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SPECIAL ISSUE ON NOVEL PSYCHOACTIVE SUBSTANCES

An insight into the deep web; why it matters for addiction psychiatry?

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Abstract

Objective Nowadays, the web is rapidly spreading, playing a significant role in the marketing or sale or distribution of "quasi" legal drugs, hence facilitating continuous changes in drug scenarios. The easily renewable and anarchic online drug-market is gradually transforming indeed the drug market itself, from a "street" to a "virtual" one, with customers being able to shop with a relative anonymity in a 24-hr marketplace. The hidden "deep web" is facilitating this phenomenon. The paper aims at providing an overview to mental health's and addiction's professionals on current knowledge about prodrug activities on the deep web.

Methods A nonparticipant netnographic qualitative study of a list of prodrug websites (blogs, fora, and drug marketplaces) located into the surface web was here carried out. A systematic Internet search was conducted on Duckduckgo® and Google® whilst including the following keywords: "drugs" or "legal highs" or "Novel Psychoactive Substances" or "NPS" combined with the word deep web.

Results Four themes (e.g., "How to access into the deepweb"; "Darknet and the online drug trading sites"; "Grams-search engine for the deep web"; and "Cryptocurrencies") and 14 categories were here generated and properly discussed.

Conclusions This paper represents a complete or systematical guideline about the deep web, specifically focusing on practical information on online drug marketplaces, useful for addiction's professionals.

KEYWORDS
darknet, deep web, Internet, novel psychoactive substances, psychonauts, Web 2.0

1 | INTRODUCTION

Overall, the Internet and social networking sites (SNS) are rapidly growing in size and currently play a significant role in the marketing, sale, and distribution of "quasi" legal drugs (EMCDDA, 2016; Orsolini, Francesconi, Papanti, Giorgetti, & Schifano, 2015; Schifano, Orsolini, Papanti, & Corkery, 2015). The quasianarchic and easily changeable online market is gradually shaping a range of changes in drug scenarios, transforming indeed the drug market from a street to a virtual perspective (EMCDDA, 2016; Power, 2013), with customers being able to shop with a relative anonymity in a 24-hr marketplace (Forman, 2006). In fact, the advent of the Web 2.0. has rapidly increased the availability of interactive and communicative tools (e.g., fora, blogs, SNS, etc.), able to share and disseminate pharmaceuticals and/or drug-related information, including those on (il)legal drugs (Flash Eurobarometer 401, 2014; Orsolini, Francesconi, et al., 2015; The Gallup Organization, 2011). In particular, platforms such as Twitter®, Facebook®, Google+®, LinkedIn®, Tumblr®, YouTube®, and so on, facilitate the exchange of short messages, via desktop, laptop, tablet, or smartphone between members of interrelated groups and, therefore, offer opportunities for people to share opinions, information, links, and experiences related to substance use (abuse and misuse). There is already evidence that social networks have been employed by drug abusers for the purpose of discussing and obtaining drugs (Barratt, 2012; Boyer & Wines, 2008; Orsolini, Francesconi, et al., 2015). This is particularly relevant for some recently developed substances (Bersani et al., 2014; Santacroce et al., 2015), and it appears to be influenced by attractive and convincing marketing strategies (Corazza et al., 2014; Orsolini, Francesconi, et al., 2015; Schifano & Orsolini, 2015).

Within this context, the capillary diffusion and growth of the novel psychoactive substances (NPS) market on the Web and the ease

availability of recreational and illicit psychoactives have been somehow facilitated by the development of electronic currencies and anonymous transaction infrastructures (Corazza et al., 2011; Corazza et al., 2012; Davies et al., 2010; Forsyth, 2012; Solberg, 2012). Moreover, the security of protected identities, an increased variety, "novelty," and quality of available substances as well as the possibility to select vendors and to interact with them, further stimulated and implemented this online market and its attractiveness (Orsolini, Francesconi, et al., 2015; Van Hout & Bingham, 2013a, 2013b).

