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

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3 **'An insight into the deep web; why it matters for addiction psychiatry?**
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28 **Running title: *Deep web and the new changing virtual drug market***
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ABSTRACT

Objective. Nowadays, the web is rapidly spreading, playing a significant role in the marketing/sale/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-hour 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 pro-drug activities on the deep web.

Methods: A non-participant netnographic qualitative study of a list of pro-drug websites (blogs, fora, 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”/“legal highs”/“Novel Psychoactive Substances”/“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: The present paper represents a complete/systematical guideline about the deep web, specifically focusing on practical information on online drug marketplaces, useful for Addiction’s professionals.

Key words: deep web; darknet; psychonauts; novel psychoactive substances; internet; web 2.0.

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 et al., 2015a; Schifano et al., 2015). **The ‘quasi’ anarchic 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 (Power, 2013; EMCDDA, 2016), with customers being able to shop with a relative anonymity in a 24-hour 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 (The Gallup Organization, 2011; Flash Eurobarometer 401, 2014; Orsolini et al., 2015a). 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 (Boyer and Wines, 2008; Barratt, 2012; Orsolini et al., 2015a). **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 et al., 2015a; Schifano and Orsolini, 2015)**.

Within this context, the capillary diffusion and growth of the 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 (Davies et al., 2010; Corazza et al., 2011; Corazza et al., 2012; 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, furtherly stimulated and

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2
3 implemented this online market and its attractiveness (Orsolini et al., 2015a; Van Hout and
4
5 Bingham, 2013a; 2013b).
6

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8 Most of online drug marketplaces, particularly those selling illegal substances, are located
9
10 on the “dark net of the deep web”. The Deep web (also known as ‘Deepnet’, ‘invisible web’,
11 ‘hidden web’, etc.) is the part of World Wide Web content not indexed by standard search engines
12
13 (i.e. Google, Yahoo and so on). The term was firstly introduced by Bergman (2001) even though Jill
14
15 Ellsworth previously coined the term ‘invisible web’ to refer to websites that were not registered
16
17 with any search engine (Ellsworth, 1994). Whilst the *surface web* is the counterpart of the web,
18
19 consisting of data that standard search engines can index. The traditional search engines see only a
20
21 small amount of the information that is available. Whilst the deep web is several orders of
22
23 magnitude larger than the surface web (Bergman, 2001; Bin et al., 2007). For this reason, an
24
25 analogy of an iceberg has frequently been used to represent the division between ‘surface’ and
26
27 ‘deep’ web (Shestakov, 2008; Shestakov, 2011). Many of illegal and criminal activities take place
28
29 on the deep web, although not all activities on the deep web are illegal, illicit and synonymous of
30
31 criminality. However, the deep web has been recently investigated by researchers in drug addiction
32
33 for its relevance in the online market of the illegal drugs and, recently, for its putative role in the
34
35 ‘market chain’ of the NPS (Corkery et al., 2017). To date, the Internet has become an ‘*anarchic*
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37 *free-market world*’ in which drug legislation is being outpaced by chemistry and technology
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39 (Power, 2013; Schifano et al., 2015).
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46 According to these preliminary considerations, it is here considered of paramount
47
48 importance the need to improve the levels of knowledge and awareness about the online drug-
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50 related sources (e.g., surface and deep web; pro-drug fora and blogs; drug marketplaces; and so
51
52 on), especially among the Mental Health and Addiction’s specialists. Firstly, there is a cogent
53
54 need to improve the knowledge levels of both the NPS clinical and
55
56 pharmacological/toxicological issues, and of the main ways through which these molecules are
57
58 being marketed, sold, acquired and finally consumed. This knowledge is arguably essential for
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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 the light of these evidence, 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, the present 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.

