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The supply of steroids and other performance and image enhancing drugs (PIEDs) in one English city: Fakes, counterfeits, supplier trust, common beliefs and access

Abstract

As with other illicit drugs, such as heroin or cocaine, illicit steroids and other performance and image enhancing drugs (PIED) have for some time been assumed to involve an inherent degree of danger and risk. This is due to the unknown and potentially dangerous substances present in them; fakes and counterfeits are of particular concern. Many of these ‘risks’ are unknown and unproven. In addition, a tendency to abstract these risks by reference to forensic data tends to negate the specific risks related to local PIED markets, and this in turn has led to much being missed regarding the broader nature of those markets and how buyers and suppliers interact and are situated within them. This article reports on research that sought to explore each of these issues in one mid-sized city in South West England. A snapshot image is provided of what the steroids and other image or performance enhancing drugs market ‘looked like’ in this particular city in 2013: how it operated; how different users sought out and purchased their PIED; the beliefs they held about the PIED they sourced; and the methods they employed to feel confident in the authenticity of their purchases. A forensic analysis was undertaken of a sample of user-sourced PIED as a complementary approach. The results showed almost all of these drugs to be poor-quality fakes and/or counterfeits. The level of risk cannot be ‘read off’ from forensic findings, and poor-quality fakes/counterfeits cannot simply be considered an attempt to defraud. Users believed they had received genuine PIED that were efficacious, and employed a range of basic approaches to try to ensure genuine purchases. Many, if not

most, transactions at the 'street' level were akin to 'social supply' rather than commercial in nature.

Keywords: doping; social supply; dealing; GC-MS; black market; counterfeit; fake; performance enhancing drugs.

1. Introduction

1.1 Background

As long ago as 1991, Strauss and Yesalis [15] claimed the non-prescription steroid and other PIED market to be increasingly besmirched by fakes and counterfeits and moreover, because these PIED were often being injected, these represented a real danger to those using them. Some years later Lenehan [15] suggested that the ‘majority’ of PIED purchased by users were likely to be fakes and carried meaningful public health consequences. These concerns, about the public health risks of ‘fake’ or counterfeit PIED, are similar to concerns historically voiced about the ‘dangers’ contained in most illicit street drugs, particularly injectables, regarding dangerous cutting agents or substitutes/fakes. The equation of fake/counterfeit = danger/risk however should not be taken as a simple given.

In Coomber [1, 2, 3, 4, 5, 6] and later in Cole et al [7], it was established that nearly all that is believed about the ‘cutting’ of illicit drugs such as heroin, cocaine, ecstasy and other street drugs is mythical and/or misunderstood. Such substances are not ‘cut’ or ‘stepped on’ (adulterated/diluted) by drug dealers with dangerous substances such as rat-poison, brick-dust, ground-glass, talcum powder or scouring powder, and street drugs such as heroin and crack are not ‘cut’ down through the chain of distribution as is commonly supposed. Nor are they routinely cut at any stage. Adulteration does occur, but this is almost always purposive, mostly happens prior to importation and is usually done with either comparatively benign substances (compared with the main drug) or with substances that mimic or enhance the drug being supplied. So-called ‘fakes’ or substitutes are supplied to unsuspecting customers on occasion, but this is often either a direct attempt to simply defraud – for example, individual wraps sold by street dealers to transient buyers rather than buyers known to them [cf. 8] who might seek recompense – or, in the case of ‘pills’ (e.g. PMA in place of MDMA), it is either unknown to the seller (most likely) or, if known, is an attempt to supply something close to the desired product during a time of scarcity of the desired drug. For illicit street drugs, trust is a key criterion for users when they are choosing their source, and an attempt to protect against ‘rip-offs’ and ensure (to some extent at least) quality or reasonable potency [9, 10, 11]. The health risks assumed to be inherent in non-

genuine street drugs, while clearly not an unimportant concern, are non-the-less often unreasonably exaggerated on the basis of assumption rather than evidence, as is the case with so many drug market-related fears [12].

As with other street drugs, it is the controlled or prohibited nature of PIED use that produces a black market. In black markets, supply to users takes place in clandestine contexts, which means that products usually have little or no formal quality control to protect consumers and ensure that what is sold/purchased is authentic. Essentially, ‘the rise of the “black market” sources brings with it a host of risks, from poor quality doping products to a general “hardening” of the market’ [16: 239]. To date, however, despite the solid body of evidence developing on the black market of illicit drugs, there has been little focus on either the nature of the black market for PIED or supply-side dynamics [18, 16]. This is especially true for the market intersection with those non-elite athletes mainly engaged with PIED for body and image enhancing purposes.

1.2 Sourcing PIED internationally

A report by the UK Advisory Council on the Misuse of Drugs (ACMD) in 2010 [19] reviewed data suggesting that the illicit market for PIED has three basic sources: (1) products manufactured ‘legitimately’ in middle-income countries (for example, China and India) where regulatory oversight is weak; (2) products manufactured/packaged in ‘underground’ laboratories where quality and safety is not demonstrable (or guaranteed); and (3) legitimate products manufactured in high-income countries and bought either legally or illegally. The contribution of each source to the overall market is unknown.

The picture is further complicated in the sense that, although PIED are strongly controlled substances in many jurisdictions, they are nonetheless legal in some. Also, the addition of new products – and therefore new laws – complicates the legal standing of some substances [20]. This means that the production and distribution of PIED worldwide is in fact a ‘semi-legal’ market [21].

