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Title: A ‘messenger of sex’? Making testosterone matter in motivations for anabolic-androgenic steroid injecting

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A 'messenger of sex'? Making testosterone matter in motivations for anabolic-androgenic steroid injecting

Abstract

Anabolic-androgenic steroids are synthetic derivatives of testosterone. They are thought to be the most commonly used performance and image-enhancing drugs (PIEDs) in Australia. However, the motivations for men's use of steroids and other PIEDs are poorly understood. Established ways of understanding these motivations highlight men's performance and/or image-related concerns, in the context of contemporary masculinities and gender norms. Researchers have paid little attention to how the social and political features of testosterone shape and transform steroid use. Instead, testosterone tends to be taken for granted as a 'messenger of sex' that acts on the body in predictable and routinised ways. This article takes a different approach. Drawing on feminist science studies and interviews conducted for an Australian research project, we investigate how the cultural and symbolic meanings assigned to testosterone shape the ontological politics of men's steroid consumption. Approaching testosterone as an emergent social and biopolitical gathering rather than as a stable sex hormone allows us to better understand how men's PIED consumption is mediated, particularly by pervasive ideas about sexual difference and the biology of gender. In concluding, we consider ways of better engaging men who consume steroids in health initiatives, in keeping with their concerns and perspectives.

Keywords: Steroids; testosterone; hormones; ontological politics; feminist science studies

Introduction

Feminist scholarship has long taken issue with hormone-based ideas of gender as promoting simplistic biological accounts of agency, embodiment and sexual difference (e.g., Butler, 1993; Oudshoorn, 2003). Many researchers have also critiqued the science on which normative hormonal accounts of agency are premised (Fausto-Sterling, 2000; Roberts, 2007). This work has drawn attention to hormones (such as steroids) as biologically, socially and politically co-constituted, rather than simply biological. Despite these critiques, social research into steroids has predominantly treated testosterone as a stable, biological substance that acts on the body in predictable physiological ways (e.g., increasing muscle mass and size). This article takes a different approach. Using feminist science studies research on hormones and biomedicine, we investigate the ways in which cultural and symbolic meanings associated with testosterone shape steroid consumption. This approach foregrounds the ‘ontological politics’ (Mol, 1999) of steroid injecting, that is, the contingent forms of embodiment and gendered realities testosterone makes possible for men who inject steroids. To do so, we analyse interviews with 60 men who inject PIEDs conducted for an Australian research project designed to better understand this phenomenon. We begin by arguing that the presumed tie between testosterone and masculinity contributes to a sense of increased physical vibrancy for men who use steroids. Pleasurable experiences of strength, energy and youthfulness (and a range of other testosterone ‘effects’) are closely tied to the cultural status assigned to testosterone as a ‘kind of concentrated essence of masculinity’ (Keane, 2005, p. 191). Following this, we argue that steroid consumption is also framed via commonplace understandings of testosterone as a simple ‘messenger of sex’ (Roberts, 2007, p. 22). In this framing, steroid consumption necessarily enhances masculinity. We go on to argue that steroid injecting in turn reinforces hormonal accounts of sex and gender, even as these biological accounts directly reference uniquely modern masculine ideals of confidence, authority and self-management. Lastly, we consider aspects of steroid consumption not readily digested in the simple formula, man + testosterone = enhanced masculinity, that is, the production of ‘unpredictably destabilising effects on gender attributes’ (Sedgwick, 1994, p. 136). Via effects such as gynecomastia (breast growth) and testicular shrinkage, steroid injecting may be implicated in feminised forms of attention and labour centred on the management of sexuality, the ‘natural’ body and fertility. Overall, we argue that approaching testosterone in feminist science studies terms – as an emergent social and biopolitical

gathering rather than as a stable sex hormone – allows us to better understand the forces motivating and mediating men’s PIED consumption, including pervasive ideas about sexual difference and gender as biologically produced and aligned. In concluding, we consider ways of better engaging men who consume steroids in health initiatives in line with their experiences, concerns and perspectives.

Background

Anabolic-androgenic steroids are thought to be the most commonly used PIED in Australia (Larance et al., 2008). Steroid hormones are understood not only as central to sexual development but as ‘powerful growth hormones affecting most, if not all, of the body’s organ systems’ (Fausto-Sterling, 2000, p. 193). These include reproductive organs, bone mass, heart function, liver metabolism and blood cell production. In this account, steroids possess anabolic properties, regulating muscle protein metabolism (and subsequently muscle growth), and androgenic properties, promoting and regulating the development of sexual characteristics. Research suggests that men who consume steroids commonly do so to help grow and repair muscle tissue and to improve various forms of physical performance (Kimergård, 2015; Santos & Coomber, 2017).