Methodology

A non-participant netnographic qualitative study of a list of pro-drug websites (blogs, fora, 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 pro drug websites. Some 8,640 forum threads were here screened. After removal of those web pages which were either duplicates or non-relevant 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 best practice protocols for online research (Van Hout and Bingham, 2013a; 2013b; Sixsmith et al., 2003; Marguia et al., 2007; Mendelson et al., 2007; Davey et al., 2012) and in compliance with unobtrusive and

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3 naturalistic features of netnographic research (Hsiung, 2000; Kozinets, 2010), no posts or other
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5 contributions to private or public forum discussions were made. The paradigms of observational
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7 status, inherent flexibility and openness of the approach were here respected. Confidentiality
8
9 measures applied to the dataset included storage in an online, password-protected computer and
10
11 removal of screen pseudonyms, URLs, country and city identifiers (Wilkinson and Thelwall, 2011).
12
13 In following the EPP protocol, the dataset was transferred to a Word document for analysis, using
14
15 the EPP five-step method (Karlsson et al., 1995). Four themes (e.g. '*How to access into the deep*
16
17 *web*'; '*Darknet and the online drug trading sites*'; '*Grams-search engine for the deep web*'; and,
18
19 '*Cryptocurrencies*') and 14 categories were here generated. With the unit of analysis being given by
20
21 each discussion forum post, the above themes were first identified by LO and then confirmed with
22
23 FS, with possible disagreements thoroughly discussed. Whenever possible, a qualitative description
24
25 for each of the aforementioned themes was here provided; any unknown information was
26
27 considered as missing. Validity (e.g., credibility; confirmability; dependability; and transferability),
28
29 in the form of 'trust-worthiness' (Lincoln and Guba, 1985; Maxwell, 1992; Patton, 2002), was here
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31 **attained** with verification of similarities relating to the four themes here retrieved across both the
32
33 forum **and** blogs activities.

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38 Ethical approval for the study has been sought and granted by the School of Pharmacy
39
40 Ethics Committee at the University of Hertfordshire (December 15, 2010, reference code
41
42 PHAEC/10-42), with a further extension of the approval granted in November 2013.
43
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47 Results

48
49 **The experiences of pro-drug fora and/or blogs' users regarding the world of the deep**
50
51 **web and its implications in the drugs and NPS's consume were commonly published on public**
52
53 **Internet drug user fora and blogs. The data here collected denote that the fora and blogs**
54
55 **members who report a good knowledge and competency in using deep web also have**
56
57 **experiences with all darknet tools that allow to access into the online drug marketplaces**
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1
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3 **which sell both illegal drugs and NPS. Four themes and 14 categories emerged from the data**
4
5 **here collected (Table 1).**
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10 **Theme 1: How to access into the deep web**

11 The darknet (aka **'dark address', 'lost net', 'dark address space', 'greynet', 'sparse**
12 **darknets', etc.)** consists of a computer network characterized by an anonymous and restricted
13 access by third parties, mainly used for illegal and/or criminal activities. The darknet is a subsection
14 of the **deep web**, i.e. the World Wide Web content hidden **and** not accessible by means of standard
15 search engines, consisting in password-protected or dynamic websites as well as encrypted
16 networks. The **deep web** is characterized by a decentralized system which does not allow users to
17 be monitored in their web activities. Despite there are so far a range of networks **and** ways to access
18 the **deep web**, the most used and known include the TOR Browser (eng. *The Onion Routing*), the
19 I2P Software (i.e. *'Invisible Internet Project'*) and the Freenet network.
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32 **"[...] Since discovering the warmth and safety and security of the Tor Browser Bundle, I**
33 **haven't accessed this website without its comfy blanket of anonymity. If there are young people**
34 **on here who don't know how easily it is for your location to be determined based on browser**
35 **cookies, IP address tracking, and other such behaviours, I would recommend you consider**
36 **using Tor. Tor bounces your internet signal through a number of different locations all over the**
37 **world, making it impossible for the website you are accessing to figure out your location. There**
38 **are a number of very good reasons to use this kind of cloud of anonymity other than the obvious**
39 **ones here. First of all, it prevents snooping by companies, it makes it more difficult to get**
40 **viruses because the browser blocks cookies and flash and disruptive Java scripts. You do have to**
41 **change the way you interact with the web to some degree, no youtube, flash games, and such.**
42 **But you can always have another, non-clouded browser running at the same time, looking at**
43 **things you don't mind people knowing you're looking at [...]"** (www.dmt-nexus.me, accessed
44 on 20th September, 2016).
45

