as a result of their use, in the last two decades a growing body of research has shown that many individuals who use drugs perceive positive and pleasurable effects while avoiding the problems that may follow from taking them (Race, 2009), including when it comes to anabolic-androgenic steroids (Mulrooney et al., 2019).

It is therefore important to start thinking about drug use in ways which encompass all experiences of people who use licit and illicit drugs. Lancaster, Seear and Ritter (2017), p. 122) suggest that discussions of medicinal cannabis open up discourses of pleasure which have not been possible under prohibitionist models of drugs policy, or indeed, in medicine as traditionally evidenced and understood. Health need not stand in opposition to pleasure as the absence of disease, but can be conceptualised in a more 'holistic' way, encompassing notions of physical, mental and social wellbeing (Lancaster et al., 2017; Race, 2009). Folded within the concept of 'wellbeing' is the notion of 'pleasure' in that this concept promotes an idea of 'the good life' which moves beyond the simple biological curing of disease and ailment (Lancaster et al., 2017). The shift towards wellbeing challenges both (1) the idea that 'medicine' cannot be understood (or indeed desired) in terms of pleasure (Lancaster et al., 2017), and (2) 'the enormous discursive and scientific labour, both within and outside medicine, that goes into characterising the purpose of medicine neutrally (in terms of repairing disorder) rather than positively (as enhancement)' (Race, 2009, p.5). Testosterone can, for instance, be used to treat sexual dysfunction, alleviation of depression, promotion of well-being and anti-aging, as well as enhancing muscle mass and strength. However, if we treat testosterone as only a 'medical object', discussions on how this should be regulated are directed to how medicines ought to be controlled and managed (Lancaster et al., 2017). By moving beyond mere restoration and opening up what 'medicine can do', we allow for different knowledges and embodied experiences to be taken into account, as well as different modes of evidencing (Lancaster et al., 2017). This in turn opens discussions around the purpose of medicine (see Dunn et al., this issue).

As Brennan, Wells and Van Hout (2018), p.49) note, 'the potential for lay performance of medical procedures on the self in a space where people assume autonomy over their knowledge and understanding of the body and engage in self-medication and self-experimentation warrants further investigation'. Self-medication can empower individuals but can increase the risks of drug use significantly. Therefore, we need to understand the motivations for, and the practices of, self-medication in order to reduce the harms of these practices. Such investigations can reveal not only the nature of both enhancement and repair, and the shortcomings of this distinction, but also the shortcomings of the medical system as currently practised. Using Bacchi's (2016) WPR approach we can see that policy may constitute non-prescribed testosterone use

as a problem, but when individuals with verifiable health problems are denied treatment by health practitioners desiring to give treatment, it appears the problem is actually the policies that prevent access to medical treatment, or the biopolitics of the situation.

Notes

- 1 The experiential knowledge of bodybuilders which is sometimes informed by science.
- 2 Some participants had heard of individuals terming 400 mg per week 'a cruise dose', but these participants stated that such large doses were more accurately termed 'permblasts' (permanent blasts), and therefore enhancement.
- 3 Indeed, during the research information on how to manipulate testosterone levels in order to deceive health professionals was found in online enhancement communities. Such deception can be detected by monitoring luteinizing hormone (LH) and follicle stimulating hormone (FSH) in addition to testosterone levels.

Declarations of Interests

None.

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References

- Amoako, E. P., Richardson-Campbell, L., & Kennedy-Malone, L. (2003). Self-medication with over-the-counter drugs among elderly adults. *Journal of Gerontological Nursing*, 29(8), 10–15. [10.3928/0098-9134-20030801-05](https://doi.org/10.3928/0098-9134-20030801-05).
- Ayalew, M. B. (2017). Self-medication practice in Ethiopia: A systematic review. *Patient preference and adherence*, 11, 401–413. [10.2147/PPA.S131496](https://doi.org/10.2147/PPA.S131496).