Australian research on steroid and other PIED use is scarce but PIED consumers are known to be accessing needle and syringe exchange programs in greater numbers than in the past (Iversen et al., 2013; Memedovic et al., 2017). The vast majority of people who use PIEDs are thought to be men, mostly heterosexual men aged less than 25 years (Iversen et al., 2013). Harms and risks associated with steroid consumption cited in the literature range from minor short-term effects such as acne and fluid retention to serious long-term harms such as increased blood pressure, suppression of gonadotropins, liver damage, cardiovascular disease and increased risk of blood-borne virus transmission (Kimergård & McVeigh, 2017). Despite these risks, Australian men are thought to be consuming steroids in growing numbers, raising pressing questions about the reasons for doing so.

Literature Review

Why do men consume steroids and other PIEDs, with what effects, and under what social and political conditions? According to the literature, steroid consumption is typically motivated by the desire to improve strength and athletic performance, the need to meet occupational requirements and/or the desire to improve body image (Kimergård, 2015; Santos & Coomber, 2017). However, the literature also suggests a wide range of benefits that exceed initial motivations for use, including improved mood, confidence, energy and sexual experiences (Latham et al. 2019; Monaghan, 2001, 2002; Rowe, Berger & Copeland, 2016; Underwood, 2017). These aspects of steroid use have received relatively little research attention; more work is needed to illuminate the social and cultural forces shaping and mediating use (Seear, Fraser, Moore & Murphy, 2015).

As Keane (2005) observed over a decade ago, medical and psychological research on steroid use tends to posit a pathological relationship between consumption and masculinity. On the one hand, steroid use is approached as analogous to other forms of illicit drug use, and the steroid using-subject is cast as dangerous, excessively masculine and anti-social. On the other, steroid use is linked to body image disorder and depicted as a ‘vivid example of contemporary masculinity in crisis’ (Keane, 2005, p. 203). Drawing on Keane’s analysis, Moore, Hart, Fraser and Seear (2019) recently reviewed the constitution of masculinity in research on PIEDs published since 2005. They argue that much of this research continues to pathologise men who use PIEDs as ‘insecure, inadequate and vulnerable, and as marked by compulsion and crisis’ (2019, p. 15). Such analyses diminish the agency of men who consume PIEDs and obscure the unique meanings arising from PIED consumption as a practice of the self in the context of contemporary social and moral imperatives of self-improvement (Fomiatti et al. under review; Latham et al. 2019; Underwood, 2017).

As observed by Keane (2005) and Moore et al. (2019), few exceptions to this pathologising approach exist. Monaghan’s (2001, 2002) ethnographic research on bodybuilding and steroids cautions against the excessive emphasis on risk practices and ‘diseased’ bodies. He suggests that bodybuilding and drug-taking need not be explained in terms of antecedent inadequacies caused by a ‘masculinity-in-crisis’ (Monaghan, 2001, p. 334). Moving away from a binarised depiction of health or enhancement, Monaghan explores the ‘vibrant physicality’ – the sensual embodied pleasures – forged through bodybuilding *and* drug-taking (2001, p. 331). Andreasson (2015) also employs an ethnographic approach to gym culture,

arguing that while PIED consumption may partly reproduce traditional gender norms, it is also implicated in the creation of more reflexive masculinities in which bodily aesthetics and the appreciation of masculine beauty are central. Taking a similarly attentive approach to issues of agency, Underwood (2017) draws on her research on online communities of recreational bodybuilders to observe that men use PIEDs to improve their appearance and in turn to alter perceived unequal power relations with women. Underwood and Olsen (2018) further argue that these online spaces allow for connection and emotionality between men. These studies suggest that PIED use, including steroid consumption, generates and transforms contemporary masculinities via relations with new technologies, spaces, bodies, movements and cultural conceptions. Their findings also suggest that more traditional (and potentially harmful) expressions and practices of masculinity are sometimes preserved. In this article, we explore this ambivalence further through studying how the social and political dimensions of testosterone inform steroid injecting and contemporary masculinities.

