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Editorial

Human enhancement drugs: Emerging issues and responses

It can be argued that there are no 'enhancement' drugs *per se*, for enhancement is not an objective property of any drug but rather a meaning assigned to the drug on the basis of the expected effects of that drug. Thus all drugs could be enhancement drugs if deemed to be, for the definition of enhancement depends on the meaning we, as a society, give to the drugs' effects. If a drugs' effects are deemed to be detrimental that drug may be considered a 'poison' or 'toxin'. If the effects of a drug are deemed valuable or beneficial, and the drug is used to restore or sustain 'health' or 'normality', the drug may be deemed 'therapeutic' or a 'medicine'. If the effects of the drugs are experienced as beneficial but those benefits are not seen as necessary to restore or sustain health, these drugs may be deemed 'recreational' (if the drug is used primarily for 'pleasure') or 'enhancing'. Whether or not drug use is considered enhancement depends in large part on our definition of 'normality', and on what we, as a society, value. The term 'enhancement' refers to changes that are considered to be in a positive direction, that is, they are 'improvements' or changes that are viewed as increasing value, and that alter an individual to a state which society has deemed above 'normal'. Enhancement is commonly defined by bioethicists as "*interventions that are used to improve human form or functioning beyond what is necessary to restore or sustain health*" (Juengst & Moseley, 2019). However, whilst there are established definitions of 'health', such as the WHO "*Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity*", these are typically broad and so open to interpretation (e.g. is it merely repair and maintenance or does it include enhancing well-being?) which makes enhancement challenging to define.

This is, of course, not a new debate, as throughout human history substances have been used for many purposes; from therapeutic and medicinal use, through use to maintain and improve functioning, and for their psychoactive properties, stimulating feelings of pleasure (McVeigh, Evans-Brown & Bellis, 2012). These 'categorisation' of types of drug use are dynamic and often blurred. Furthermore, categorisations of use are frequently mapped onto the drugs themselves so that certain drugs may be regarded as 'therapeutic', others 'recreational' and yet others 'enhancing'. But these categorisation are problematic as drugs can have a range affects that result in multiple reasons for their use. Amphetamines, which are frequently deemed 'recreational drugs', can certainly be used for pleasurable effect, but they can also be used for enhancement purposes such as for weight loss due their effect on appetite (Heal, Smith, Gosden & Nutt, 2013; Mooney et al., 2017). Furthermore, anabolic androgenic steroids (AAS) are therapeutic drugs with clinical uses, but when used for "off-label" purposes or outside of clinical settings they are categorised as 'image and performance enhancing drugs'. This boundary is further complicated by the fact that AAS may be used for pleasure (Mulrooney, van de Ven, McVeigh & Collins, 2019) and therefore may be seen as 'recreational', and also for self-directed therapy and therefore may be deemed "therapeutic" but also "off-label".

Historically much of the research and discussion around drugs has focussed on the use of drugs that is seen as most acceptable: therapy. Beyond this therapeutic use of drugs, most discussions have revolved around the 'recreational' use of drugs, specifically the 'psychoactive' drugs that are used for their pleasurable effects. This 'recreational' use is often viewed as being a 'less acceptable' purpose, in part because it is considered to pose high risks to the individual user of the drug, and to society at large. For similar reasons the acceptability of enhancement drug use is called into question, yet the use of these drugs has historically received much less attention. However, in recent years there has been a growing body of research that has sought to engage with and better understand people who use drugs for enhancement purposes. So, while we may still be at an early stage of defining and characterising the taxonomy of human enhancement drug use, we have a growing understanding of the varied use of drugs for enhancement, their effects, harms, benefits and the populations engaging in their use (van de Ven, Mulrooney & McVeigh, 2020).

Key features that distinguish the use of drug for 'enhancement' from other categories of drug use is the motivation for drug use (i.e. to improve the individual to a state beyond 'normality') and the context of use (i.e. in situations where drug use is not deemed necessary to achieve health or 'normality'). In this collection, *Human enhancement drugs: emerging issues and responses* we present articles which not only describe the diversity of enhancement drugs use among varied populations, but also explore the problems with the categorisation of certain drugs as 'enhancement drugs' by illustrating the range of motivations of use for these drugs.

Motivations for use of 'enhancement drugs'

While the use of drugs for human enhancement is a long-standing phenomenon, it has most commonly been described among those who engage in sporting activities, in particular elite-level sport and bodybuilding (Kanayama & Pope, 2018). However, as this collection illustrates, drugs can be used with the aim of enhancing many aspects of life - appearance, performance and functioning – e.g. building muscle, stimulating creativity, improving cognition and functioning, increasing stamina and improving/enhancing sexual performance or pleasure. In recent years there has been increasing concern about the use of these substances for aesthetic enhancement and to improve educational performance, as well as emerging patterns of enhancement use, such as micro-dosing with psychedelics. There is also a growing recognition of

the potential harms that can arise from the use of drugs for human enhancement (Baggish et al., 2017; Kanayama, Brower, Wood, Hudson & Pope, 2009; Pope et al., 2014). Alongside this there is now a better understanding of the pleasure derived from this form of drug use, often through the delayed gratification due to the functional purpose of the drug but also (in particular regarding drugs used for sexual performance) the immediate sensation of pleasure and satisfaction (Pienaar, Race & Lea, 2020).