- Bacchi, C. (2016). Problematizations in health policy: Questioning how "Problems" are constituted in policies. *SAGE open*. [10.1177/2158244016653986](https://doi.org/10.1177/2158244016653986).
- Barbonetti, A., D'Andrea, S., & Francavilla, S. (2020). Testosterone replacement therapy. *Andrology*, 00, 1–16 (online ahead of print). [10.1111/andr.12774](https://doi.org/10.1111/andr.12774).
- Bassil, N., Alkaade, S., & Morley, J. E. (2009). The benefits and risks of testosterone replacement therapy: A review. *Therapeutics and clinical risk management*, 5(3), 427–448. [10.2147/tcrm.s3025](https://doi.org/10.2147/tcrm.s3025).
- Begley, E., McVeigh, J., & Hope, V. (2017). The National IPED info survey: Image and performance enhancing drugs, 2016 National Survey Results. Liverpool: Liverpool John Moores University Retrieved from <http://www.wales.nhs.uk/sitesplus/documents/888/IPED%20report%202017.%20FINAL.pdf>.
- Boellstorff, T., Nardi, B., Pearce, C., & Taylor, T. L. (Eds.). (2012). *Ethnography and virtual worlds: A handbook of method*. Princeton: Princeton University Press.
- Bowen, D., Kisuule, G., Ogasawara, H., Siregar, Ch. J. P., Williams, G. A., Hall, C., et al. (2000). Guidelines for the regulatory assessment of medicinal products for use in self-medication (PDF). Geneva: World Health Organization WHO/EDM/QSM/00.1retrieved 1st April 2020 from <https://apps.who.int/medicinedocs/en/d/Js2218e/1.1.html>.
- Brennan, R., Wells, J., & Van Hout, M. C. (2018). Blood letting: Self-phlebotomy in injecting anabolic-androgenic steroids within performance and image enhancing drug (PIED) culture. *International Journal of Drug Policy*, 55, 47–50. [10.1016/j.drugpo.2018.02.011](https://doi.org/10.1016/j.drugpo.2018.02.011).
- Campbell, G., Nielsen, S., Bruno, R., Lintzeris, N., Cohen, M., Hall, W., et al. (2015). The pain and opioids IN treatment study: Characteristics of a cohort using opioids to manage chronic non-cancer pain. *Pain*, 156(2), 231–242. [10.1097/01.j.pain.0000460303.63948.8e](https://doi.org/10.1097/01.j.pain.0000460303.63948.8e).
- Cheng, Y., Bateson, D., Concepcion, K., Stewart, M., Lowy, M., Sweeney, S., et al. (2018). Initiation of testosterone replacement therapy. *Australian Journal for General Practitioners*, 47, 698–704. [10.31128/AJGP-02-18-4480](https://doi.org/10.31128/AJGP-02-18-4480).
- Chutuape, M. A. D., & de Wit, H. (1995). Preferences for ethanol and diazepam in anxious individuals: An evaluation of the self-medication hypothesis. *Psychopharmacology*, 121(1), 91–103. [10.1007/BF02245595](https://doi.org/10.1007/BF02245595).
- Cohen, J., Collins, R., Darkes, J., & Gwartzney, D. (2007). A league of their own: Demographics, motivations and patterns of use of 1,955 male adult non-medical anabolic steroid users in the United States. *Journal of the International Society of Sports Nutrition*, 4, 12. [10.1186/1550-2783-4-12](https://doi.org/10.1186/1550-2783-4-12).

- Cornford, C. S., Kean, J., & Nash, A. (2014). Anabolic-androgenic steroids and heroin use: A qualitative study exploring the connection. *International Journal on Drug Policy*, 25(5), 928–930. [10.1016/j.drugpo.2014.06.002](https://doi.org/10.1016/j.drugpo.2014.06.002).