Where non-prescribed use and non-licensed distribution of PIED are illegal, however – as in the non-sporting world – common assumptions are made about the drug market that tend to an over-homogenisation of what it looks like [cf. 22]. In general,

the ‘street drug’ market is stereotypically thought to be controlled from the top down by organised crime and characterised by control through endemic violence and intimidation, the use of predatory tactics and the drive for profits [16]. This view has now largely been discredited, and drug markets and the people operating within them are increasingly seen as highly diverse [22, 23], although the traditional view continues to drive much enforcement policy [24].

Further, in this vein, from research in Belgium and the Netherlands, Fincoeur et al. [17: 240] argue that, despite the widely held belief that ‘mafia type’ organised crime and commercially/profit-driven dealers control the supply of PIED, this is both ‘empirically unsubstantiated’ and contrary to the emerging evidence [see also 21]. This should not be a surprise, as emergent concerns around doping in the sporting world have long mirrored (despite lagging behind and taking a policy lead from) the fears and misconceptions about street drugs from the non-sporting world [13]. Moreover, and as we shall see from the research presented here, Fincoeur et al. [17] point to a non-elite PIED market that is often closer to that of social supply or minimally commercial supply [25] and a normalised supply [9] than to ‘Mr Bigs’ or a market saturated with commercially orientated dealers.

1.3 The social supply of illicit substances

Rather than understanding ‘the’ drug market as a single entity, it is helpful to understand that there are often multiple drug markets (heroin/cannabis/‘pills’, etc.) within any one geographical area, and that these markets will sometimes overlap and intersect but at other times they will not [26, 22]. Even within a single drug (e.g. heroin and crack) market, there can be numerous types of supplier and the market can operate on different levels, with each of these levels manifesting different market-related activities such as violence and intimidation to different degrees. Some groups will be violent, while others will not. Middle-class suppliers, women suppliers, youth-friendly suppliers, club-goers with a ‘designated buyer’ for the next night out, heroin user-dealers, young ‘runners’, female drug ‘mules’ and so on all differ meaningfully from the stereotype of a drug dealer. Overall – especially among those who broker and supply to/for/from friends – these variations from the stereotype of a drug dealer numerically dominate in the current milieu [23].

As mentioned above, while it is a common assumption that PIED markets are stereotypically ‘top-down’, essentially controlled by drug dealers, this is not borne out by emerging research. Research, including this current study, continues to demonstrate that meaningful levels of social supply are commonly present. Social suppliers, or minimally commercial suppliers (because most supply transactions involve some level of ‘profit’ – such as getting drugs for free) are less motivated by commercial gain [25] than ‘dealers proper’. In a micro social context, where their own drug use is relatively normalised, it is easy for some users to drift into supply and for them to neutralise the idea that they are ‘dealers’ because they supply only/mainly to friends and acquaintances [20], often for altruistic reasons. Many of Fincoeur et al.’s [17] samples of local PIED users (bodybuilders and recreational weight trainers) in Belgium and the Netherlands, for example, didn’t see themselves as ‘real’ dealers and saw their activity simply as part of everyday life. Analogously, in Plymouth, many PIED injectors also collect needles for other peers from needle exchanges and supply those too. Needles are free and legal, but some PIED users prefer not to engage with services and those that don’t mind doing so help out their peers in this way. Doing similar with PIED is an extension of these peer related activities. Fincoeur et al. [17: 37] also found that, in addition to PIED, many of their suppliers also supplied knowledge and information on how to use PIED and other helpful advice (e.g. nutritional or medical), and received kudos/status in return. The relationship was reciprocal in ways that went beyond simple economic exchange and economic incentives appeared to be a minor motivational factor for supplying PIED for many.

1.4 Legislative controls

Legislative controls help frame the ways in which markets manifest. In the United Kingdom, for example, anabolic steroids are Class C drugs under the 1971 *Misuse of Drugs Act*. On presentation of a doctor’s prescription, they can be sold by pharmacists. While possession for personal use is legal, the manufacture, supply or intent to supply steroids without a license is a crime. This includes the giving or gifting of steroids to friends. These offences carry a maximum penalty of 14 years in prison and/or a fine. In April 2012, it became illegal to import steroids into the United Kingdom via post, courier or other freight services. Steroid users can still travel abroad to purchase steroids for personal use only and bring them into the United

Kingdom [27]. These constraints, plus relatively buoyant demand, create the context for illicit supply and clandestine markets.

A large-scale study of EU Member States' regulatory and legal frameworks with regard to PIED [28] found that both broader street drug legislation and specific legislation providing criminal sanctions against doping in sport applied in 19 Member States. An even larger international study [29] of over 50 countries found that legislation and regulatory frameworks were complex, and varied dramatically in their interpretation and adherence. For example, in Denmark, the supply and use of PEID was under PEID-specific legislation, while in Greece it was under general sports legislation [29]. Typically, in countries where general drug legislation covered the use and supply of PEID, penalties were more severe [29]; however, this was not always the case.

Hermansson [30] has previously noted that PIED at the end of the 1990s and early 2000s could be bought without prescriptions in most countries in Asia, Africa and South America, and that most anabolic steroids seized in Sweden and Finland originated from Spain, Russia, Greece, Turkey, Egypt and Thailand. Somewhat surprisingly, both Sweden and Denmark were considered to be the source of a number of popular black market PIED. An increased prevalence of counterfeit PIED being manufactured illegally in Russia and being smuggled into Finland and Sweden was also reported [30].