As noted earlier, sociological research on steroid use has paid little attention to the social and political dimensions of testosterone, tending to treat it as a self-evidently biological substance with predictable effects on the body and psyche. In critiquing such research, Keane (2005) argues that:

The status of testosterone as the ‘male sex hormone’, a kind of concentrated essence of masculinity, enhances the transformative power attributed to steroids. In contrast, ‘female’ sex hormones have been successfully domesticated, medicalized and commercialized and are not imbued with such dangerous capacities. (p. 191)

For Keane, testosterone is a potent symbolic marker of masculinity, and as such, likely to shape men’s experiences of steroid use. Over a decade after Keane’s insightful observation, no further research has been conducted into how steroid injecting is informed by social and political understandings of testosterone. However, feminist scholars (e.g., Oudshoorn, 2003; Fausto-Sterling, 2000; Roberts, 2007) have expanded our understanding of these issues. Scientific research on the body has long been criticised for its unquestioning reproduction of social norms and the gendered cultural imaginary of ‘biological’ accounts of sexual difference (Butler, 1993; Grosz, 1994; Martin, 1991). Nearly two decades ago, Fausto-Sterling argued that the very naming of steroid hormones as ‘sex hormones’ means that scientists effectively ‘integrated the signs of gender’ into the body (2000, p. 148). Questions about how the social and the body are mutually implicated persist in more contemporary

explorations of testosterone. Philosopher Paul B. Preciado (2013) combines a diaristic account of using testosterone with a claim that we have entered a ‘pharmacopornographic’ era in which hormonal classification and control are prominent technologies of the self. He argues that ‘[h]ormones are bio-artifacts made of carbon chains, language, images, capital, and collective desires’ (2013, p. 167). Although Preciado critiques the biological link typically drawn between testosterone and masculinity, his memoir nevertheless overflows with masculine bravado, largely affirming the connection between the two (Karkazis, 2018). As Karkazis argues, ‘facts’ about testosterone have a long history of being used by men ‘to reinforce the conventional ideals of masculinity that, in turn, enable men to maintain their privileged position in the gender hierarchy’ (2018, p. 12). Cordelia Fine (2018) makes a similar point in her recent book, *Testosterone Rex*. Tracking the deployment of testosterone across multiple social and scientific domains of practice, including evolutionary biology, neuroscience and social psychology, she critiques the social-scientific image of testosterone as ‘the potent, hormonal essence of competitive, risk-taking masculinity’ (2018, p. 23). She argues that the myth that testosterone is wholly responsible for sexual behaviour and gendered difference prohibits equality of opportunity and political investment in addressing enduring gendered inequality.

While these ideas about the political ramifications of sex hormones are not new, this recent resurgence of testosterone scholarship speaks to the continuing cultural interest in the basis of sex and gendered distinctions. It is on this broad – and explicitly feminist – social science scholarship that the analysis conducted here is built. What might critiques of testosterone as the ‘male sex hormone’ in the context of steroid injecting tell us about contemporary ideals of masculinity? How might men’s steroid consumption be mediated by understandings of testosterone, and how might men’s steroid consumption be addressed and supported from health and social perspectives?

Approach

In conducting our analysis, we draw on the work of feminist science and technology scholar Celia Roberts (2007) on gender, biomedicine and hormones. Like Fausto-Sterling, Roberts is interested in the social constitution of the materiality of the body. Specifically, she explores the ways in which the material and the social are mutually implicated in the production of

sex, gender, sexual difference and contemporary modes of embodiment. Drawing on the work of feminist philosopher Donna Haraway, Roberts proposes a 'refigured view of hormones' in which hormones are neither the sole effects of biology or of cultural discourse, but are bio-social actors that 'disrupt these historically significant categories' (2007, p. 19). According to this way of thinking, nature is not pre-given, ahistorical and foundational, but made in social interactions between human and non-human actors; its status as inevitable and ontologically anterior is a relational discursive achievement rather than the effect of some prior or permanent state. This view of nature underpins Haraway's formulation of bodies as 'material-semiotic actors' constituted in and through various networks of practice, knowledge and power. Roberts uses this conceptualisation of nature and the body to understand hormones as emergent actors whose activities can and should be 'analysed without alignment with biological determinism' (2007, p. 19). While hormones act within the body, they also *exceed* the body to 'message' (evoke, reproduce, perform and enact) culturally legible social meanings and, indeed, forms of sexed embodiment. In this sense, hormones are not simply 'messengers of sex' messaging an 'inherent or pre-existing sex within bodies', but are instead 'active agents in bio-social systems that constitute material-discursive entities' known as the sexes (2007, p. 22). This messaging activity occurs within specific times, places and cultures, and is folded back upon and in the body to give rise to historically specific forms of sexed and gendered embodiment. According to Roberts, hormones should be understood as material-discursive entities (made of technoscience, biomedicine, chemicals, bodies, social practices, discourse and cultures) rather than stable biological substances.