Most of online drug marketplaces, particularly those selling illegal substances, are located on the "dark net of the deep web." The deep web (also known as "Deepnet," "invisible web," "hidden web," etc.) is the part of World Wide Web content not indexed by standard search engines (i.e., Google, Yahoo, and so on). The term was first introduced by Bergman (2001) even though Jill Ellsworth previously coined the term "invisible web" to refer to websites that were not registered with any search engine (Ellsworth & Ellsworth, 1994). Although the "surface web" is the counterpart of the Web, consisting of data that standard search engines can index, the traditional search engines see only a small amount of the information that is available whereas the deep web is several orders of magnitude larger than the surface web (Bergman, 2001; Bin, Mitesh, Zhen, & Kevin Chen-Chuan, 2007). For this reason, an analogy of an iceberg has frequently been used to represent the division between "surface" and "deep" web (Shestakov, 2008; Shestakov, 2011). Many of illegal and criminal activities take place on the deep web, although not all activities on the deep web are illegal, illicit, and synonymous of criminality. However, the deep web has been recently investigated by researchers in drug addiction for its relevance in the online market of the illegal drugs and, recently, for its putative role in the "market chain" of the NPS (Corkery, Orsolini, Papanti, & Schifano, 2017). To date, the Internet has become an "anarchic free-market world" in which drug legislation is being outpaced by chemistry and technology (Power, 2013; Schifano et al., 2015).

According to these preliminary considerations, it is here considered of paramount importance the need to improve the levels of knowledge and awareness about the online drug-related sources (e.g., surface and deep web; prodrug fora and blogs; drug marketplaces; and so on), especially among the mental health and addiction's specialists. First, there is a cogent need to improve the knowledge levels of both the NPS clinical and pharmacological or toxicological issues, and of the main ways through which these molecules are being marketed, sold, acquired, and finally consumed. This knowledge is arguably essential for mental health professionals to be able to both implement appropriate short- and long-term therapeutic strategies and draft a range of effective preventative approaches.

Moreover, in light of these evidences, a range of future research perspectives and objectives, which should be considered at the EU-wide level, could be here considered, including the possibility to develop new prevention approaches, which take into account the Web and, in particular, of the deep web. Therefore, this paper aims at providing, through a netnographic approach, an overview about the current evidence, knowledge, and novelties on the drug-related activities in the deep web, which could be useful for the addiction's psychiatrists, particularly for those working with NPS.

2 | METHODOLOGY

A nonparticipant netnographic qualitative study of a list of prodrug websites (blogs, fora, and drug marketplaces) located into the surface web was here carried out. Netnography is a new qualitative research methodology that applies an ethnographic approach to the study of cultures and online communities (Kozinets, 2002, 2010). A systematic Internet search was conducted on Duckduckgo® and Google® whilst including the following keywords: "drugs," "legal highs," "Novel Psychoactive Substances," and "NPS" combined with the word "deep web." The first 10 pages recorded per search term and search engine were consequently analysed and selected only if relevant in terms of information and data provided regarding to the deep web and "drugs," with a particular focus on NPS. Within the time frame January–April 2016, data were collected from 64 unique prodrug websites. Some 8,640 forum threads were here screened. After removal of those Web pages, which were either duplicates or nonrelevant to the aims of the study, 800 fora threads, authored by some 1,303 users, were considered valid and were here analysed using the empirical phenomenological psychological (EPP) method (Husserl, 1970). In line with the best practice protocols for online research (Davey, Schifano, Corazza, & Deluca, 2012; Marguia & Tackett-Gibson, 2007; Mendelson, 2007; Sixsmith, Boneham, & Goldring, 2003; Van Hout & Bingham, 2013a, 2013b) and in compliance with unobtrusive and naturalistic features of netnographic research (Hsiung, 2000; Kozinets, 2010), no posts or other contributions to private or public forum discussions were made. The paradigms of observational status, inherent flexibility, and openness of the approach were here respected. Confidentiality measures applied to the dataset included storage in an online, password-protected computer and removal of screen pseudonyms, URLs, country, and city identifiers (Wilkinson & Thelwall, 2011). In following the EPP protocol, the dataset was transferred to a Word document for analysis, using the EPP five-step method (Karlsson, 1995). Four themes (e.g., "How to access into the deep web"; "Darknet and the online drug trading sites"; "Grams-search engine for the deep web"; and "Cryptocurrencies") and 14 categories were here generated. With the unit of analysis being given by each discussion forum post, the above themes were first identified by L.O. and then confirmed with F.S., with possible disagreements thoroughly discussed. Whenever possible, a qualitative description for each of the aforementioned themes was here provided; any unknown information was considered as missing. Validity (e.g., credibility; confirmability; dependability; and transferability), in the form of "trust-worthiness" (Maxwell, 1992; Patton, 2002), was here attained with verification of similarities relating to the four themes here retrieved across both the forum and blogs activities.