The situation, therefore, is that there are many authentic and (variously) inauthentic PIED being produced and supplied to PIED markets around the world and that this has been the case for some time. It has also become clear that that, for non-sporting users in countries such as England [31], Australia [32], Germany [33], the United States [34, 35], Belgium and the Netherlands [16], supply for most is essentially via the black market as opposed to medical prescription or bona fide pharmaceutical sourcing, and as such there is a question mark over exactly what is being supplied.

1.5 The forensic evidence

There are a limited number of studies that have examined the composition of anabolic steroids and other PIED obtained from the illicit market [14]. One of the first studies

of this kind was from Walters et al. [36]. They found that the anabolic steroids tested were either under- or over-strength (to what was listed on the packaging or labels), and thus likely to be counterfeits produced with unreliable methods. Musshoff et al. [37] found that 15 of 42 (35%) products from the black market in Germany did not contain the expected ingredients. More recently, Graham et al. [38] found 42 per cent of 57 tested substances to be counterfeit, with what was stated on the label often being different to what was contained in the substance. Similarly, this time in Germany, Thevis et al. [39] found that 18 out of 70 (25.7%) (mostly) anabolic steroids contained ingredients different from those listed on the packaging.

A further study from Germany [40] yielded similar results with only four of 11 confiscated black market products containing the substance and amount declared on the label. Showing consistency across borders a recent Italian study [41] found that only two of 15 pharmaceutical preparations seized by authorities contained the content stated on the labels. In each of the other cases, either no PIED were present at all or steroids different from those listed on the labels or different amounts from those declared were found. In Belgium, Coopman and Cordonnier [42] found 25 of 74 (34%) black market products used by bodybuilders did not match their labels. Read differently, though, two-thirds *did*.

More comprehensively, in Brazil, of 2,818 anabolic products seized by the Brazilian Federal Police Department [43], 32 per cent were found to be counterfeit, with only half of those containing the listed substances. Interestingly, and demonstrating the levels of variance, approximately 99 per cent of the clenbuterol tested were genuine.

Overall then, the forensic picture is one that has long suggested huge variations in what can be found in the PIED black market internationally. In many respects, the variations greatly exceed those found in the illicit street marketplace, where potency or purity, rather than fakes/counterfeits, is the primary issue.¹ The variation suggested by these studies is such that, for many users, unless their source is somehow direct or

¹ Especially with regard to heroin or cocaine. In times of shortage, substitute drugs that have similar effects are sold in place of the requested drug, but even the seller may not be aware of this. PMA, for example, has often been found to be substituted for MDMA (ecstasy), sometimes with fatal consequences.

diverted from bona fide medical supplies, they cannot know whether the PIED they use is under- or over-strength, whether it is the product they expected, or whether it even contains any PIED at all.

1.6 The possible health consequences of inauthentic PIED

That the composition of anabolic steroids from the illicit market is largely unknown is only just beginning to be understood by those in the health and medical fields [14, 44], and the evidence base in this area is still limited. Counterfeit or sub-standard PIED and/or PIED produced in substandard conditions could affect health in a number of ways. Substandard production methods or conditions can lead to over- or under-strength preparations, the use of products that themselves may have been produced in substandard conditions, the use of unreliable product to make a further unreliable product, the risk of contamination with foreign matter that poses health risks and so on. Hence, further knowledge is required in this area but purposeful investigation is currently largely lacking.

Previous general research on PIED has shown that the use of anabolic steroids can have a range of adverse effects [45], such as growth-suppressing effects on young adults [46], and that high and multi-doses can lead to serious organ damage, reduced fertility and gynecomastia in males and masculinisation in women and children. There is also a range of other effects that can result, including hypertension and atherosclerosis, blood clotting, jaundice, hepatic neoplasms and carcinoma, tendon damage, psychiatric and behavioural disorders [47]. The use of anabolic steroids can also increase the risk of sudden cardiac death (SCD), myocardial infarction, altered serum lipoproteins and cardiac hypertrophy [48].

None of the above health risks is inevitable, and they are, for the most part, dose and administration dependent; however, huge (unintentional) variation in what and how much is being used due to the vagaries of the PIED market is not a framework for a considered and reliable approach to safe PIED use. While of genuine public health concern, it is also important however not to unreasonably exaggerate the risks from impure and inauthentic substances without a genuine evidence base, as was long the case in the world of street drugs [6].

1.7 Notions of inauthenticity

To date, the evidence relating to authenticity in the PIED market has been considered primarily from a forensic science perspective, as was the case with street drugs for many years [cf. 1]. In this way, the findings of ‘difference’ (less/more than stated on label, different compounds, sometimes stated ingredients substituted for others) are represented as essentially fake and, by extension, ‘dangerous’. This perspective tends to fetishise forensic views of what inauthentic means and thus tends to reproduce the ‘problem’ as proving the dangers of not knowing what you are buying, as previously happened with drugs such as heroin and ecstasy without critical evaluation. More reflective reasoning engaging sociological and cultural understanding of the process of drug production and supply can situate the problem somewhat differently and re-evaluate the risks in this light. The evidence from Thevis et al. [39], for example, shows that genuine PIED are often bought but that these are not quite what was being ordered. The market is mixed in what is actually supplied and inauthentic substances will present different risks and many of these will not be necessarily high risk nor the product of cynical acts. In terms of what the ‘problem’ really is, there is currently too narrow an approach to both situating forensic evidence and extrapolating health risks from it and this represents a problem in terms of how research addresses PIED markets going forward in this regard.