Writing more recently on the material-discursive constitution of disease, specifically hepatitis C, Fraser (2010) draws on the work of Latour to similarly argue that phenomena such as hepatitis C are 'gathered' or constituted and enacted in 'culture and action', usually in such a way as to appear *prior* to culture and action (p. 96). She argues that approaching a phenomenon as gathered, or as a 'gathering', is useful for challenging unexamined claims about the 'essential nature' of things. This approach is consistent with Roberts' call to view hormones as 'allies of particular world views' rather than as neutral, naturally occurring objects (2007, p. 17). In this article, we treat testosterone as an ally of a familiar gendered worldview, a gathering of purportedly masculine actions and properties – one that shapes steroid injecting in ways that can both reinforce and undermine normative gendered realities and the conditions of possibility for gendered embodiment and agency. This observation

about the ‘world-making’ (Fraser, 2006) effects of testosterone gestures towards the political stakes at play in controversies over hormones. In a move now familiar to critical drugs scholarship (e.g., Dwyer & Moore, 2013; Farrugia, 2017; Fraser, 2010; Savic & Fomiatti, 2016), the approach we describe in this section moves us from the realm of positivist realism to that of ontological politics (Law, 2004; Mol, 1999; 2002). Here, the ‘real’ (e.g., the ‘natural’ body, the ‘two’ sexes or hormonal ‘effects’) is made in and through practices such as steroid injecting rather than preceding them. In following this approach, we ask what the gendered symbolic meanings that co-constitute testosterone in men’s accounts of steroid injecting can tell us about their consumption. What are the gendered and social obligations and imperatives men experience in contemporary culture? How does testosterone work performatively to make some gendered realities possible?

Method

This article draws on in-depth, semi-structured interviews conducted for an Australian Research Council-funded project entitled ‘Understanding performance and image-enhancing drug injecting to improve health and minimise hepatitis C transmission’ (DP170100302).¹ Interviews were conducted across Australia with 60 men with a history of injecting PIEDs, including steroids. Participants were recruited using flyers placed in needle and syringe programs, harm reduction services, primary health services, sexual health services, bars and clubs, supplement stores and sex-on-premises venues. The study was also advertised on social media platforms, including Facebook, Twitter, Gumtree, Craig’s List and Scruff, as well as on steroid and bodybuilding online forums and in *Men’s Health* magazine. In Victoria, participants were recruited with the assistance of Australia’s only Steroid Education Program for people who use steroids (Aitken et al., 2002). Participants were over the age of 18 and had reported injecting a PIED in the last 12 months. Aside from one participant who solely used peptides, all other participants used multiple PIEDs, and almost all used anabolic-androgenic steroids, including testosterone.

¹ This discussion of method is adapted from two earlier publications from the same research project (Fomiatti et al. under review; Latham et al. 2019)

The 60 participants were recruited from urban and regional Victoria (n = 20), Queensland (n = 15), Western Australia (n = 13) and New South Wales (n = 12). Men were aged 19 to 72 years, with 18 aged under 25 years and 42 aged over 25 years. Participants were asked how they identified their sexual orientation (with prompts for gay, homosexual, straight, heterosexual, bisexual, queer and/or other). Forty-seven men identified as heterosexual, eight as gay and one as bisexual. We did not ask about sex assigned at birth. No participants disclosed that they were trans or had a trans history. Thirty-three participants reported that both they and their parents were born in Australia, 13 participants reported that they were born in Australia and one or both of their parents were born overseas, and 14 participants reported being born overseas.

The interviews lasted between 45 and 90 minutes. The interview schedule was developed with reference to the literature, the project's aims and input from the project advisory board, and further developed during the project as the interviews highlighted new issues. The interviews explored experiences of PIED use including initiation to injecting, injecting settings, fitness settings and routines, practices and patterns of injecting and consumption, experiences of PIED use and its effects, interactions with health service providers, and sources of information about safe injecting and hepatitis C. All participants were given (in person or via email) an information sheet describing the aims of the project, signed a consent form, and were reimbursed AUD50 for their time and contribution to the research. Curtin University's Human Research Ethics Committee approved the study (HRE2017-0372).

All interviews were digitally recorded, transcribed and imported into NVivo 11 for data management and coding. A coding framework was generated using a combination of methods: codes were identified in response to the project's aims and previous research on PIED consumption, on the basis of emerging themes in the data, and in consultation with the project's advisory board. The interview transcripts were coded by the first author and another research team member (Emily Lenton) using an iterative process, in collaboration with the lead investigator (author three) to maximise coding consistency and comprehensiveness.