- Corona, G., Torres, L. O., & Maggi, M. (2020). Testosterone therapy: What we have learned from trials. *The Journal of Sexual Medicine*, 17(3), 447–460. [10.1016/j.jsxm.2019.11.270](https://doi.org/10.1016/j.jsxm.2019.11.270).
- Coward Robert, M., Rajanahally, S., Kovac Jason, R., Smith Ryan, P., Pastuszak Alexander, W., & Lipshultz Larry, I. (2013). Anabolic steroid induced hypogonadism in young men. *Journal of Urology*, 190(6), 2200–2205. [10.1016/j.juro.2013.06.010](https://doi.org/10.1016/j.juro.2013.06.010).
- Dennington, V., Finney-Lamb, C., Dillon, P., Larance, B., Vial, R., Copeland, J., et al. (2008). *Qualitative field study for users of performance and image enhancing drugs*. Adelaide: Drug and Alcohol Services South Australia.
- Drysdale, K., Bryant, J., Hopwood, M., Dowsett, G. W., Holt, M., Lea, T., et al. (2020). Destabilising the 'problem' of chemsex: Diversity in settings, relations and practices revealed in Australian gay and bisexual men's crystal methamphetamine use. *International Journal of Drug Policy*, 78, Article 102697. [10.1016/j.drugpo.2020.102697](https://doi.org/10.1016/j.drugpo.2020.102697).
- Dunn, M., Henshaw, R., & McKay, F. H. (2016). Do performance and image enhancing drug users in regional Queensland experience difficulty accessing health services? *Drug and Alcohol Review*, 35(4), 377–382.
- Dunn, M., McKay, F. H., & Iversen, J. (2014). Steroid users and the unique challenge they pose to needle and syringe program workers. *Drug and Alcohol Review*, 33(1), 71–77.
- Eaves, E. R. (2015). "Just Advil": Harm reduction and identity construction in the consumption of over-the-counter medication for chronic pain. *Social Science & Medicine*, 146, 147–154. [10.1016/j.socscimed.2015.10.033](https://doi.org/10.1016/j.socscimed.2015.10.033).
- Eiroa-Orosa, F. J., Giannoni-Pastor, A., Fidel-Kinori, S. G., & Argüello, J. M. (2016). Substance use and misuse in burn patients: Testing the classical hypotheses of the interaction between post-traumatic symptomatology and substance use. *Journal of Addictive Diseases*, 35(3), 194–204. [10.1080/10550887.2015.1127717](https://doi.org/10.1080/10550887.2015.1127717).
- Fischer, S., Ehler, U., & Amiel Castro, R. (2019). Hormones of the hypothalamic-pituitary-gonadal (HPG) axis in male depressive disorders - A systematic review and meta-analysis. *Frontiers in Neuroendocrinology*, 55, Article 100792. [10.1016/j.yfrne.2019.100792](https://doi.org/10.1016/j.yfrne.2019.100792).
- Graham, M. R., Ryan, P., Baker, J. S., Davies, B., Thomas, N.-E., Cooper, S.-M., ... Kicman, A. T. (2009). Counterfeiting in performance- and image-enhancing drugs. *Drug Testing and Analysis*, 1(3), 135–142. [10.1002/dta.30](https://doi.org/10.1002/dta.30).
- 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. [10.1016/j.peh.2016.11.002](https://doi.org/10.1016/j.peh.2016.11.002).
- Gutman, H., Hutton, P., Foucault, M., & Martin, L. (1988). *Technologies of the self: A seminar with Michel Foucault*. Amherst: University of Massachusetts Press.
- Hammerley, M. (2016). *Reading ethnographic research: A critical guide* (2nd ed.). London: Routledge.
- Harvey, O., Keen, S., Parrish, M., & van Teijlingen, E. (2019). Support for people who use Anabolic Androgenic Steroids: A Systematic Scoping Review into what they want and what they access. *BMC public health*, 19(1), 1024.