In addition to the relatively scanty knowledge about what supplied PIED really contain, little is also known about how specific local PIED markets work, how users navigate their way through PIED markets, how local markets compare with local markets in the minds of buyers, and how buyers believe they can discern between authentic and fake or inauthentic PIED, and as a consequence ensure they receive the PIED they desire. This article reports on research that sought to explore all of these issues in one mid-sized city in the south-west of England – Plymouth. What is provided here is a snapshot image of what the PIED market ‘looked like’ in this particular city in 2013: how it operated; how different users sought out and purchased their PIED; the beliefs they held about the PIED they sourced; and the methods they employed to [try to] ensure genuine purchases; and finally, what a sample of PIED sourced from local users/suppliers actually contained.

2. Methods

2.1 Introduction

Local drug and alcohol service commissioners in the UK city of Plymouth were keen to gain insight into how local PIED users interacted with the PIED market so that they could better understand how PIED users' beliefs and behaviours impacted on health risks, and thus how they might better shape service provision. They also wanted to know what risks were presented by locally available products.

The approach employed was that of rapid appraisal (RA), a (usually) mixed-method form of research that aims to quickly gather information regarding a particular (often local) issue in order to make an assessment of how the issue might be addressed in an evidenced-based manner [22]. In the 'drugs field', it has been strongly associated with harm-reduction approaches, governance and policy responses, and this was also true for this research. In 1998, the World Health Organization published its guidelines on RA in the field of injecting drug use, where RA was both commended and recommended on the grounds that it was rapid, investigative, draws upon extant data and can be applied to a multiplicity of concerns in both developed and developing countries [49]. RA has been commended for its multi-method approach of data collection, in its use of and triangulation [50] of a range of data sources [51].

2.2 Mixed-method, multi-‘agency’ approach

A variety of methods were employed in order to provide a profile of the Plymouth PIED market. These methods were in keeping with the principles of RA and were applied within one key service delivery agency in Plymouth and a number of local gyms. These mixed methods were mostly qualitative in design/application, but samples of PIED were sourced from users and suppliers, and forensic data was also produced and analysed.

Purposive sampling was utilised and a total of thirty-two participants volunteered to be interviewed. Snowing balling was also used to recruit participants via PIED users who were informed about the project via the local service provider and gyms. The thirty-two research participants that engaged in semi-structured interviews consisted of:

- 25 local (current or recently ex) adult problem/injecting PIED users (eight of whom were ‘social suppliers’ within this local PIED market)

- four local gym owners/managers
- three local ‘commercial’ PIED suppliers

Access to local arrest and forensic data regarding PIED was also used to inform the approach. For the forensic analysis, 19 different samples of local ‘street’ PIED were sourced from two key persons (one a supplier, one a well-placed user) of which 10 were analysed using gas chromatography-mass spectrometry (GC-MS) and reported on.

2.3 Ethical approval

The research had ethical approval from the University of Plymouth, Faculty of Health, Education and Society Research Ethics Committee.

3. Findings

A further article (currently in preparation) will focus on PIED users’ motivations for PIED use; the ways in which they used them and why; the health problems they experienced; the risks they perceived, and the harm-reduction strategies they employed (and/or did not employ).

This article focuses on one local UK PIED market, how it was perceived by the users and suppliers who interacted with it and how they strategised to ensure that they were getting what they wanted from it. Forensic analysis of locally sourced PIED is reported on.

3.1 Demographics of the sample

Of the 25 participants in this study 24 were male (95%) and 1 (5%) was female. Ninety per cent described themselves as ‘White British’ (n=23), 5% per cent as mixed race (n=1) and 5% as another ethnicity (n=1). Respondent’ ages ranged from 20 to 44 years, with the average age being 31 years, and just under half of the respondents were unemployed (n=11), while 8 (36%) were in employment and 3 (14%) were students.

3.2 Plymouth’s PIED market: Access, sales, purity and fakes

3.2.1 A broad overview of the Plymouth PIED market

One of the key respondents in the study was a professional/competition body-builder who was also a Plymouth gym owner. He also supplied/sold PIED to body-builders, provided 'harm-reduction' information and showed those that requested it how to inject (he had been a trained nurse in a 'previous life'). He also provided most of the samples that were tested for the project. He was very willing to be interviewed, was comfortable being open about the sales of PIED he made and how he sourced them, and was almost of the opinion that even if arrested little would happen to him because it was a non-serious offence. If not exactly an advocate of PIED use, he believed that informed use of PIED by sensible users should not be an offence, nor should access to these substances be unreasonably limited. He was open about the local supply and use scene and was keen to know what the PIED he used/supplied contained. To this end, and over a period of time, he provided PIED samples to the project. Other key persons were two other gym owners (one a recent ex-supplier of PIED himself) and a close companion of a high-profile internationally renowned PIED-using body-builder. The latter was well connected and confident that his (Anonymised Northern English City - based) sources provided him with genuine PIED (which he provided to the project) superior to that sourced in Plymouth.