Over the last decade or so there has been much interest in the use of drugs to enhance sexual performance, with much of this research focused on gay and bisexual men, and in particular the 'chemsex/Party & Play (PnP)' phenomenon (Guerra, Salway, Beckett, Friedman & Buchan, 2020; Hibbert, Hillis, Brett, Porcellato & Hope, 2021). Yet the use of drugs in the context of sex is likely to be common across wider communities (Evers et al., 2020; Lawn, Aldridge, Xia & Winstock, 2019) with drugs used in various ways including for disinhibition, and to improve attraction, sexual performance and stamina. Moyle, Dymock, Aldridge and Mechen (2020) in this collection explore experiences of what they term 'Pharmacosex' amongst a diverse sample. Their mixed methods study utilized virtual ethnography and interviews with people with a range sexual and gender identities. They found that sex-related drug use encompasses a diverse range of practices and had varied meanings for those involved. They identify the need for a more expansive approach to understanding sex-related drug use that goes beyond biomedical based conceptions of sexual enhancement.

The use of drugs to enhance performance occurs across many domains, including for example use to enhance physical performance during work or study. In this collection, Dumbili, Gardner, Degge and Hanewinkel (2021) explore the informal use of prescription drugs in Nigeria in the context of enhancing performance among young adults focusing on their role in work and education. The authors note how the effects of these drugs may be related to culturally-based expectations of their effect in a setting were self-medication and use of informal healthcare are common.

During the last decade there has been increasing concern around the use of drugs to enhance cognitive performance, particularly in relation to educational performance (Franke, Bagusat, Rust, Engel & Lieb, 2014; Sharif, Guirguis, Fergus & Schifano, 2021). In this collection, Petersen, Petersen, Poulsen and Nørgaard (2021) examine how posts on the social media platform 'Instagram' about study drugs impact there use, whilst in their two discussion pieces Walsh (2021) and Mann (2021) explore ethical and philosophical issues around the enhancement of human cognition. Walsh draws on Egalitarianism and Rawlsian Prioritarianism to consider what these contemporary theories of justice might tell about the political legitimacy, or lack thereof, regarding doping for intellect. Ultimately, he suggests that so long as there is universal access to these drugs and existing injustices are not compounded, then the enhancement is not necessarily morally objectionable.

Whilst AAS are primarily used for the enhancement of performance or image, evidence for other motivations, particularly therapeutic motivations, is emerging, calling into question their classification as 'enhancement drugs'. Two papers in this collection address this topic. Underwood, van de Ven and Dunn (2021) explore the use of AAS to self-medicate low testosterone through an ethnography of online enhancement communities (i.e. forums and social media groups). They found self-medicated testosterone replacement therapy (TRT) regimes to be very similar to TRT as practised in clinical contexts. Although self-medication was often practised because of an inability to access TRT through the healthcare system, some preferred self-medication due to cost, access, and reliability, and concerns about perceived lack of expertise amongst health practitioners. This therapeutic use of AAS was found to have a complex relationship with the use of these drugs for enhancement purposes. Another therapeutic use of AAS, to reduce the effects of aging, is explored by Dunn, Mulrooney, Forlini, van de Ven and Underwood (2021) in their commentary on the 'pharmaceuticalisation' of 'healthy' ageing. They explore how society responds to enhancement for longevity with a specific focus on testosterone and testosterone deficiency, and what this may mean for an increasingly ageing society looking to improve not only lifespan but 'healthspan'. Together these papers indicate the boundary between the use of drugs for 'repair' and enhancement is unclear and requires further exploration.

Therapeutic use of enhancement drugs is further explored by Mulrooney, Collins and Darkes (2021) in their essay on the use of testosterone treatment for body dysmorphia. They explore the current barriers to this in the context of medically-sanctioned testosterone administration for other conditions, specifically, gender dysphoria. They argue that the disparate approaches may be understood, in part, as an example of a bias reflecting the selective pathologizing of AAS use, socio-cultural evolutions in gender identity and expression and, more broadly, the manner in which culture defines disorder and its appropriate response.

One of the motivations for the therapeutic use of enhancement drugs, such as self-medicated TRT, is a lack of faith in health professionals who are seen as lacking knowledge. Improving the understanding of healthcare workers and their relationships with people who are using, or who have a desire to use, enhancement drugs is likely to be core to effective responses to the use of enhancement drugs. Responses to the use of enhancement drugs are currently limited, typically related to providing information and advice or access to clean injecting equipment for those who inject. There have been few interventions outside competitive sports settings or doping control and a distinct lack of rigorous evaluation of interventions across the field of enhancement drugs as a whole (Backhouse et al., 2015; Bates et al., 2019). Key to the delivery of effective responses and support to those using these drugs for enhancement is adequate and accurate knowledge and understanding amongst those healthcare workers who come into contact with this population. Atkinson et al. (2021) in this collection explore an intervention designed to provide training to health professionals and examine the challenges in doing so. Their findings highlight the importance of including the voices of both healthcare professionals and those using enhancement drugs in the development of interventions.