Analysis

Vibrant physicality

In this section we draw on our interview data to explore how men describe the experience of steroid use as pleasurable (building on Monaghan's, 2001, discussion of vibrant physicality), in part because of the discursive meanings associated with testosterone. Many participants described testosterone as directly changing their physical experience of their bodies. For some participants, injecting steroids and thereby increasing the body's level of testosterone was understood to directly increase muscle strength and stamina and reduce recovery times. For others, testosterone's actions were more abstract, such as improving energy, mood, and overall vitality. For example, Jasar (NSW, 44) explained that he felt 'full of life [and] energy'. Similarly, Nathan (Qld, 26), explained that with higher levels of testosterone he felt 'amazing', 'confident' and able to 'take on the world', and as though nothing could 'hurt' him. In the following interview extract, Martin (Vic, 29) likewise describes the 'incredible effects' he experienced after taking oral steroids following a power-lifting injury:

It's a general anti-inflammatory, it increases red blood cells across the board [...] I started with an oral called Oxandrolone, commonly referred to as Anavar [...] Within two to three weeks the pain completely subsided [...] and within eight weeks of eighty milligrams per day of Anavar, [my shoulder] was back at almost a hundred per cent. I lost eighteen kilos and my muscle mass increased, my energy levels were better, moods were better, confidence was through the roof; it was incredible.

Here, the 'effects' of testosterone on the body are described as extremely powerful, with the hormone's action messaged and reinforced via traditional gendered attributes such as muscle mass and confidence. Indeed, testosterone itself seems to take on 'masculine' characteristics such as strength and power here, contributing to the energetic and powerful embodiment our participants described.

In addition, participants' descriptions of vibrant physicality were entangled with notions of testosterone-induced youthfulness and virility. Don (Vic, 28), for instance, had been injecting steroids for approximately four years. He speculates about the enhancement effects of testosterone, saying:

I feel like [steroid injecting produces] some sort of longevity, sort of enhancement, sort of aesthetic without having to work too much for it [...] It increases your IGF [insulin-like growth factor] levels and sort of has connections to HGH [human growth hormone] levels and all kinds of [things]. It just gives you more of a youthful sort of buffer I think and having high testosterone levels, it does change your brain.

Don uses biomedical discourse to describe the physiological effects of testosterone on the body (such as on insulin, human growth hormone and the brain). Although Michael (Vic, 22) is only 22 years old, he likens the effects of testosterone to that of youth, that is, the experience of being a teenage boy with ‘a lot of testosterone’:

I guess it brings back ... because obviously when you’re sixteen years old, you’ve just got this unlimited drive for [everything], because you’re obviously growing up and you’ve got a lot of testosterone. I guess there was some sort of mimicked feeling in that sense, like I’ve got the energy of like a sixteen-year-old again.

Michael suggests that a higher level of testosterone mimics the feelings of energy, enthusiasm, youthfulness and ‘unlimited drive’ he attributes to younger men. In this sense, this account illustrates the messaging work done by hormones and hormonal accounts of development in the materialisation of steroid ‘effects’ (see Seear, 2013). That is, men’s experience of steroid injecting (making them feel younger and more energetic) emerges, in part, through pre-existing developmental accounts of testosterone’s effects on adolescent boys. Overall, our analysis suggests that quite traditional gendered discourses of testosterone’s effects persist in lay understandings of the hormone, and that these directly shape consumers’ sense of increased physical vibrancy when consuming steroids. As we go on to argue in more detail in the next section, our point here is not to deny that steroids affect anabolic activity or sexual development, but that the sense of a more vibrant physicality described by our participants must be understood not as a simple biological effect but by taking into account circulating discourses of their effects, as well as the pleasures and rewards of enhancing normative masculinity (Latham et al. 2019). Gendered norms and social practices gather testosterone and experiences of vibrant physical effects as much as anabolic activity or biology. It may be that this gathering of vibrant physicality can be more directly acknowledged and addressed in healthcare and health promotion in order to avoid alienating men who consume steroids.

Chemical manhood

As might be expected, testosterone also operates in participants' accounts of steroid injecting as the basis of sexually differentiated behaviour. Men in this study commonly perceived testosterone as enhancing their manliness and virility, often describing it as the 'male' hormone. For example, Cameron (NSW, 36) describes feeling not only 'stronger and more confident' on steroids, but 'more of a man [... because] you have more testosterone in your body'. Similarly, Henry (Qld, 44) explains that 'a normal testosterone level' is 'implicit in being male' and '[having] a male sex drive'. Gabe (Vic, 22) explicitly describes testosterone as 'the male hormone':

Well the male hormone is testosterone. You put more of that in your body – and we already know what males are like with testosterone. So you put more of that in your body and your sex drive is heightened to such an extreme, so it's probably good not to be in a relationship.

Matthew (VIC, 26) makes a similar connection between higher testosterone levels and the desire to 'dominate':

I don't get that nervous, because testosterone gives you that sense of confidence. I mean that's what testosterone does. It's that flight or fight, you know. You get that sort of alpha feel [...] It amplifies your primitive nature, so you start to feel like you've got this person in front of you who you're about to have a sexual encounter with, so in your head, you're the alpha, you dominate, so you feel great.