46 TOR is a virtual network which helps "to peel away the Onion-like Layers of the dark web",
47 by providing anonymous access through Tor Mail and hosted websites (i.e. online drug
48 marketplaces) and, hence, preventing the analysis of network traffic. TOR implements the onion
49 routing which encrypts and transmits a large number of data through a series of randomly selected
50 'nodes' (i.e. 'onion routers'), which in turns decrypts only one layer of the message in order to
51 allow only the transmission directly suited to the encrypted packet and onion router which gave the
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3 message. Moreover, the proxy node does not know the content of transmitted information either
4
5 where it comes from ('input node') or which will be the recipient of the data ('output node'). TOR
6
7 created a dedicated TOR client program, i.e. a specialized adapted TOR browser which supports
8
9 pseudo-domains ".onion". Downloading Tor browser is extremely easy and completely legal and
10
11 accessible on the surface web (<https://www.torproject.org/download/download.html.en>). TOR
12
13 browser allows safety of anonymity, privacy and obscurity of any activities you do on the deep web,
14
15 through the user's IP (Internet path) address anonymization which does not reveal the user's
16
17 location in the network.
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21 **"[...] I2P is an anonymous network, exposing a simple layer that applications can use to**
22 **anonymously and securely send messages to each other. The network itself is strictly message**
23 **based (ala IP), but there is a library available to allow reliable streaming communication on top**
24 **of it (ala TCP). All communication is end to end encrypted (in total there are four layers of**
25 **encryption used when sending a message), and even the end points ("destinations") are**
26 **cryptographic identifiers (essentially a pair of public keys). To give a very simplistic answer, I2P**
27 **routes based on public keys not IP addresses, though data still transverses over IP, the network**
28 **architecture is designed to ensure that there is no way to correlate the IP address of your router**
29 **and the public key(with high levels of encryption) [...]"** (www.shaman-australis.com, accessed
30 on 20th September, 2016).

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

45
46 **"[...] There are two ways to connect to Freenet: You can enable insecure mode (the**
47 **installation wizard will ask you) and Freenet will automatically find nodes to connect to -**
48 **Strangers. You can connect to nodes run by people you know - Friends. Note that these**
49 **should be people you actually know on some level, in order to maintain good network**
50 **topology and maximum security. In practice, you should probably use both of these options,**
51 **unless you are really paranoid, in which case you should of course only connect to people you**
52 **trust. Insecure mode should work automatically once enabled, so the rest of this page is**
53 **about connecting to Friends [...]"** (<http://www.psychonaut.com/>, accessed in 20th September,
54 2016)

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56
57 Freenet has been considered the predecessor of I2P. It is a peer-to-peer anonymous
58 decentralized publishing network, which stores, disposes and freely shares files **and** data. Freenet
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3 network is accessible by a client software (<https://freenetproject.org/>). However, Freenet is
4
5 specifically addressed to serving static content, hence, being less flexible in terms of hosted services
6
7 compared to TOR and I2P.
8
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10 11 **Theme 2: Darknet and the online drug trading sites**

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13
14 NPS are usually sold online, in ‘head-shops’ or sometimes alongside controlled substances
15
16 in the illicit market, **i.e. darknet marketplaces. According to many drug users’ online**
17
18 **discussions, it has been also recently considered the relevant role of the online drug trading**
19
20 **sites (both located in the surface and in the deep web) in selling these chemicals. The market**
21
22 **of NPS appears to be extremely variable and easily renewable, as new drugs/NPS may rapidly**
23
24 **appear on the ‘quasi-legal’ market on the surface web and just quickly disappear, due to a**
25
26 **little demand, a change in legal status, a replacement of a substance with a newer with similar**
27
28 **supposed features, etc. NPS fall in and out of favour, as users try them and move away from**
29
30 **them.** Specific “*window-periods*” have been identified in which it is possible that there are not ever
31
32 available previous products that are sold in place of alternative products advertised as ‘similar’ or
33
34 resemble to other NPS out of market. Some argued that the appeal of some NPS is sometimes
35
36 linked to the poor quality of more established substances on the black market. However, online drug
37
38 marketplaces have proliferated over the recent years and, to date, a range of four different types of
39
40 modalities have been identified in order to buy recreational drugs by web:
41
42
43
44

