An international survey on the awareness, use, preference and health perception of Novel Psychoactive Substances (NPS)

Running title: awareness, use, preference and health perception of NPS

Elena Deligianni, John M. Corkery, Fabrizio Schifano and *Lisa A. Lione

School of Life and Medical Sciences, Department of Pharmacy, Pharmacology and Postgraduate Medicine, University of Hertfordshire, Hatfield, United Kingdom

*Corresponding author at: University of Hertfordshire, AL10 9AB, Hatfield, United Kingdom

Email address: l.lione@herts.ac.uk (Dr Lisa Lione)

Conflicts of Interest

FS is a member of the UK Advisory Council on the Misuse of Drugs (ACMD). F.S. and J.C. are members of the ACMD's Novel Psychoactive Substances Working Group. All authors have approved the final manuscript. This is original unpublished work and is not being submitted for publication elsewhere.

Funding

All work presented is internally funded by the University of Hertfordshire.

ABSTRACT (205 words)

Objective

This survey investigated the level of public awareness, preference and motivation of NPS use as well as knowledge of potential associated health risks.

Methods

A Bristol Online Survey was advertised through social media and a drug forum ''Bluelight'' between 7 January and 7 February 2015.

Results

Responses were received from 17 countries, mainly from Europe. Most responses (83%) came from University educated students. Two-thirds (65%) of the 168 respondents were aware of NPS. Awareness was significantly increased in those with bisexual/homosexual orientation ($p<0.05$) and those in employment ($p<0.05$). Fourteen percent of the 168 respondents were users of NPS and use was significantly affected by age and those in employment ($p<0.01$), but unaffected by their level of education ($p>0.05$). Nearly half of the NPS users perceived NPS to carry either a low risk to health (20%) or did not know whether or not they posed a health risk (29%).

Conclusions

These survey data indicate that awareness of NPS and, importantly, perception of the potential health risks associated with NPS use is lacking. NPS awareness and use is higher in those in employment but is unaffected by the level of education. This highlights the need for targeted drugs education intervention by policy-makers in schools and universities.

Key words

Novel psychoactive substances (NPS), 'legal high', ketamine, psychoactive effects, recreational use, online survey

Introduction

Novel Psychoactive Substances (NPS) represent a bewildering array of unregulated psychoactive compounds with slight differences in their chemical structures to mimic effects of traditional illicit drugs and are marketed globally as legal alternatives (so-called 'legal highs') to well-known controlled drugs (EMCDDA-Europol, 2016a). There is debate around nomenclature and definition (King & Nutt, 2014,) but within Europe most researchers use the term NPS (EMCDDA, 2011). The last decade has witnessed the rapid emergence of NPS sold over the internet and in 'head-shops'. The content, interactions, side-effects and abuse potential of these NPS are often unknown, not only to users but also to health care professionals. There are many gaps in knowledge related to NPS acute and long-term effects. Typical side-effects that have been noticed in users of NPS are psychosis, hallucinations, tachycardia, seizures and organ toxicities (Stephenson & Richardson, 2014). There are increasing numbers of deaths associated with NPS (Corkery, Loi, Claridge, Goodair, Corazza, et al, 2015), although in most cases the deceased are polysubstance users and the contribution which individual drugs made to death cannot always be accurately determined in such cases.

The emergence of NPS has created a challenge for drug policy-makers worldwide and a substantial global threat for public health. Most NPS are not controlled under the International Drug Control Conventions, and their legal status differs from country to country (UNODC, 2014). The United Nations Office on Drugs and Crime (UNODC) indicates that 102 countries and territories from all regions of the world have reported the emergence of NPS in their drug markets (UNODC, 2016). Up until December 2015, 644 novel substances were reported to the UNODC Early Warning Advisory (EWA) (UNODC, 2016). In 2014 one in five Americans told the Global Drugs Survey (GDS) that they had taken an NPS in the last year – more than any other country in the world (GDS, 2014).

In Europe there has been a very rapid increase in use of NPS, according to Early Warning System (EWS) data provided to the EMCDDA over the period 2005-2015. The EU EWS is currently monitoring over 590 novel substances; in 2015 98 new substances were reported for the first time (EMCDDA, 2016b).