- Hearne, E., Grund, J., Van Hout, M. C., & McVeigh, J. (2016). A scoping review of home-produced heroin and amphetamine-type stimulant substitutes: Implications for prevention, treatment, and policy. *Harm Reduction Journal*, 13(14). [10.1186/s12954-016-0105-2](https://doi.org/10.1186/s12954-016-0105-2).
- Hughes, Carmel, McElroy, James, & Fleming, Glenda (2001). Benefits and risks of self medication. *Drug Safety*, 24(14), 1027–1037. [10.2165/00002018-200124140-00002](https://doi.org/10.2165/00002018-200124140-00002).
- Hulme, S., Hughes, C. E., & Nielsen, S. (2019). What factors contributed to the misconduct of health practitioners? An analysis of Australian cases involving the diversion and supply of pharmaceutical drugs for non-medical use between 2010 and 2016. *Drug and Alcohol Review*, 38(4), 366–376. [10.1111/dar.12918](https://doi.org/10.1111/dar.12918).
- Hupli, A., Didziokaitė, G., & Ydema, M. (2016). Toward the smarter use of smart drugs: Perceptions and experiences of university students in the Netherlands and Lithuania. *Contemporary Drug Problems*, 43(3), 242–257. [10.1177/00914509166600143](https://doi.org/10.1177/00914509166600143).
- Irwig, M. S., Fleseriu, M., Jonklaas, J., Tritos, N. A., Yuen, K. C. J., Correa, R., et al. (2020). Off-label use and misuse of testosterone, growth hormone, thyroid hormone, and adrenal supplements: Risks and costs of a growing problem. *Endocrine Practice*, 26(3), 340–353. [10.4158/PS-2019-0540](https://doi.org/10.4158/PS-2019-0540).
- Johnstad, P. G. (2018). Powerful substances in tiny amounts: An interview study of psychodelic microdosing. *Nordic Studies on Alcohol and Drugs*, 35(1), 39–51. [10.1177/1455072517753339](https://doi.org/10.1177/1455072517753339).
- Juengst, E. T. (1998). What does enhancement mean? In E. Parens (Ed.), *Enhancing human traits: Ethical and social implications* (pp. 29–47). Washington, D.C: Georgetown University Press.
- Kennedy, M. C., Boyd, J., Mayer, S., Collins, A., Kerr, T., & McNeil, R. (2019). Peer worker involvement in low-threshold supervised consumption facilities in the context of an overdose epidemic in Vancouver, Canada. *Social Science & Medicine*, 225, 60–68.
- Khantzian, E. J. (1985). The self-medication hypothesis of addictive disorders: Focus on heroin and cocaine dependence. *The American Journal of Psychiatry*, 142(11), 1259–1264. [10.1176/ajp.142.11.1259](https://doi.org/10.1176/ajp.142.11.1259).
- Khantzian, E. J. (1997). The self-medication hypothesis of substance use disorders: A reconsideration and recent applications. *Harvard Review of Psychiatry*, 4(5), 231–244. [10.3109/10673229709030550](https://doi.org/10.3109/10673229709030550).
- Kiepek, N. (2016). Exploring legitimacy and authority in the construction of truth regarding personal experiences of drug use. *Journal of Addiction Research & Therapy*, 7, 273. [10.4172/2155-6105.1000273](https://doi.org/10.4172/2155-6105.1000273).
- Klein, A. (2012). The anthropology of drugs. In R. Fardon, O. Harris, T. H. Marchand, M. Nuttall, C. Shore, V. Strang, & R. A. Wilson (Eds.), *The sage handbook of social anthropology* (pp. 365–376). London: SAGE Publications Ltd. [10.4135/9781446201077](https://doi.org/10.4135/9781446201077).
- Lancaster, K., Seear, K., & Ritter, A. (2017). Making medicine; producing pleasure: A critical examination of medicinal cannabis policy and law in Victoria. *International Journal of Drug Policy*, 49, 117–125. [10.1016/j.drugpo.2017.07.020](https://doi.org/10.1016/j.drugpo.2017.07.020).