45 1) ***The informed market segment*** which includes all websites, mainly located on the surface
46
47 web, relatively readable, transparent and extremely serious in their appearance, which mainly sell
48
49 NPS **and** research chemicals. These websites usually report the chemical names and apparently
50
51 accurate and complete chemical, pharmaceutical features of the new compounds on sale. The
52
53 products are usually sold as the simple powder in plain plastic sachets without any special effort at
54
55 presentation. **These websites advertise these compounds as ‘research chemicals’. The sellers**
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3 **are usually pharmacologically and chemically competent as well as familiar with dosing,**
4
5 **combinations and clinical effects and so on.**
6

7 2) *The commercial segment* is represented by those websites owning a more
8 seductive/attractive layout. These websites usually sell products in familiar forms (i.e. tablets,
9 herbs, etc.) with extremely eye-catching packages (i.e. bright colours, attractive names, etc.).
10 Youngsters are commonly the users' target, being captured by misleading advertisements which
11 maintain doubt about the synthetic nature of the products offered, e.g. by presenting synthetic
12 cannabinoids that look like herbal cannabis, or selling compounds **and** combinations under opaque
13 package without few information on quality and quantity of substances contained.
14
15

16 3) There are some *classified advertisements* mainly located on general-public websites and
17 SNS (i.e. Facebook[®], Twitter[®], Instagram[®], Flickr[®], etc.) that are placed in order to attract all sorts
18 of potential consumer and which contain specific links to online drug trading websites.
19
20

21 4) *The "deep web" segment* represents the greater part of online drug market. It allows
22 vendors and sellers to sell and buy in a relatively anonymity and appears to be the first place in
23 which NPS are marketed.
24
25

26 These online drug-trading sites function more or less like an 'e-Bay-style' **and** e-commerce
27 site, where buyers and sellers can find each other to complete the related transactions. Vendors and
28 customers often communicate with the help of encrypted instant-messaging systems and pay by
29 means of cryptocurrencies. To this respect, Silk Road was the most popular online trading website.
30 Activated in February 2011, it was shut down by the US Federal Bureau of Investigation on
31 October 2, 2013 and soon replaced firstly by SilkRoad2 (shut down in November 2014) and then by
32 SilkRoad3 (<http://reloadedudjtjvxr.onion/register.php?auth=XRvzMm7OoUhuzo>). Located on the
33 dark web, this trading site might be accessible only via a secure and confidential net by encryption
34 of computer IP addresses, something that occurs either through the help of the Tor anonymising
35 software or through a Tor-network web proxy. Silk Road has been defined as a "*certifiable one-stop
36 shop for illegal drugs that represents the most brazen attempt to peddle drugs online that we have*
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3 *ever seen*” (Shumer, 2014). Other cyber drug markets, which like Silk Road running on the
4
5 anonymity software Tor, continue to emerge. Directories like *Hidden Wiki* or the *All You're Wiki*
6
7 directory often are updated when particular drug marketplaces have turned out to be scams, whilst
8
9 the subreddit thread *r/DarkNetMarkets* and the list of Darknet markets by *Deepdotweb.com* keeps
10
11 an updated warning list of markets and services that are currently active or that may be scams or
12
13 busts (Deepdotweb.com, 2016; Reddit.com, 2016).
14
15

16
17 Out of those currently active by the time of writing (end of May 2016), the most popular
18
19 ones are represented by: *Alphabay* (<http://pwoah7foa6au2pul.onion/register.php?aff=41211>);
20
21 *Dream Market* (<http://ltxocqh4nvwkofil.onion/?ai=1675>); *Outlaw Market*
22
23 (<http://outfor6jwcztwbpd.onion/indxx1.php>); *Python Market*
24
25 (<http://25cs4ammearqrw4e.onion/market/task.php?register=1&ref=5164>); *Apple Market*
26
27 (<http://254iloft5cheh2y2.onion/register.php?invite=3GmwV3P>); and many others
28
29 (Deepdotweb.com, 2016; Reddit.com, 2016).
30
31
32
33