The broad picture provided by these key persons revealed a relatively small commercial PIED market in Plymouth. Three or four main commercially motivated suppliers from outside Plymouth were said to be involved; they then supplied to others, like the gym owner described above, who we might see as a hybrid between street dealer and wholesaler. One local 'taxi driver' was pinpointed as a key link from outside Plymouth at the wholesale level to the Plymouth scene/market. Broadly, most key persons described a historical context of supply of PIED, not just in Plymouth but in the United Kingdom generally, where gyms/gym owners were the traditional suppliers. In Plymouth, this context remains in part but the growth of PIED use – like the growth in prevalence and *relative* normalisation of other illicit drugs [cf. 9] means that there has been a broadening out of supply – for example, connected users supplying friends and other acquaintances. This 'social supply', as will be discussed below, is arguably quite different from the kind of commercial supply of 'dealers proper' [25] and, paralleling some parts of the broader illicit recreational drug market, most users appear to source their PIED from 'connected friends' – or (in the case of PIED) co-body-builders who 'help them out' [25, 9].

3.2.2 Forensic analysis of PIED sourced directly from users and suppliers

Nineteen different PIED samples were sourced from suppliers/users in the city of Plymouth. Two of these samples were known to have been sourced from Leeds, and were thought by the person who provided them to have been ‘genuine’ and of better quality than that generally found in Plymouth. These samples were provided by people who were highly convinced of their veracity. In all cases, the injectable samples contained unused residue left in resealable or unused vials, which were then provided, along with original packaging, directly to the laboratory for testing. The samples of tablets, which were by comparison all complete, were provided – again in the original package or bottle – to the laboratory for storage and analysis. One gym owner/manager who proudly professed to take an informed harm-reduction approach regarding advice and what PIED were supplied provided 15 of the samples (injectable PIED and tablets) over a two-month period. The samples (e.g. see Images 1–3) all appeared to be of a professional quality, and both users and suppliers were convinced of the authenticity of the samples they provided.

[Insert IMAGES 1-3 ABOUT HERE]

Image 1. Plymouth PIED sample labelled as Nandrobolin Decanoate ‘Decca’

Image 2. Plymouth PIED sample labelled as Alphabolin Methenolone Enanthate

Image 3. Plymouth PIED samples tested

3.2.3 Findings of the forensic analysis

Ten samples (see Image 3) underwent analysis by gas chromatography-mass spectrometry (GC-MS), and a spectral matching approach (National Institute of Standards and Technology (NIST) reference data) was used to identify components of the samples.

The findings of the forensic analysis were fairly damning for the Plymouth PIED market. Of the 10 samples tested, three could be considered to be 'genuine', in that they appeared to contain the labelled ingredients, and seven could be classed as 'fakes', as none of the labelled compounds were detected. The concentrations of the steroids in these genuine samples were not determined; however, instrument responses were much lower than would be expected based upon the concentrations reported on the labels, suggesting that only very small quantities of the steroids were present. It seems illogical to go through the effort of producing a steroid to then supply it at a very low dosage. However, it should be noted that chemical synthesis is a difficult procedure, and even in a successful reaction, yields can be as low as a few percentage points. Unless the laboratories producing these products have very sensitive, expensive analytical equipment available that requires skilled operators, it is unlikely that they would be able to measure the concentrations of the chemicals they have produced, or even confirm whether steroid production was successful. As a result, perhaps it is unfair to refer to the samples that didn't contain the steroid as 'fakes', as most of these samples contained excipients that would have been selected to enhance the product; it is possible that the laboratories intended to produce a genuine product, but were simply unsuccessful in production and unable to test this. The poorest quality product was sample 002, in which no steroids or excipients were identified. This was followed by samples 005 and 007, which contained fatty acids (likely derived from oil), but there was no evidence of any further adulterants present to enhance the product; thus these samples could potentially just be vegetable, seed or nut oil. It was also noted by users that samples from Leeds (008 and 009) were expected to be higher quality than the other samples supplied; no evidence was found to support this.

Regarding the excipients found in the samples, most of these are commonly used in pharmaceutical preparations, with sugars and oils being used as carrier components and likely included to enhance the product (e.g. as sweeteners). The producers appear to have considered which additives to include in these samples, with the use of various excipients such as lignocaine to aid injection and reduce pain. Packaging also appears to have been designed with the product in mind. Images 1–3 show that many of the products had either solid plastic packaging, or used amber glass; this reduces degradation of the product due to exposure to sunlight.

In relation to potential risks to health for the users of these products, the risks were likely to be relatively low for the excipients identified, as many of these are commonly used in pharmaceutical-grade preparations – for example, sugars and oils. However, it should be noted that there is always a risk of allergic reaction, and this may be particularly important for users who have known allergies. Local anaesthetics, such as lignocaine, should be used cautiously by those with hypertension, cardiovascular disease, impaired respiratory function and epilepsy, among other conditions. Unfortunately, due to limited labeling of the products tested herein, where only the active ingredient was reported, it would not be possible for a user to ascertain whether the product contained components to which they know they are allergic, or that are not advisable to use due to a medical condition. It should also be noted that the spectral matching approach used does not provide definitive identification of compounds, and there is therefore a risk of misidentification. Additionally, there were numerous other compounds present in these samples that did not achieve a good match with NIST libraries, and therefore no evidence as to their identity was gathered. This study did not consider possible interactions between compounds present (whether identified or not), and interactions could potentially have adverse consequences for the user.

Perhaps of most concern to the user should be the addition of other steroids to the product, as seen in sample 006. If users are already taking a mixture of steroids, the unknown addition of another chemical could pose risks. The presence of benzyl benzoate is also of concern, as the reasoning for inclusion of this chemical in the product is not apparently beneficial to the user, and may have adverse consequences.