The UK is one of the biggest consumers of NPS in Europe (GDS, 2016) with frequent reports of serious clinical and public health issues, particularly for vulnerable groups (prisoners, teenagers, homeless). The Global Drug Survey (GDS) reports 58% of NPS were purchased online in the UK last year and NPS users are three times more likely to end up seeking emergency medical treatment than using traditional drugs (GDS, 2016). The risk of potential harms, i.e. long-term mental health issues, crime, debt and violence has prompted the UK government to bring in the Psychoactive Substances Act 2016 banning the production, supply, importation and exportation of NPS (Home Office, 2016b).

There are a number of websites (international, national and local) dedicated to providing information on NPS (e.g. http://www.talktofrank.com, https://www.globaldrugsurvey.com/brand/the-highway-code). In contrast, users (e.g. drug-related internet fora) and internet sales sites often provide unregulated, user-led source information which may not present an accurate picture and can be intentionally misleading to (potential) consumers (Davey, Schifano, Corazza, Deluca, et al, 2012). The largely outdated and misleading term 'legal high' implies there had been some process of assessment deeming these substances safe for human consumption. Awareness that "if something is legal it does not mean it is safe" and anything you consume is potentially unsafe does not necessarily register with (potential) consumers. For consumers, it is simply a matter of how much of it you need to consume that is important.

A number of surveys have investigated the pattern of NPS use, although few surveys capture the user's perceptions of NPS safety (McElrath & O'Neill, 2011) and the educational background of respondents. Understanding consumer perceptions of NPS safety could enhance targeted prevention interventions. This international online survey was designed with two aims – first to provide data on the international patterns of NPS awareness, use, preference, motivations, experiences and health perceptions (the basis for this paper) and - second to provide data specifically on ketamine use (not presented here). The educational background and employment status of respondents was also collected. Some of these survey findings have been presented at the IVth Novel Psychoactive Substances conference (Deligianni, Corkery, & Lione, 2016).

METHODS

In order to elicit the views of individuals, especially young people, and to get as wide a range of views in a short period of time, an online survey was considered to be the most appropriate method. This approach has been previously used by the second and third authors in recent years in order to obtain information on NPS.

The survey was developed using Bristol Online Survey (www.survey.bris.ac.uk), a web survey development service with wide readership. This product was used as it is freely available to the University of Hertfordshire, provides analytical tools and is easy to use. The survey instrument was designed to capture patterns of NPS and ketamine awareness (had they heard of NPS/'legal high' or ketamine), use, preference, motivations, experiences and health perceptions. There were 32 structured questions split into 4 sections. The first two sections were mandatory (10 questions on demographics and NPS awareness, use and perceived harms). Respondents were informed that

they should only complete the third section if they had taken an NPS on at least one occasion in the past. Finally the fourth section was specific to those that had taken ketamine on at least one occasion in the past. **A copy of the survey will be provided upon request.**

Following a pilot involving six university students no changes to the survey were necessary. The survey was in English and advertised on the drug forum Bluelight (www.bluelight.org) and **promoted using** social media **facebook pages (via personal contact pages, LondonGreeks and University of Hertfordshire Bioscience society, Bioscience students, Life and Medical Sciences international students, Freshers 2014/2015, BioSoc Herts pages).** The survey was entirely anonymous, took ten to fifteen minutes to complete and comprised questions requiring both restricted/categorical and/or open responses. Social media enabled easy and fast distribution of the survey through personal accounts and University groups. The drug forum was an important source for targeting drug users but also individuals with an interest in drug-related issues. The survey was available online between 7 January and 7 February 2015.

The inclusion criteria were: (a) no restriction in terms of age, gender, sexual orientation or region of participants; (b) non-users and users of NPS / legal highs could take part in the research; and (c) a good understanding of English was required for participants.

Descriptive statistics were performed to describe the basic features of data using the Bristol Online Survey tool. Chi-square tests were used to assess whether changes in demographics affected NPS awareness and use. The significance level was set to $p<0.05$ after a Bonferroni correction. IBM ® SPSS™ Statistics for Windows (version 21) was used.

The study was approved by the University of Hertfordshire's Health and Human Sciences Research Institute Ethics committee (PHAEC/1042 (02). Informed consent was assumed by individuals agreeing to proceed with the survey.

RESULTS

The survey was completed by 168 respondents from 17 countries during the month it was available online.