34 **Theme 3: Grams-search engine for the deep web**

35
36 **Within the ‘deep web’, the ‘hidden’ purchasing activities have been recently made**
37
38 **easier with the availability of the beta version of the Grams Darknet Market search engine**
39
40 (<http://grams7enufi7jmdl.onion>). Grams is a search system like Google AdWords[®], in which
41
42 vendors can buy a set of keywords that allow their listings to go to the top of search results, hence
43
44 increasing the spread of novel psychoactives’ marketplaces (Reddit.com, 2016). Grams is
45
46 considered the ‘*Google of the darknet*’ owning an appearance like Google search engine and is able
47
48 to provide, simply by typing the ‘drug name’, a list of vendor’s name, location and the price of the
49
50 product. It is only available via the TOR browser. Grams also includes a number of Google-like
51
52 features, i.e. “*I Feel Lucky*” search button and a series of features with allow users to filter out
53
54 results and the most recent listings, etc.
55
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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, like the *Litecoin*[®] (<https://litecoin.org/>) and the *Anoncoin*[®]/*ANC* (<https://anoncoin.net/>). *Litecoin*[®] is an open source, peer-to-peer Internet currency which 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 *Anoncoin*[®] 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 *Anoncoin*[®] public addresses (Reddit.com, 2016).

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 (Schifano et al., 2015; Orsolini et al., 2015b). **However, previous studies anticipated the current drugs’ background (Schifano et al., 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 et al., 2015; **Schifano and Orsolini, 2015**). This rapid changing drug scenario facilitated

1
2
3 the birth of a new drug subculture, i.e. the ‘psychonauts’ communities’, particularly belonging to
4
5 the Nerd subculture, inspired **and** attracted by virtual reality and IT technologies (Orsolini et al.,
6
7 2015a; 2015b; Schifano et al., 2015; 2016). Moreover, for a growing number of people, Internet has
8
9 been now considered the first place they look when trying to look for recreational drugs and their
10
11 related information, especially when faced with **the rapid and baffling proliferation of NPS**
12
13 **(EMCDDA, 2016; Orsolini et al., 2015a; Schifano et al., 2016)**. Nowadays, the phenomenon of
14
15 NPS is taking uncontrollable proportions and the virtual communities of research chemicals’ users
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17 are rapidly increasing (Schifano et al., 2015). These completely untested compounds are part of an
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19 international online market that has become too fast and too complex for any government to control
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21 properly (EMCDDA, 2016). This growing market has been facilitated by the advent of Web 2.0.
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23 and some authors named the current new drug users as the generation “Drugs 2.0”, which allowed
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25 the spread of an anarchic free-market world in which drug legislation is being outpaced by
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27 chemistry and technology (Power, 2013).
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32 **NPS are usually sold online, in ‘head-shops’ or sometimes alongside controlled**
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34 **substances in the illicit market. Recently, it has been discovered that some ‘legal high’**
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36 **products (such as ‘spice or synthetic cannabinoid products) are being sold in a wide range of**
37
38 **outlets including corner shops, pubs and petrol stations (Papanti et al., 2014). However, it has**
39
40 **been recently considered the relevant role of the online drug trading sites in selling these**
41
42 **chemicals. The market of NPS is extremely variable as new drugs may rapidly appear on the**
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44 **‘quasi-legal’ and illegal market and just quickly disappear, usually due to little demand, as it**
45
46 **has been observed with the case of 2C-T-7 (aka ‘Blue Mystic’) (Schifano et al., 2005).**
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49 To date, the **deep web** commercial segment appears to represent the greater part of the
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51 online drug market, including recreational **and** illegal drugs as well as NPS. Although the common
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53 user of the drug marketplaces located into the **deep web** has been considered a highly qualified IT
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55 expert with advanced computer skills, it has been recently demonstrated that the **deep web** is also
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57 spreading amongst not-technical users, thanks to the plethora of websites providing easy guidelines
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3 to access the deep web (Orsolini et al., 2015a; Orsolini et al., 2015b; Schifano et al., 2015).
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5 Particularly, some recent studies reported a wide use also in rural areas (Martinotti et al.,
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7 2015), specifically amongst young adults (Martinotti et al., 2014). Furthermore, the deep web
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9 segment represents a safer and more confidential and anonymous way both to communicate, share
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11 opinions, discussions and information about recreational drugs and to sell psychoactive
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13 substances, using protected and confidential addresses and virtual currencies which allow hidden
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15 money transactions (Schifano et al., 2015; Schifano and Orsolini, 2015).