- Larance, B., Campbell, G., Moore, T., Nielsen, S., Bruno, R., Lintzeris, N., et al. (2019). Concerns and help-seeking among patients using opioids for management of chronic noncancer pain. *Pain Medicine*, 20(4), 758–769. [10.1093/pm/pny078](https://doi.org/10.1093/pm/pny078).
- Lescure, D., Paget, J., Schellevis, F., & van Dijk, L. (2018). Determinants of self-medication with antibiotics in European and Anglo-Saxon countries: A systematic review of the literature. *Frontiers in Public Health*, 6, 370. [10.3389/fpubh.2018.00370](https://doi.org/10.3389/fpubh.2018.00370).
- Matsumoto, A. M. (2019). Testosterone replacement in men with age-related low testosterone: What did we learn from the testosterone trials? *Current Opinion in Endocrine and Metabolic Research*, 6, 34–41. [10.1016/j.coemr.2019.04.004](https://doi.org/10.1016/j.coemr.2019.04.004).
- McHenry, J., Carrier, N., Hull, E., & Kabbaj, M. (2014). Sex differences in anxiety and depression: Role of testosterone. *Frontiers in Neuroendocrinology*, 35(1), 42–57. [10.1016/j.yfrne.2013.09.001](https://doi.org/10.1016/j.yfrne.2013.09.001).
- Metastasio, A., Negri, A., Martinotti, G., & Corazza, O. (2018). Transitioning bodies. The case of self-prescribing sexual hormones in gender affirmation in individuals attending psychiatric services. *Brain Sciences*, 8(5), 88. [10.3390/brainsci8050088](https://doi.org/10.3390/brainsci8050088).
- Mulrooney, K. J. D., van de Ven, K., McVeigh, J., & Collins, R. (2019). Commentary: Steroid madness- has the dark side of anabolic-androgenic steroids (AAS) been overstated? *Performance Enhancement & Health*, 6(3), 98–102. [10.1016/j.peh.2019.03.001](https://doi.org/10.1016/j.peh.2019.03.001).
- Pope, H. G., J. r., Kanayama, G., Ionescu-Pioggia, M., & Hudson, J. I. (2004). Anabolic steroid users' attitudes towards physicians. *Addiction*, 99(9), 1189–1194. [10.1111/j.1360-0443.2004.00781.x](https://doi.org/10.1111/j.1360-0443.2004.00781.x).
- Pope, H. G., J. r., Wood, R. L., 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.
- Race, K. (2009). *Pleasure consuming medicine: The queer politics of drugs*. United States: Duke University Press.
- Reddit (2020). *r/roids Unofficial Census*, <https://docs.google.com/forms/d/1OhlamWmZrY7xL149R3bEuY7gqK5-m1jB7i72lyDUQ/viewanalytics?fref=gc&dti=1431420717070970>, accessed 31 March 2020.
- Rivoal, I., & Salazar, N. B. (2013). Contemporary ethnographic practice and the value of serendipity. *Social Anthropology*, 21, 178–185.
- Rowe, R., Berger, I., & Copeland, J. (2017). "No pain, no gain"? Performance and image-enhancing drugs, health effects and information seeking. *Drugs: Education, Prevention and Policy*, 24(5), 400–408. [10.1080/09687637.2016.1207752](https://doi.org/10.1080/09687637.2016.1207752).
- Ruiz, M. E. (2010). Risks of self-medication practices. *Current Drug Safety*, 5(4), 315–323. [10.2174/157488610792245966](https://doi.org/10.2174/157488610792245966).
- Sansone, A., Sansone, M., Lenzi, A., & Romanelli, F. (2017). Testosterone replacement therapy: The emperor's new clothes. *Rejuvenation Research*, 20(1), 9–14. [10.1089/rej.2016.1818](https://doi.org/10.1089/rej.2016.1818).