Ethical approval for the study has been sought and granted by the School of Pharmacy Ethics Committee at the University of Hertfordshire (December 15, 2010, reference code PHAEC/10-42), with a further extension of the approval granted in November 2013.

3 | RESULTS

The experiences of prodrug fora and/or blogs' users regarding the world of the deep web and its implications in the drugs and NPS's

consume were commonly published on public Internet drug user fora and blogs. The data here collected denote that the fora and blogs members who report a good knowledge and competency in using deep web also have experiences with all darknet tools that allow to access into the online drug marketplaces which sell both illegal drugs and NPS. Four themes and 14 categories emerged from the data here collected (Table 1).

3.1 | Theme 1: how to access into the deep web

The darknet (aka "dark address," "lost net," "dark address space," "greynet," "sparse darknets," etc.) consists of a computer network characterized by an anonymous and restricted access by third parties, mainly used for illegal and/or criminal activities. The darknet is a subsection of the deep web, that is, the World Wide Web content hidden and not accessible by means of standard search engines, consisting in password-protected or dynamic websites as well as encrypted networks. The deep web is characterized by a decentralized system, which does not allow users to be monitored in their web activities. Despite there are so far a range of networks and ways to access the deep web, the most used and known include the TOR Browser (eng. the onion routing), the I2P Software (i.e., "Invisible Internet Project") and the Freenet network.

> *"[…] Since discovering the warmth and safety and security of the Tor Browser Bundle, I haven't accessed this website without its comfy blanket of anonymity. If there are young people on here who don't know how easily it is for your location to be determined based on browser cookies, IP address tracking, and other such behaviours, I would recommend you consider using Tor. Tor bounces your internet signal through a number of different locations all over the world, making it impossible for the website you are accessing to figure out your location. There are a number of very good reasons to use this kind of cloud of anonymity other than the obvious ones here. First of all, it prevents snooping by companies, it makes it more difficult to get viruses because the browser blocks cookies and flash and disruptive Java scripts. You do have to change the way you interact with the web to some degree, no youtube, flash games, and such. But you can always have another, non-clouded browser running at the same time, looking at things you don't mind people knowing you're looking at […]" (www.dmt-nexus.me, accessed on 20th September, 2016).*

TABLE 1 Categories and themes emerging from the content textual analysis as per EPP protocols

Theme	Categories
Theme 1: how to access into the deep web	• The content of the deep web • The TOR Browser to access into the deep web • The I2P Software to access into the deep web • Freenet Software to access into the deep web • The content of the dark net and how to access to it
Theme 2: darknet and the online drug trading sites	• The informed market segment of the online drug trading websites • The commercial segment of the online drug trading websites • The social network sites (SNS) segment of the online drug trading websites • The deep web segment of the online drug trading websites • The online drug trading websites function like an e-Bay style website • The most popular online drug marketplaces
Theme 3: grams-search engine for the deep web	• The Grams Darknet Market search engine like a Google for drug users
Theme 4: cryptocurrencies	• How to hide money transaction in the online drug trading • The most commonly used and reported cryptocurrencies

Note. EPP = empirical phenomenological psychological; TOR = the onion routing.