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18 Although the ‘deep web’ acquisition procedures are slightly more complicated than
19
20 those typical of the open web online pharmacies (Schifano et al., 2015), the ‘hidden’
21
22 purchasing activities have been recently made easier with the availability of the beta version
23
24 of the Grams Darknet Market search engine (<http://grams7enufi7jmdl.onion>). Grams
25
26 represents an extremely interesting revolution in the online ‘drug world’, as it facilitates the
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28 research of any types, quality and quantity of illegal and ‘quasi-legal’ drugs, by hence
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30 increasing indeed the possibility to access and purchase any type of NPS etc.

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34 To the best of our knowledge, this paper represents the first attempt at providing a
35
36 systematic overview of available evidence and information, collected through a netnographic
37
38 approach, of the drug-related activities occurring on the deep web. Mental Health’s
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40 professionals and Addictions’ psychiatrists should be kept regularly updated about the
41
42 current shifting and changeable drug market, as this may indeed be associated with a range of
43
44 clinical implications. The spread of the web facilitates a gradual, albeit partial, shift from a
45
46 ‘street’ to a ‘web’ market (Corkery et al., 2017; Orsolini et al., 2015a;) which in turns leads to
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48 both increasing levels of consumers’ knowledge and a further, capillary, diffusion of NPS
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50 (Schifano and Orsolini, 2015). These molecules’ intake may be extremely risky (Schifano et al,
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52 2015), also because the NPS pharmacodynamics’ and toxicological effects are poorly
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54 understood (Schifano et al 2016). The major concern is relating to the poor clinical
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56 knowledge of NPS, in general, amongst mental health professionals and addiction
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3 **psychiatrists. Indeed, clinicians are not always aware of the psychopathological risks relating**
4 **to NPS intake and, at the same time, they are not always able to identify a potential NPS user**
5 **(Simonato et al., 2013). In association with this, most clinicians are not fully aware of both the**
6 **online drug marketplaces and of the drugs which are made available for purchase. Clinicians**
7 **should be informed about the NPS intake modalities; their sought-after effects; and the**
8 **idiosyncratic psychoactives' combinations commented online by the e-psychonauts (Orsolini**
9 **et al., 2015b). The 'deep web' is a further, more hidden, step which is currently in a**
10 **continuous developmental stage. This seems to represent a platform which facilitates the**
11 **occurrence of confidential exchange of drug-related information and acquisition of a range of**
12 **molecules, including: NPS; 'quasi-legal'; and illegal drugs (Schifano and Orsolini, 2015).**
13 **Further research should focus on designing and testing a range of preventative tools, aiming**
14 **at attracting NPS users.**
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29 Further research directions in Drug Addiction should be specifically implemented and
30 addressed in order to better investigate and evaluate preventive tools able to control **and** limit the
31 online drug market, also including specific measures towards the new drug users.
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38 **Conflicts of interest**

39 FS is both a Core Member of the Advisory Council on the Misuse of Drugs (ACMD, UK) and the
40 Chair of the Specialist Advisory Group (Psychiatry) for the European Medicines Agency (EMA).
41
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3 enforcement cooperation in the field of drug trafficking - DG Justice/DG Migrations and Home
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5 concerning Novel Psychoactive Substances; NPS).
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For Peer Review