In summary, the products received and tested were of a poor quality, and more often than not the supposed active ingredient could not be detected. However, it does seem that some logical considerations informed the product design in the majority of cases, with additives selected to enhance the user experience by making injection easier, reducing pain at the injection site or improving flavour – an approach consistent with findings from ‘street’ drug markets [6]. Based upon compounds identified via spectral matching, risks to users’ health are likely to be low unless they have pre-existing conditions. The risks to human health due to other unidentified compounds in these

samples cannot be accounted for, nor can possible adverse interactions between different components of the products tested².

3.3 Access to PIED: Where and how they were obtained

Consistent with much non-addicted supply of recreational street drugs [cf 26, 9], *the majority of users* reported obtaining their PIED either via ‘friends’ or the gym – either someone that attended the gym or someone who worked there/owned it:

From a friend who gets from a doorman [G02]

I just get it from my mate, basically. I used to get it off one of the guys that worked at the gym. It’s really a casual subject in there, so it’s like you have to whisper around. It’s like general chit chat.. [G09]

3.3.1 Purchasing practices: Group purchases, personal purchases

Eight of the 25 PIED users reported having supplied to other PIED users themselves. Sometimes this involved marginal levels of profit or a small share of the product supplied, but mostly it was undertaken for no profit and was more facilitative (brokerage) or the act of a ‘go-between’ [52] than an act of dealing as this is conventionally understood:

Used to buy for other friends too, but then just bought for myself ... [G5] [also has bought for others] ‘once or twice’ who didn’t know how to get them and ‘written training programmes for them’.

I just buy for myself. I think most people just tend to buy for themselves. I’ve bought steroids for other people three or four times. Friends that can’t get it for themselves or friends that are trying to hide it from their partners. I get it for my friend and he keeps it at work. He has friends at work that do it as well. He keeps it at work. Just hides it from his girlfriend. [G1]

² Because of the harm reduction significance of these findings a flyer was produced relaying the findings of the forensic analysis and fed back to the local PIED community via the trusted safer injecting service most recruitment for this research was obtained through. In addition a recommendation (among others) to the funder of the research and the safer injecting service for future harm reduction related monitoring and research was also made

Similarly, as with social supply in the non-PIED street drug market, some kudos or reputational gain could be derived from facilitating or auctioning supply for those without contacts or with less confidence to go directly to a seller.

In addition to purchasing via a friend or friends, a certain amount of group purchasing – where users purchase larger amounts together, often using a ‘designated buyer’ [11] – was also a common practice:

Normally buy for self but will buy for others as gym owner does not want lots of people coming directly to him, especially young lads. He will not sell to young lads. I’ve bought steroids for other people 10–12 times a year. [G13]

The role of friends and the trust that is easier to transpose onto them as a well placed source of ‘good’ supply were also evident as reasons why some did or did not choose to source steroids and other PIED via the internet.

3.3.2 Internet sourcing

Despite common assumptions about the sourcing of drugs online, accessing PIED via the internet generally wasn’t seen as an option, partly because it was less personal; it appears that there is an element of trust that is transposed onto the purchased PIED if the person that supplied is trusted/known [regardless of the logic of that position]:

With the internet you never know what you’re going to get. I’m prepared to do it in person, trust the guy. I mean my friend knew the guy so it made it a bit easier. I don’t think it’s the fact that ... just worried about doing the steroids to begin with. It never crossed my mind that they might be fake. [G02]

Through a friend who gets them at the gym. Never on internet. [G14]

Not everyone felt this way about the internet, however.

From the internet. You’ve just got to trust it really, I sort of went through a few but ... it’s just from trust really. It’s coming from Thailand but the actual

one I'm getting, I think is made in Pakistan but it's coming from Thailand. [5A]

3.3.3 How quick and easy

As is common in the reporting of other street drugs, PIED were considered easy and quick to access. Given that urgency is not quite as meaningful to PIED users (compared with, say, heroin users), and that they can plan in advance when they will need to source them, knowing that they can access them if and when needed, is perhaps of greater importance for this group:

A week. I could get it quicker if I needed it by going to the gym and asking around. Less reputable gyms that is, where steroids use is rife. [G5]

I could get them within a few hours if I wanted them. If he didn't have it in, he could get it within 24 hours. [G6]

Mostly, if the normal supplier is unavailable, there is a preference to either wait – because (unlike heroin users, for whom urgency and compulsion are part and parcel of the sourcing/purchase/use triumvirate [53]), PIED users have this option – until their supplier can supply or to use other friends whom they also trust:

I wouldn't go to anyone else, he's ex-competition so he knows his shit. [3A]

From friends at other gyms. [G13]

No, only use one source who sells to small group. [3B]

3.3.4 Purchased when abroad

PIED users are permitted by law to bring back PIED from other countries for personal use. This is not an uncommon route of supply on the 'circuit'. Among our respondents, although most had never purchased abroad or received PIED in this way (at least knowingly), a number had:

[Friends have] Egypt's a big one. And Thailand again, they are the main two ones. You can get them from there. You can walk into Egypt and get prescriptions straight away from pharmacists so you can bring back into this country without being stopped at customs. [G6]

Yes, Spain and Turkey. [8B]

3.3.5 *Costs of PIED*

As we might expect, the cost of PIED was reported to vary. Whereas heroin or cannabis or other street drugs are essentially the same product, and there is a going rate, PIED are variously produced (see packaging) and sourced, and thus some variation in price is expected/accepted. There was even confusion over whether or not the internet was a cheaper source of PIED:

No, the internet's a lot, lot more. I'd say definitely five to ten pounds more. [G6]

Don't know [if internet purchases are cheaper than those bought locally]. [G5]

Differentiation and variation in price can be seen in the following selected responses, however:

20ml multi-shot £25 upwards. One ampoule £5. [G13]

Multi-shot Decca which cost £40 for a 10ml vial. Each ml has 300mg. [G5]

For a bottle of testosterone, I'm looking at anything between £14 to £20 maximum ... [G6]

3.3.6 *Perceptions of PIED 'purity' or quality*

As we have seen from the forensic analysis of the samples sourced, only a few of the samples actually contained what the packaging said they did, and those that did appeared to be have very low active ingredients compared with the strength indicated/expected. Despite this being the case, few of the users doubted the overall or

general reliability of the PIED that they accessed regularly, and some even believed that they had the capacity to know or not (within reason):

No, I don't think so ... orals I can generally taste. I can bite into it and has a different taste to it but I can probably tell if it's [fake] ... You can just tell the taste if it's Dianabol or Oxymetholone. I can generally tell. [G6]

No. In Sri Lanka the steroids weren't fake they were poor-quality copies...I'd say it still worked but the quality assurance procedures were not of a high quality. [G5]

In my experience I've pretty much known I've been sold alright stuff because you can tell your hormones change and stuff like that, really. [1A]

Everything's worked for me. [G1]

No never, no fake stuff, no. But then I search the internet properly and I check out how many, you check the ratings people will write bad stuff about [8A]

Some acknowledged that quality is not guaranteed however:

As far as testosterone goes it's like Russian Roulette, you either get the real stuff or you don't. You either get over-dosed stuff or under-dosed stuff or you get it on the dot ... or you don't get stuff at all. [G6]

I'm not sure, I see the ones I've got are just vials, it's single so ... the glass ones. So I'd think that they'd be pretty much. I've heard all sorts of stories, cooking oil and all sorts being sold. [5A]

3.3.7 Checks for the 'genuine articles' that users believe to be important or for which they need to watch out

Clearly, as can be seen from some of the following responses fakes or non-pharmaceutical grade 'copies' can be obvious/noticeable, but as the samples provided

by our supplier/user show, unreliable products can now come with excellent packaging that is virtually indistinguishable from the genuine product:

I don't think you can ever be 100per cent sure. I mean with the pharmaceutical thing it's reasonably easy to tell. The pharmaceutical packages. I mean the [name of Safer Injecting Service] can test what you're taking to see if it's real and what's in it and stuff like that. [Researcher note: [name of Safer Injecting Service] cannot do these tests.] [G1]

Smells musky; packaging. [G13]

Needs to have hologram on bottle. [G14]

You know if you've been sold something fake anyway because the lid would be tampered with and stuff like that. [1A]

Because I know the guy I get it off. It always comes in the same strips. Unless it comes in the pop-out strips, I will not buy it. [3A]

Taste, feel/read. Lid not sealed, looked like cooking oil. [8B]

4. Discussion and Conclusion

Overall, the findings presented here provide a different image of a local PIED market than the one often assumed from forensic reporting alone or from traditional views on how drug markets work. Although the forensic data do confirm the findings of other studies that illicitly supplied PIED are commonly inauthentic or of poor quality, it is not necessarily the case that all poor-quality PIED are an attempt to simply defraud. Nor are they representative of an indifferent supply process. As in the production of drugs such as heroin, poor production methods can massively affect the potency or even presence of the drug in question [5]. The much more sophisticated and expensive process related to the production of PIED thus also leaves it open to greater levels of production failure and weakness of quality control. Poor-quality PIED, especially where potency is low (as opposed to overly high), or inert fakes do not

therefore represent particularly problematic substances in terms of health risk at levels that are perhaps usually assumed.

An understanding of risks needs to be evidence based, not assumption based. With drugs such as heroin and cocaine, it is commonly assumed that if these drugs are only 40 per cent pure then they are 60 per cent impure, and that it is the ‘impurities’ that represent the kind of health risks that cause overdose and death [1]. The reality, however, is that most low-grade heroin or cocaine is ‘cut’ with relatively benign substances (in comparison to the main drug), such as lactose, mannitol, caffeine or paracetamol [7], and that some health risks are often lowered by these substances because the potency of the drug is less. As some of the research has also shown, however, while there is a great deal of inauthentic PIED in circulation, there are also plenty of counterfeits that contain the stated ingredients at the stated levels as well as authentic PIED either diverted from medical supplies or sourced direct from countries where production is less tightly controlled. As with most illicit drug-related health fears, it is important not to over-simplify and assume too much about the drug market, or to accept those assumptions as given and then make them the standard level of understanding [12, 14]. The current public health concerns around PIED fakes/counterfeits, as with street drugs, is partly based on fear of what ‘might be’ (usually the worst case scenario) rather than evidence on the real risks which are difficult to determine at an individual level. Whilst ‘real risks’ will be evident we need to accept that they will rarely be worst case scenario risks for the majority of PIED users the majority of the time.