In these extracts, testosterone is enacted as a simple 'messenger of sex', with sex and gender as biologically constituted. Supplementing the body's testosterone is understood to heighten and amplify putatively natural masculine traits such as sexual assertiveness and dominance. Given the widespread biomedical and cultural conflation of testosterone with maleness and masculinity, and the enduring legacy of hormonal accounts of gender and sexual difference, these descriptions of testosterone-fuelled sexuality and 'alpha' masculinity are hardly unexpected (see van Anders, 2013). They are familiar and have been discussed by other researchers. We do not argue, however, that the relationship between steroid consumption and masculinity is representative of 'masculinity-in-crisis' (see also Keane, 2005; Monaghan, 2001; Moore et al. 2019). Instead, we observe that accounts of the effects of steroid injecting

can be utilised to preserve traditional asymmetrical ideals of sexual difference – particularly through the reproduction of hormonal accounts of the ‘biology’ of masculine dominance.

Importantly, while the expressions of enhanced masculinity described above were treated as biological and natural by participants, they reflect and reproduce distinctively contemporary gendered forms of bio-sociality (see Roberts, 2007) that are intertwined with contradictory exhortations for men to be ‘manly’ and confident while eschewing outwardly aggressive or vain behaviour (Gill & Orgad, 2017; Tanner, Maher & Fraser, 2013). Many participants described the effects of elevated testosterone as including increased assertiveness in social relationships, and especially at work. Don (Vic, 28), for example, explains that steroids give him ‘more security’ in his relationships with others:

I’m not always like this but sometimes I feel more dominant and more assertive and more, you know, goal-oriented. And just not intimidated by the people, you know [...] I feel like I don’t have to compete with other people because I [... already] have this level of testosterone there.

Several participants remarked that they feel more confident at work because of increased testosterone levels due to injecting steroids. For example, Martin (Vic, 26) explains:

What I found with your basic steroid, which is testosterone and some of the milder derivatives [...is that] they make you feel much more confident, and they just enhance what’s already there, okay? So I used to always be the guy at work being shat on by someone [...] and I’d be this close to saying [something], but I’d never say it. I’d be like, ‘okay, just let it go’. I’d be ... walked on. When I started performance-enhancing drugs, people [would] try [to] walk on me, and that shit I was thinking would come out.

David (Vic, 27), who works in construction, makes similar comments in relation to feeling more confident and assertive at work:

An example [of more confidence] might be when I’m at work and I get told off for something that was done, and maybe it wasn’t my fault or there was a reason why a thing was done that way. I felt more confident enough to [say], ‘Hey, no, no, no. This is this, rah, rah, rah’ – explain and say my part.

In short, participants understood the confidence and assertiveness they experienced as a direct result of elevated levels of the ‘male hormone’, testosterone, in the body. We argue, however, that contemporary discourses of testosterone reflect and message current expectations around ideal masculinity, and that this is indivisible from these biological effects. This version of testosterone as a gathering means that the biological and social aspects of the hormone cannot be distinguished in producing more confident and authoritative embodiment.

For most participants, the embodied effects described here are experienced as pleasurable and positive in that they align with contemporary cultural injunctions around gendered self-improvement and confidence (Gill & Orgad, 2017; Latham et al. 2019). As participants suggest above, they experience enhanced normative masculinity as improving social and working relationships, presumably with other men. Our point here is not to suggest these experiences are false or inauthentic, but rather to show how socially and culturally specific norms and practices materialise the body and embodiment in particular ways, and that body projects and drug-using practices such as steroid injecting can have unanticipated, if fundamentally normative, effects such as improved social status for men. As our analysis makes clear, steroid injecting is a practice through which gender and sexual difference are reproduced as biological and ‘natural’, even though the very means, terms and terrain of this reproduction are socially and politically produced.

Managing and gendering the hormonal body

In this final section we explore how, although aligned with normative gender production, testosterone also troubles the taken-for-granted link between hormones and sex–gender embodiment. It does this through its ‘unpredictably destabilising effects on gender attributes’ (Sedgwick, 1994, p. 136). While some participants describe testosterone as enhancing and amplifying ways of being male, other accounts indicate that this relationship is not so straightforward. Some participants describe undesirable effects on mood, particularly in the form of heightened anger and aggression. For instance, Alex (Qld, 38) explained that ‘the main thing with steroids is that sometimes your aggression gets a little bit too much’, while Owen (NSW, 40) described getting ‘a little edgy’ and experiencing ‘a bit of anger’. That participants make links between testosterone and aggression is hardly surprising given the routine associations drawn between testosterone, aggression and violence (‘roid rage’) in