- Skarstein, S., Lagerlöv, P., Kvarme, L. G., & Helseth, S. (2018). Pain and development of identity in adolescents who frequently use over-the-counter analgesics: A qualitative study. *Journal of Clinical Nursing*, 27(19–20), 3583–3591. [10.1111/jocn.14513](https://doi.org/10.1111/jocn.14513).
- Tan, R. S., & Scally, M. C. (2009). Anabolic steroid-induced hypogonadism-towards a unified hypothesis of anabolic steroid action. *Medical Hypotheses*, 72(6), 723–728. [10.1016/j.mehy.2008.12.042](https://doi.org/10.1016/j.mehy.2008.12.042).
- Thevis, M., Schrader, Y., Thomas, A., Sigmund, G., Geyer, H., & Schänzer, W. (2008). Analysis of confiscated black market drugs using chromatographic and mass spectrometric approaches. *Journal of Analytical Toxicology*, 32(3), 232–240. [10.1093/jat/32.3.232](https://doi.org/10.1093/jat/32.3.232).
- Tircova, B., Bosakova, Z., & Kozlik, P. (2019). Development of an ultra-high performance liquid chromatography-tandem mass spectrometry method for the determination of anabolic steroids currently available on the black market in the Czech Republic and Slovakia. *Drug Testing and Analysis*, 11(2), 355–360. [10.1002/dta.2541](https://doi.org/10.1002/dta.2541).
- Tsametis, C. P., & Isidori, A. M. (2018). Testosterone replacement therapy: For whom, when and how. *Metabolism*, 86, 69–78. [10.1016/j.metabol.2018.03.007](https://doi.org/10.1016/j.metabol.2018.03.007).
- Turner, S., Mota, N., Bolton, J., & Sareen, J. (2018). Self-medication with alcohol or drugs for mood and anxiety disorders: A narrative review of the epidemiological literature. *Depression and Anxiety*, 35(9), 851–860. [10.1002/da.22771](https://doi.org/10.1002/da.22771).
- Underwood, M. (2017). *Exploring the social lives of image and performance enhancing drugs: An online ethnography of the Zyzx fandom of recreational bodybuilders.* *International Journal of Drug Policy*, 39, 78–85.
- Underwood, M. (2019). The unintended consequences of emphasising blood-borne virus in research on, and services for, people who inject image and performance enhancing drugs: A commentary based on enhanced bodybuilder perspectives. *International Journal of Drug Policy*, 67, 19–23. [10.1016/j.drugpo.2018.11.005](https://doi.org/10.1016/j.drugpo.2018.11.005).
- van de Ven, K., Boardley, I., & Chandler, M. (2020). *IPED infographics for health professionals*. Human Enhancement Drugs Network retrieved 17 August 2020 <https://humanenhancementdrugs.com/events-and-projects/free-iped-infographics/>.
- van de Ven, K., & Koenraadt, R. (2017). Exploring the relationship between online buyers and sellers of image and performance enhancing drugs (IPEDs): Quality issues, trust and self-regulation. *International Journal of Drug Policy*, 50, 48–55. [10.1016/j.drugpo.2017.09.004](https://doi.org/10.1016/j.drugpo.2017.09.004).
- van de Ven, K., & Mulrooney, K. J. (2017b). 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. [10.1016/j.drugpo.2016.07.009](https://doi.org/10.1016/j.drugpo.2016.07.009).
- van de Ven, K., & Mulrooney, K. J. (2017a). Drug testing high school athletes and fitness. In D. E. Newton (Ed.), *Steroids and doping in sports* (2nd edition). US: ABC-CLIO.
- Van Hout, M. C. (2014). Kitchen chemistry: A scoping review of the diversionary use of pharmaceuticals for non-medical use and home production of drug solutions. *Drug Testing and Analysis*, 6(7–8), 778–787.
- Van Hout, M. C., & McElrath, K. (2012). Service user involvement in drug treatment programmes: Barriers to implementation and potential benefits for client recovery. *Drugs: Education, Prevention and Policy*, 19(6), 474–483.