It has been suggested [17, 18] that the presence of organised Mafioso-type criminal gangs or other mid- to low-level organised criminals are commonly thought to characterise the PIED market. This would normatively also assume a range of other stereotyped drug market characteristics to also be present, such as a prevalence of black market-related violence and intimidation. In Plymouth, as in local drug markets elsewhere in England [22], even the heroin and crack cocaine market doesn’t conform to this image. Non-commercial supply sometimes predominates, and in turn manifests far less drug market-related violence and intimidation than in commercially oriented markets. The Plymouth PIED market likewise did not conform to this structure, and any evidence of it being a violent marketplace was absent. Overall, the picture that

emerged was of a market with a small number of relatively unconnected (with each other) local suppliers, who sourced their drugs from different wholesalers – some of whom were connected and/or the internet. A number of gym owners were involved, but there were also numerous ‘independents’ who sourced for themselves and others.

The qualitative findings highlighted the particularly social nature of many, if not most, PIED market interactions in Plymouth at this time. Social supply, and the centrality of ‘friends’, were at odds with the notions of organised crime and even violence assumed to be central to illicit drug markets. As an informal network of ‘friends’ and acquaintances, organisational hierarchies were thus less important than the relations between participants [54: 149–52]. Indeed, as the forensic results revealed, the quality of the products in reality was secondary to the feelings of trust and reciprocity between users and suppliers, and simpler roles of ‘user’ and ‘supplier’ or ‘dealer’ are not necessarily useful in discussing local drug market interactions such as these. The concept of the social as central to PIED market interactions has also been found elsewhere. Maycock and Howat’s [55: 858] Australian-based research found that the social capital attached to the selling and purchasing of PIED was important, that ‘the act of purchasing and using an illegal substance acted as a bonding agent’ and that, ultimately, ‘obligation, belonging, social interaction, social trust and reciprocation are evident in the illegal anabolic steroid distribution network’. Fincoeur et al. [17] similarly acknowledge the fundamental socio-cultural dimensions of drug markets for PIED. Their participants did not consider themselves ‘real dealers’, ‘but as someone who is simply helping out friends and acquaintances with their training needs’ [17: 13]. Each of these positions is reflected in our findings, where suppliers were usually friends or acquaintances, and where trust bled into faith in the product purchased (and probably also in the product supplied by those supplying). There is nothing to suggest that either those supplying or those purchasing believed they were not transacting product that would be efficacious (which is not the same thing as saying they all thought the produce to be genuine, diverted pharmaceutical supplies).

Trust was central to much of how the PIED users operated, and most of what constituted a ‘method’ for ensuring (as far as they were concerned) efficacious or authentic PIED was based on the trust users awarded their supplier; mistrust as to why

the internet was not a reliable source speaks volumes. Trust was often built up through a symbiotic and reciprocal relationship involving information-sharing, gym training, kudos and shared values around body enhancement and PIED use, as in the study by Maycock & Howat [55]. In many cases it also appears that the *social* dynamics involved in non-elite PIED transactions provide purchasers with a degree of trust that enables both confidence in the authenticity of their purchases and as a consequence some placebo effect as regards their purchases. Given that nearly all the sample believed their purchases to be efficacious in terms of body enhancement in a context where it seems likely they often receive effectively inactive product this is one conclusion that might be drawn.

Viewing transactions as social supply embedded in ‘cultural reciprocity’ [17: 14] rather than rational choice [56], as demonstrated in this study and those cited above, speaks to a significant shift in the ways illicit drug use – in particular PIED use and supply – can be understood. The socio-cultural dimensions, alongside the forensic evidence that has continued to demonstrate the high proportion of counterfeit products in circulation on the black market, can be understood together.

The study reported on here was located in one mid-sized English coastal city in 2013 and provides a snapshot of the Plymouth PIED market at a particular point in time. Nonetheless, the findings are consistent with other research in a range of ways – both forensic and qualitative – and, although caution is normatively argued to be necessary with regard to case study examples without representative populations in terms of making generalising statements, it is nonetheless also possible that such research can be viewed as highly indicative of situations elsewhere [57]. At the very least, and in the absence of representative research – which is likely to continue – it provides an opportunity for framing similar case study research in other locations and building a wider picture iteratively. In addition, by bringing together forensic testing with qualitative methods such as those employed in this study, we have provided, in timely fashion, what Lucidi and colleagues [58] advocate for in future studies into doping. The mixed methods approach employed in this study has provided crucial insight into PIED markets that goes beyond simply noting the incidence of inauthentic PIED to also try to understand the broader nature of how buyers and sellers in some local PIED markets interact and how they are situated.

Theoretically, the results call for a refocus on the material culture of drug markets [59] and actor networks [60] as ways of understanding the fake and real PIED being distributed in these types of markets. Practically, this study contributes towards a growing body of literature that questions the tough legal stance taken by many countries towards steroid use and supply. The findings of this study are consistent with research into the social supply of illicit recreational drugs [61: 446], suggesting that over-zealous pursuit of local suppliers may be like ‘crushing a walnut with a sledge hammer’. Current legislation often fails to understand the context in which supply is taking place, and the levels of culpability attributable to minimally commercial social supply as opposed to dealing proper. In addition, and as referred to earlier, prohibition enforced differentially around the world has led to a black market in PIED where the prevalence of poor-quality and/or inauthentic (both fake and counterfeit) products appears to be continuing to rise. If Denham’s [20] observations relating to the United States and the specific, often non-evidence based interactions between politics, science and public health policy on PIED control are anything to go by, increased prevalence of poor-quality counterfeit PIED – and its attendant risks – is, along with use, likely to increase rather than decrease.

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