popular culture, media reporting and scientific research (Keane, 2005). What we wish to highlight here is a different and arguably more important point. Although participants in our study observed these ‘effects’, they were not framed as inevitable and did not function to absolve responsibility for behaviour. Instead, for many participants, changes in mood prompted reflection and what might be considered tacit criticism of the conventional masculine traits commonly associated with the powers of testosterone. For example, although Tibor (NSW, 23) described intensified feelings of rage and anger, he also described being ‘aware’ of these changes in mood. He increasingly asked himself ‘is this something that I should really be angry [about] or is it something because of [steroids]?’ Other participants such as Ryan (NSW, 43) expressed concern that injectable steroids ‘were augmenting [his] levels of testosterone’ and making him ‘more aggressive [... and] edgy’. To manage these effects, he stopped using injectable testosterone and switched to a different combination of an oral testosterone and human growth hormone. For some participants, the self that emerged via steroid injecting was undesirable because it too closely resembled conventional masculinity and associated performances of anger, aggression and violence. Hence, while testosterone is sometimes treated as a simple ‘messenger of sex’, our analysis suggests that in the context of steroid injecting, the way it gathers also provokes critiques and disavowals of traditional forms of masculinity.

This increased attention to the body and behaviour is also evident in men’s reports of concern with libido and fertility. Whereas some participants describe the virilising effects of testosterone, others held ‘excess’ testosterone responsible for more ambiguous or paradoxical effects on sexuality. After experiencing erectile dysfunction, Grant (NSW, 25) decided to do a ‘power post-cycle therapy’ to come off his regular regime of testosterone and the drug Deca-Durabolin:

To be honest with you, it was actually a fairly easy transition. Like, can I just be blunt and honest with you? [...] The old fellow [penis] didn’t work very well [laughs]. That’s the best way to put it. As you know, if your manhood doesn’t work, the shit hits the fan.

Fabian (NSW, 22) also experienced troubling effects on his libido, so decided to use smaller amounts:

So, at the moment, [the side effects] are something I'm trying to minimise with low[er] amounts of what I'm using. So the last cycle I probably had very harsh, adverse mental effects. [My] mind was just warped and [I] couldn't see that, but everyone else could [...]. Your sex drive obviously can be affected. Obviously your testicles stop working as soon as you inject an exterior source of testosterone into your body. So that kind of sucks a lot.

For Fabian, issues with his sexual drive and performance are closely related to concerns about 'natural' testosterone levels and normal biological functioning. Other participants also expressed concern about maintaining 'natural' testosterone levels and thereby ensuring their reproductive health and ability to conceive children in the future. As Basil explains:

I'll also get semen testing to make sure that nothing's gone wrong down there because I don't have kids yet, but I'd like to someday. (Basil, VIC, 25)

In these accounts testosterone is understood to 'activate' the body in different ways (Roberts, 2007). Whereas in the comments in previous sections testosterone was understood to amplify masculine qualities such as sex drive and confidence, in these accounts, testosterone consumption is described as threatening the 'natural' production of hormones, sexual performance and, in turn, 'manhood'. While testosterone sometimes messages traditional notions of masculinity and sexual difference, it may also be implicated here in the production of feminised concerns about the management of the 'natural' body and fertility.

Importantly, although 'testosterone's effects' come in many forms and are unpredictable, participants theorise its actions in such a way as to exclude its destabilising effects on gender and sexual difference from its normal purview. How is this achieved? Endocrinological accounts of aromatisation, the chemical process in which testosterone is converted to oestrogen, is one way in which participants preserve testosterone's 'natural' conjoining with maleness and masculinity. As Roberts (2007) explains, when an over-concentration of hormones occurs in the blood, their function may be altered; the hormone may bind to receptor proteins of different cells and these cells may convert the extra hormones into products with other biological effects. For example, she writes, 'androgens may be turned into oestrogens under certain circumstances of excess concentrations' (p. 60). Participants commonly mobilised this endocrinological account to explain destabilising gender effects. According to Phil (WA, 35), the aromatisation of testosterone to oestrogen had 'made [him]

feel a bit more down', while Martin (23, Vic) was certain that the 'roid rage' and high emotions he experienced were actually caused by oestrogen. As he put it, in starkly gendered terms, they made him feel 'like a woman'. Luke (24, WA) also makes the link between testosterone conversion, oestrogen and emotionality, explaining that by failing to do post-cycle therapy, he 'hit zero':

So I had all this oestrogen. I was, like, emotional, I was sort of, like, a female. I was angry all the time. I wouldn't eat, wouldn't sleep.