Populations

The use of drugs for muscular enhancement, particularly the use of AAS, is arguably the most studied aspect of human enhancement drug use, in part due to its historical association with doping in sport. AAS use outside of sport has been predominantly studied amongst men. Whilst AAS use appears to be much more common among men than women, AAS are still used by a substantial number of women. Although women's bodies are at a significantly greater risk of harm from AAS use, very little research has focused on women's use of AAS. Havnes, Jørstad, Innerdal and Bjørnebekk (2021) in this collection, examine the experiences of women using AAS. Through qualitative interviews with women they explore their use of AAS and its impact. They note the need for gender specific information on AAS use, as women who use AAS are at risk of developing irreversible masculinizing effects. These effects can negatively influence self-esteem, social life and sexual function, both during and after use, which can be difficult for those affected to process.

Use of drugs to enhance image and performance spans all population groups. While the use of AAS has been studied among gay and bisexual men (Bolding, Sherr & Elford, 2002; Griffiths, Murray, Dunn & Blashill, 2017) there's been little exploration of the use of drugs to enhance image and performance more widely across lesbian, gay, bisexual, trans and queer (LGBTQ+) populations. In this collection the use of image and performance enhancing drugs among both men who have sex with men and women who have sex with women is explored by Hibbert, Brett, Porcellato and Hope (2021). They find that in both groups the use of these substances is associated, not unsurprisingly, with body image issues. However, their use is also associated with sexual activity, satisfaction and risk. The use of drugs for enhancing sexual performance is well-established amongst sub-groups of the LGBTQ+ communities (Guerra et al., 2020; Hibbert, Hillis, Brett, Porcellato & Hope, 2021) and the use of

drugs to enhance body image in this population might in part be related to this use of drugs for enhancing 'performance', particularly sexual performance and attraction.

Range of drugs used for enhancement

The range of drugs being used for enhancement is increasing, with new substances often first emerging among groups already using established enhancement drugs. The use of drugs for muscular enhancement has typically centred on the use of AAS and associated drugs, however the use of a range of other substances has also emerged amongst the enhanced bodybuilding population over the last 35 years. McVeigh, Salinas and Ralphs (2021) in their commentary explore the emergence of a number of substances and how they have then diffused to become more widely established in other groups. They argue that the collaborative monitoring of this influential population could be key to recognising, interpreting and responding to emerging patterns of drug use before their diffusion to wider, sometimes vulnerable populations.

Those aiming to enhance their musculature often use a range of drugs other than anabolic agents for ancillary purposes, such as, to reduce body fat or give the skin a tanned appearance (Sagoe et al., 2015). These image enhancing drugs have also used been adopted by non-AAS using populations. An example, is the use of 2,4 dinitrophenol (DNP) to increase weight loss by 'burning fat' this is explored in this collection by Germain, Leavey, Van Hout and McVeigh (2021). Their study of online forums found that the use of this 'fat burner' by men and women was perceived very differently. In these online settings, whilst men were viewed as the 2,4 dinitrophenol experts, women who used were often marginalised. Subsequently, the authors suggest that women using DNP often do so without any 'real world' support and that, in the absence of gender specific harm reduction advice, women are reported to be accepting DNP advice and practices circulating in male-dominated settings with potentially fatal consequences.

The final items in this collection explore emerging issues related to the 'boundaries' between the different purposes for which drugs are used. Firstly, Liokaftos (2021) explores the issue of the microdosing of psychedelics, a recently recognised 'enhancement' drug use practice that is increasingly gaining attention. He maps out directions for further sociological investigation to better understand this phenomenon, where small doses of psychedelic drugs are taken to enhance performance particularly creativity and productivity.

In their qualitative study of people using a diverse range of substances, Askew and Williams (2021) explore the meanings and motivations around substance use. They conclude that the 'enhancement' concept of drug use has much wider applicability, and argue that all substance use could be framed as providing enhancement or achieving self-improvement. Such a reframing of use would, they argue, destigmatise substance use.

Closing thoughts

As there can be multiple reasons, for the use of a drug, the 'categorisation' of the use of that drug can thus be blurred. For example, a type of drug that can be used for 'enhancement' may also have therapeutic uses. However, simply pointing out that drugs can have both therapeutic and enhancement uses does not render this distinction meaningless, or imply that these different uses do not warrant different ethical and policy responses. The complexities in the categorisation of the use of different types of drugs, are not merely matters of academic debate, but have a real impact on lives as they determine the social acceptability of drug use, and the level of support we provide to those who use drugs, as well as whether professionals develop, manufacture, and provide the drug. While our understanding of drug use for enhancement and its relationship to other forms of drug use is still emerging, a common feature across all the papers in this collection is the need for meaningful engagement with the diverse populations of people who use drugs for 'enhancement', to better understand these issues, and develop interventions and support where needed.

Declarations of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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