The onion routing is a virtual network, which helps "to peel away the onion-like layers of the dark web," by providing anonymous access through Tor Mail and hosted websites (i.e., online drug marketplaces) and, hence, preventing the analysis of network traffic. TOR implements the onion routing, which encrypts and transmits a large number of data thought a series of randomly selected "nodes" (i.e., "onion routers"), which in turns decrypts only one layer of the message in order to allow only the transmission directly suited to the encrypted packet and onion router, which gave the message. Moreover, the proxy node does not know the content of transmitted information either where it comes from ("input node") or which will be the recipient of the data ("output node"). TOR created a dedicated TOR client program, that is, a specialized adapted TOR browser that supports pseudodomains ".onion". Downloading Tor browser is extremely easy and completely legal and accessible on the surface web (https://www.torproject.org/download/download.html.en). TOR browser allows safety of anonymity, privacy, and obscurity of any activities you do on the deep web, through the user's IP (Internet path) address anonymization, which does not reveal the user's location in the network.

> *"[…] I2P is an anonymous network, exposing a simple layer that applications can use to anonymously and securely send messages to each other. The network itself is strictly message based (ala IP), but there is a library available to allow reliable streaming communication on top of it (ala TCP). All communication is end to end encrypted (in total there are four layers of encryption used when sending a message), and even the end points ("destinations") are cryptographic identifiers (essentially a pair of public keys). To give a very simplistic answer, I2P routes based on public keys not IP addresses, though data still transverses over IP, the network architecture is designed to ensure that there is no way to correlate the IP address of your router and the public key(with high levels of encryption) […]" (www.shaman-australis.com, accessed on 20th September, 2016).*

The I2P network is an anonymous peer-to-peer (P2P) overlay network (a sort of "network within a network") that protects communication from dragnet surveillance and monitoring by third parties (http://www.i2p.net/). I2P has been developed since 2003 as an evolution of the Freenet network. I2P network has been considered specifically designed and optimized for criminal activities. Although TOR mainly aims at anonymously accessing to Internet service (i.e., WWW), I2P aims at providing a way for users to host services, via the domain ".i2p" through the homepage https://www.i2p2.i2p.

> *"[…] There are two ways to connect to Freenet: You can enable insecure mode (the installation wizard will ask you) and Freenet will automatically find nodes to connect to—Strangers. You can connect to nodes run by people you know—Friends. Note that these should be people you actually know on some level, in order to maintain good network topology and maximum security. In practice, you should probably use both of these options, unless you are really paranoid, in which case you should of course only connect to people you trust. Insecure mode should work automatically once enabled, so the rest of this page is about connecting to Friends […]" (http://www.psychonaut.com/, accessed in 20th September, 2016)*

Freenet has been considered the predecessor of I2P. It is a P2P anonymous decentralized publishing network, which stores, disposes, and freely shares files and data. Freenet network is accessible by a client software (https://freenetproject.org/). However, Freenet is specifically addressed to serving static content, hence, being less flexible in terms of hosted services compared to TOR and I2P.

3.2 | Theme 2: darknet and the online drug trading sites

Novel psychoactive substances are usually sold online, in "head shops" or sometimes alongside controlled substances in the illicit market, that is, darknet marketplaces. According to many drug users' online discussions, it has been also recently considered the relevant role of the online drug trading sites (both located in the surface and in the deep web) in selling these chemicals. The market of NPS appears to be extremely variable and easily renewable, as new drugs or NPS may rapidly appear on the "quasilegal" market on the surface web and just quickly disappear, due to a little demand, a change in legal status, a replacement of a substance with a newer with similar supposed features, and so forth. NPS fall in and out of favour, as users try them and move away from them. Specific "window periods" have been identified in which it is possible that there are not ever available previous products that are sold in place of alternative products advertised as "similar" or resemble to other NPS out of market. Some argued that the appeal of some NPS is sometimes linked to the poor quality of more established substances on the black market. However, online drug marketplaces have proliferated over the recent years and, to date, a range of four types of modalities have been identified in order to buy recreational drugs by web:

1. "The informed market segment" which includes all websites, mainly located on the surface web, relatively readable, transparent, and extremely serious in their appearance, which mainly sell NPS and research chemicals. These websites usually report the chemical names and apparently accurate and complete chemical, pharmaceutical features of the new compounds on sale. The products are usually sold as the simple powder in plain plastic sachets without any special effort at presentation. These websites advertise these compounds as "research chemicals." The sellers are usually pharmacologically and chemically competent as well as familiar with dosing, combinations and clinical effects, and so on.
2. "The commercial segment" is represented by those websites owning a more seductive or attractive layout. These websites usually sell products in familiar forms (i.e., tablets, herbs, etc.) with extremely eye-catching packages (i.e., bright colours, attractive names, etc.). Youngsters are commonly the users' target, being captured by misleading advertisements that maintain doubt about the synthetic nature of the products offered, for example, by presenting synthetic cannabinoids that look like herbal cannabis or selling compounds and combinations under opaque package without few information on quality and quantity of substances contained.
3. There are some "classified advertisements" mainly located on general–public websites and SNS (i.e., Facebook®, Twitter®, Instagram®, Flickr®, etc.) that are placed in order to attract all sorts of potential consumer and which contain specific links to online drug trading websites.
4. "The deep web segment" represents the greater part of online drug market. It allows vendors and sellers to sell and buy in a relatively anonymity and appears to be the first place in which NPS are marketed.

These online drug-trading sites function more or less like an "e-Bay style" and e-commerce site, where buyers and sellers can find each other to complete the related transactions. Vendors and customers often communicate with the help of encrypted instant-messaging systems and pay by means of cryptocurrencies. To this respect, Silk Road was the most popular online trading website. Activated in February 2011, it was shut down by the U.S. Federal Bureau of Investigation on October 2, 2013, and soon replaced first by SilkRoad2 (shut down in November 2014) and then by SilkRoad3 (http://reloadedudjtjvxr.onion/register.php?auth=XRvzMm7OoUhuzo). Located on the dark web, this trading site might be accessible only via a secure and confidential net by encryption of computer IP addresses, something that occurs either through the help of the Tor anonymising software or through a Tor-network web proxy. Silk Road has been defined as a "certifiable one-stop shop for illegal drugs that represents the most brazen attempt to peddle drugs online that we have ever seen" (Shumer, 2014). Other cyber drug markets, which like Silk Road running on the anonymity software Tor, continue to emerge. Directories like "Hidden Wiki" or the "All You're Wiki" directory often are updated when particular drug marketplaces have turned out to be scams, although the subreddit thread *r/DarkNetMarkets* and the list of Darknet markets by Deepdotweb.com keeps an updated warning

list of markets and services that are currently active or that may be scams or busts (Deepdotweb.com, 2016; Reddit.com, 2016).

Out of those currently active by the time of writing (end of May 2016), the most popular ones are represented by: Alphabay (http://pwoah7foa6au2pul.onion/register.php?aff=41211); Dream Market (http://ltxocqh4nvwkofil.onion/?ai=1675); Outlaw Market (http://outfor6jwcztwbpd.onion/indxx1.php); Python Market (http://25cs4ammearqrw4e.onion/market/task.php?register=1&ref=5164); Apple Market (http://254iloft5cheh2y2.onion/register.php?invite=3GmwV3P); and many others (Deepdotweb.com, 2016; Reddit.com, 2016).