Demographics

Respondents were mainly from Europe (149; 89%). The UK (97; 58%, with over half in England), and Greece (34; 20%) represented the main component of European respondents. **Outside of Europe respondents were mainly from the United States (10; 6%) whilst other countries represented less than 3% of respondents.** Respondents were mostly female (63%), aged 18 to 25 years (83%), heterosexual (92%) (Table 1) and had been or were still in higher education (140, 83%) (Table 2).

NPS awareness

Two-thirds (109, 65%) of respondents considered themselves aware of NPS; the most aware in this group were from the UK (71; 72%), Australia (3; 75%), and the Far East & Asia (3; 67%). In Europe (excluding the UK) and US/Canada NPS awareness dropped to (27) 52% and (6) 55% respectively. Given the low numbers of respondents from some countries, caution must be used when comparing data between the different countries. There was equal awareness of NPS amongst males

and females (both 65%); with reduced awareness in only the 26-35 years age-group (8; 50%). Sexual preference impacted NPS awareness as bisexual and homosexual respondents (13 out of 14; 93%) were significantly more NPS aware than heterosexuals (96 out of 154; 62%, $p<0.019$, Chi-square test, Table 3). Age-group and higher educational status did not alter NPS awareness, although undergraduates were more aware (81 out of 112; 72%) than postgraduates (14 out of 28; 50%). Employed respondents were significantly more aware (62; 75%) than the unemployed (39; 55%) (Chi-square test, $p<0.013$, Table 3).

NPS use

Of the total 168 respondents 24 were NPS users (14%); which accounted for 22% of the 109 NPS-aware respondents (Table 4). There were fewer NPS users from Europe (excluding UK) (4 out of 52; 7%) and Australia (0 out of 4; 0%) and more users from the Far East & Asia (1 out of 3; 33%); caution must be taken when comparing these groups because of size. There were twice as many male respondents (13 out of 63; 20%) using NPS than females (11 out of 105; 10%) although the male and female respondents were equally NPS-aware (Table 4). The age-group with the highest proportion of NPS users (excluding < 18 and >50 years - only two respondents) was the 18-25 one (70%), followed by 36-50 (17%) and 26-35 (13%) (Table 4 and Chi-square test, $p <0.004$, Table 5).

Even though most of the NPS users (20 out of 24, 83%) had studied at University and were employed the percentage of NPS use versus non-use was unaffected by educational level. Those educated to college/school level and those educated to University level both had NPS use of 14%. In contrast, employment status significantly increased NPS use (6% NPS users were unemployed, 4 out of 71; and 24% NPS users were employed, 20 out of 83, Table 5 $p=0.000$, Chi-squared test).

Motivations, effect profile/experiences, preference and health perception of NPS use

Two-fifths (40%) of non-users felt NPS were safer than illegal drugs whilst half (50%) felt NPS should be made illegal. In contrast, only 12% of users felt NPS were safer than illegal drugs (Table 4). Half (50%, 72 out of 144) of non-users gave the main reason for not using NPS as awareness of serious health complications associated with their use (Table 6).

The main motivation in using NPS for two-thirds (16/24) of the NPS users was having friends taking them. The fact that NPS were legal and gave 'a high' was also a motivation for half the users (Table 7). The main positive effect noted by users after taking NPS was feeling relaxed (67%), whilst 33% reported experiencing anxiety or hallucinations and 30% had lower inhibitions and a faster heart rate (Table 8). Two-fifths (38%, 9 out of 24) of users noted other effects, including difficulty sleeping, often if more than one drug was taken. Alcohol was most commonly reported to be taken in combination with NPS (33%).

The majority of NPS users had used both an NPS and ketamine at least once (there were 24 responses to their preferred NPS and 19 responses to ketamine from the 24 users). 71% (17) of users had taken the 'other' category of NPS with a preference for nitrous oxide, benzo-fury, mephedrone or 'spice'. Four-fifths (79%) of users had used ketamine at least once and in preference to its legal derivatives (in many countries), **methoxphenidine** (8%; 2), methoxphenidine (12%; 3) and diphenidine (8%; 2). Most (85%, 20) of the users reported only occasional use of NPS (less than once a month), 12% (3) reported often use (approximately once every 2 weeks) whilst 4% (1) reported use of NPS very often (more than 3 times/per week). Half (51%, 12) of the users perceived NPS to carry a medium to high risk to health, whilst 20% (5) thought they carried a low risk and 29% (7) did not know whether or not NPS posed a health risk.