Here, aromatisation, and more broadly feminised oestrogen, are held responsible for unruly gender(ing) effects, including gynecomastia, emotionality and depression, that do not neatly fit with conceptions of masculinity. In these discussions of aromatisation and oestrogen we can see how 'natural' gendered behaviour and masculinity are carefully and actively 'coordinated' and held in place (Latham, 2016; Mol, 2002; Savic & Fomiatti, 2016). When testosterone's effects are seen to exceed or contradict anticipated or appropriate masculine behaviour, oestrogen (and by extension femininity) is made culpable, helping to preserve established 'facts' about testosterone and maleness. Read together, participants' accounts suggest that higher concentrations of testosterone and steroid consumption are not always readily available as actors in amplifying normative masculine behaviours and experiences. Indeed, these accounts suggest that steroids can act in inconvenient unruly material-discursive ways to destabilise sex-gender attributes, even as they are used to reinforce traditional masculine norms and ideas of sexual difference. Our analysis suggests this is because testosterone is not a stable 'sex hormone' but a gathering that undergoes and enacts transformations.

Conclusion

Testosterone has received little attention in studies of PIED use, despite occupying a central role in public discourse on steroid injecting and in men's practices and experiences of consumption. So-called 'sex hormones,' including testosterone, have long been critiqued in other fields for the ways in which their treatment in science, public policy and popular discourse reproduces unexamined gender norms and stereotypes. Drawing on feminist scholarship that has critiqued biologically determinist notions of the body, we have approached testosterone as a material-discursive entity, a highly political gathering of

technoscience, biomedicine, chemicals, bodies, social practices and cultures, rather than as a stable substance with pre-determined effects. This approach to testosterone has allowed us to explore some of the cultural and social dynamics mediating and motivating steroid consumption.

Our analysis of testosterone suggests that steroid injecting is mediated by and constitutive of traditional notions of sexual difference and gender as biologically determined. As we observed early in the article, testosterone is conflated with masculinity to such a degree that the hormone itself seems masculine: it is figured as inherently active, energetic, powerful and potent. This articulation plays out in men's experiences of steroid injecting, with a more vibrant physicality made possible seemingly through the practice of *consuming* masculinity. Building on this, we explored how exogenous testosterone is seen to enhance masculine traits understood to be natural, such as sexual assertiveness, dominance and confidence. We argued that our participants typically describe these experiences of enhanced masculinity as positive insofar as they are perceived to help them meet cultural demands to be confident and authoritative, perhaps particularly in their sexual relationships, relationships with other men, and at work. Finally, we observed that although the material-discursive messaging of testosterone in practices of steroid injecting may strengthen traditional links understood to determine sex and gender, it also has strangely destabilising effects, eliciting a range of threatening forms of masculinity alongside potentially emasculating experiences of breast growth, sexual dysfunction or diminished fertility. In such cases, oestrogen and narratives of aromatisation often function to 'coordinate' these unruly effects (Mol, 2002) and reframe them along traditional binary gendered lines. More broadly, our analysis suggests that while testosterone is sometimes treated as a simple 'messenger of sex', in the context of steroid injecting, it is also implicated in the cultivation of new critiques of masculinity and attention to reproductive health and the body.

As we have suggested elsewhere, efforts to engage men who inject steroids in harm reduction and healthcare need to be approached sensitively and in ways that address their concerns (Fomiatti et al. under review). We therefore suggest a range of strategies based on these findings. First, engagement strategies and prevention messages may benefit from acknowledging the place of pleasure in steroid injecting. Didactic messages that focus on risks, harms and disorder ignore the lived experiences of many consumers and may be perceived as patronising and irrelevant for many men who report deriving pleasure and

various social and other benefits from steroid injecting (Winter et al. 2011). Second, health engagement strategies could acknowledge that men's steroid injecting is necessarily informed by hormone-related normative masculine ideals (e.g., muscularity, assertiveness and confidence). While these messages are likely not new to those who consume steroids, the explicit acknowledgement of the complex gendered political negotiations informing *all* health practices has the potential to positively intervene in more individualising accounts of steroid use that suggest these men have disordered or irrational relationships to their own bodies. Finally, given our discussion of the variability in testosterone's effects and the role of higher concentrations of testosterone in disrupting normative masculine attributes and experiences, health engagement strategies could clarify and emphasise this diversity in experience, including effects beyond those usually highlighted as 'risks' or 'harms'. In sum, as our analysis shows, testosterone is a gathering of unstable and multiple messages and effects, all performed in and through normalising discourses of gender. Acknowledging the gendering social dynamics of steroid injecting, treating testosterone as a gathering and considering the ontological politics of its effects in the ways discussed here, can directly inform health promotion efforts aimed at men who consume steroids.

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