3.3 | Theme 3: Grams-search engine for the deep web

Within the deep web, the "hidden" purchasing activities have been recently made easier with the availability of the beta version of the Grams Darknet Market search engine (http://grams7enufi7jmdl.onion). Grams is a search system like Google AdWords®, in which vendors can buy a set of keywords that allow their listings to go to the top of search results, hence increasing the spread of novel psychoactives' marketplaces (Reddit.com, 2016). Grams is considered the "Google of the darknet" owning an appearance like Google search engine and is able to provide, simply by typing the drug name, a list of vendor's name, location, and the price of the product. It is only available via the TOR browser. Grams also includes a number of Google-like features, that is, "I Feel Lucky" search button and a series of features with allow users to filter out results and the most recent listings, and so forth.

3.4 | Theme 4: cryptocurrencies

These online drug trading websites often allow hidden money transactions by means of cryptocurrencies. The most known of them is represented by the Bitcoins® which is a decentralised virtual currency, not associated with banks or systems of detection of money transfer, and hence able to guarantee more anonymous and concealed online transactions.

Other more specifically designed deep web "currencies" have been recently introduced, such as the Litecoin® (https://litecoin.org/) and the Anoncoin®/ANC (https://anoncoin.net/). Litecoin® is an open source, P2P Internet currency that allows a global payment network. Like Bitcoin®, it is fully decentralised and enables instant, near-zero cost payments to anyone in the world (https://litecoin.org/). Anoncoin® was released in June 2013 and represents the first and only currency to have built-in support for both I2P darknet and TOR network able to conceal the IP address of the user. The team is working on using a technology known as Zerocoin® which would give Anancoin® a very high level of anonymization (Bitcointalk.org, 2016). Zerocoin® was initially proposed as an extension able to add a true cryptographic anonymity to the Bitcoin® protocol. It provides anonymity with the introduction of a separate Zerocoin® cryptocurrency, stored in the block chain alongside the base currency. It allows users to make payment anonymously, without revealing their Anancoin® public addresses (Reddit.com, 2016).

4 | DISCUSSION

The birth of the so-called online "drug culture" has been somehow facilitated by the growth and capillary diffusion of the Internet, the revolutionary potentialities of the Web 2.0., and the onset of the first online drug marketplaces (Orsolini, Papanti, Francesconi, & Schifano, 2015; Schifano et al., 2015). However, previous studies anticipated the current drugs' background (Schifano, Leoni, Martinotti, Rawaf, & Rovetto, 2003). Contextually, the history of the Internet has been bound up with the drug-counterculture, which found some of its richest expression in the experimental intake of the newest and unsafe NPS (Schifano & Orsolini, 2015; Schifano et al., 2015). This rapid changing drug scenario facilitated the birth of a new drug subculture, that is, the "psychonauts' communities," particularly belonging to the Nerd subculture, inspired and attracted by virtual reality and IT technologies (Orsolini, Francesconi, et al., 2015; Orsolini, Papanti, et al., 2015; Schifano, Papanti, Orsolini, & Corkery, 2016; Schifano et al., 2015). Moreover, for a growing number of people, the Internet has been now considered the first place they look when trying to look for recreational drugs and their related information, especially when faced with the rapid and baffling proliferation of NPS (EMCDDA, 2016; Orsolini, Francesconi, et al., 2015; Schifano et al., 2016). Nowadays, the phenomenon of NPS is taking uncontrollable proportions and the virtual communities of research chemicals' users are rapidly increasing (Schifano et al., 2015). These completely untested compounds are part of an international online market that has become too fast and too complex for any government to control properly (EMCDDA, 2016). This growing market has been facilitated by the advent of Web 2.0. and some authors named the current new drug users as the generation "Drugs 2.0," which allowed the spread of an anarchic free-market world in which drug legislation is being outpaced by chemistry and technology (Power, 2013).

Novel psychoactive substances are usually sold online, in head shops or sometimes alongside controlled substances in the illicit market. Recently, it has been discovered that some "legal high" products (such as spice or synthetic cannabinoid products) are being sold in a wide range of outlets including corner shops, pubs and petrol stations (Papanti, Orsolini, Francesconi, & Schifano, 2014). However, it has been recently considered the relevant role of the online drug trading sites in selling these chemicals. The market of NPS is extremely variable as new drugs may rapidly appear on the "quasilegal" and illegal market and just quickly disappear, usually due to little demand, as it has been observed with the case of 2C-T-7 (aka "Blue Mystic"; Schifano et al., 2005).

To date, the deep web commercial segment appears to represent the greater part of the online drug market, including recreational and illegal drugs as well as NPS. Although the common user of the drug marketplaces located into the deep web has been considered a highly qualified IT expert with advanced computer skills, it has been recently demonstrated that the deep web is also spreading amongst not-technical users, thanks to the plethora of websites providing easy guidelines to access the deep web (Orsolini, Francesconi, et al., 2015; Orsolini, Papanti, et al., 2015; Schifano et al., 2015). Particularly, some recent studies reported a wide use also in rural areas (Martinotti et al.,

2015), specifically amongst young adults (Martinotti et al., 2014). Furthermore, the deep web segment represents a safer and more confidential and anonymous way both to communicate, share opinions, discussions, and information about recreational drugs, and to sell psychoactive substances, using protected and confidential addresses and virtual currencies that allow hidden money transactions (Schifano & Orsolini, 2015; Schifano et al., 2015).

Although the deep web acquisition procedures are slightly more complicated than those typical of the open Web online pharmacies (Schifano et al., 2015), the hidden purchasing activities have been recently made easier with the availability of the beta version of the Grams Darknet Market search engine (http://grams7enufi7jmdl.onion). Grams represents an extremely interesting revolution in the online "drug world," as it facilitates the research of any types, quality, and quantity of illegal and quasilegal drugs, by hence increasing indeed the possibility to access and purchase any type of NPS, etc.

To the best of our knowledge, this paper represents the first attempt at providing a systematic overview of available evidence and information, collected through a netnographic approach, of the drug-related activities occurring on the deep web. Mental health's professionals and addictions' psychiatrists should be kept regularly updated about the current shifting and changeable drug market, as this may indeed be associated with a range of clinical implications. The spread of the Web facilitates a gradual, albeit partial, shift from a "street" to a "web" market (Corkery et al., 2017; Orsolini, Francesconi, et al., 2015;) which in turns leads to both increasing levels of consumers' knowledge and a further, capillary, diffusion of NPS (Schifano & Orsolini, 2015). These molecules intake may be extremely risky (Schifano et al., 2015), also because the NPS pharmacodynamics and toxicological effects are poorly understood (Schifano et al., 2016). The major concern is relating to the poor clinical knowledge of NPS, in general, amongst mental health professionals and addiction psychiatrists. Indeed, clinicians are not always aware of the psychopathological risks relating to NPS intake, and, at the same time, they are not always able to identify a potential NPS user (Simonato et al., 2013). In association with this, most clinicians are not fully aware of both the online drug marketplaces and of the drugs, which are made available for purchase. Clinicians should be informed about the NPS intake modalities; their sought-after effects; and the idiosyncratic psychoactives combinations commented online by the e-psychonauts (Orsolini, Papanti, et al., 2015). The deep web is a further, more hidden, step that is currently in a continuous developmental stage. This seems to represent a platform that facilitates the occurrence of confidential exchange of drug-related information and acquisition of a range of molecules, including: NPS; quasilegal; and illegal drugs (Schifano & Orsolini, 2015). Further research should focus on designing and testing a range of preventative tools, aiming at attracting NPS users.

Further research directions in drug addiction should be specifically implemented and addressed in order to better investigate and evaluate preventive tools able to control and limit the online drug market, also including specific measures towards the new drug users.

CONFLICTS OF INTEREST

F.S. is both a core member of the Advisory Council on the Misuse of Drugs (ACMD, U.K.) and the Chair of the Specialist Advisory Group (Psychiatry) for the European Medicines Agency (EMA). No conflicts of interest are declared here that may have influenced the interpretation of the present data.

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