DISCUSSION

Even though more than eighty percent of respondents were university educated 18 to 25 year olds, one third (35%) were unaware of NPS. Males and females were equally unaware of NPS. The lack of NPS awareness, specifically for European regions (89% of respondents), is also confirmed by a Eurobarometer poll of over 13,000 15-24 year-olds indicating one-quarter (29%) are uninformed about NPS (European Commission, 2014a).

Sexual orientation significantly altered the NPS awareness of our respondents. Bisexual and homosexual respondents were significantly more NPS aware (93%) than heterosexuals (62%, $p<0.019$), however the raised NPS awareness did not increase their level of NPS use, which is likely due to the small number of user respondents in this survey. There is a statistically significant difference in NPS awareness between heterosexuals and homosexuals/bisexuals for females (Chi-square = 4.081, $p < 0.05$) and all respondents (Chi-square = 5.246, $p<0.05$).The high percentage of NPS awareness in homosexual/bisexual groups had been expected based on 'Chem-sex studies', where many report being introduced to NPS by sexual partners to enhance, sustain, disinhibit or facilitate sexual pleasure (Shapiro, 2015; Bourne, Reid, Hickson, Torres-Rueda, Steinberg, et al, 2015; Bourne, Reid, Hickson, Torres Rueda, & Weatherburn, 2014). Combining Crime Survey for England and Wales (CSEW) data for the period 2011/12 to 2013/14 shows that drug use by homosexual / bisexual men is higher (33.0%) than gay / bisexual women (22.9%) and heterosexual men (11.1%) and women (5.1%) (Home Office, 2014b). However 'Chem-sex' is not an NPS-specific phenomenon, as traditional illicit drugs (such as amphetamine, ecstasy and cocaine) are widely used alongside NPS. Such studies are also largely confined to specific London boroughs (Measham, Wood, Dargan, & Moore, 2011; Abdulrahim, Whiteley, Moncrieff, & Bowden-Jones, 2016; Bourne et al, 2014).

Fourteen percent of our respondents were users of NPS (22% of the NPS-aware group) with a higher trend of NPS use in males (20%) than females (10%, p=0.07). The higher use by males should also be considered in the context of the self-selecting nature of the survey sample, which was mainly female (62.5%). The rate of female (and Greek and University) respondents is unusually high (NPS surveys are usually weighted towards male respondents) as our survey was advertised mainly via university groups and personal accounts via the first author of this paper (a female Greek national) to enable a rapid response rate during the short survey period. In line with our findings the CSEW notes that males (1.1%) were more likely to have used NPS in the last year than females (0.4%) and they show that ketamine misuse is most common in young males, which may be reflected in our survey, as 79% of our NPS users also used ketamine. The Home Office (2016a) also report that young (16-24 years) men (3.6%) were more likely to have used NPS than young women (1.6%).

NPS use by 14% of our European respondents is slightly higher than the 8% NPS use reported in the 2014 Eurobarometer poll (European Commission, 2014a) which may, in part, be due to the survey being published through the Bluelight drug forum. Another factor is that most respondents (58%) were from the UK which is known to have a higher level of NPS use compared to other European countries. In line with recent Global Drug Surveys (GDS) (2015, 2016) our survey shows the UK has a higher rate of NPS use (17%) compared with the rest of Europe (8%). The 2015 GDS indicates the UK has a NPS usage rate (8.6%) higher than other European countries and global use of 4.6%. Interestingly 20% of our European respondents were Greek and a recent Greek nationwide school population survey reported NPS use to be below the European average at 2.5%, although this survey was based on only 16 year old responses (Kokkevi, Fotiou, Kanavou, Stavrou, & Richardson, 2016). Although the US and Asia have higher rates of NPS use in our survey this will, in

part, be explained by sampling differences (89% respondents were from Europe). Also given that the control status of NPS differs between countries, the 'other' substances that respondents used and considered as NPS may have differed between countries.

NPS use was significantly affected by the age of the respondents ($p<0.01$) and those in employment ($p<0.01$). Age clearly matters although the age effect will have been skewed by sampling differences as the response level is very low in the older groups (e.g. 27 respondents were over 26 years compared to the 141 respondents aged less than 25 years). Other surveys indicate ageing is seen as a protective factor for NPS use (Home Office, 2014b). The majority of NPS users in our survey also used ketamine and UK population surveys show an increase in ketamine use in all adults (16–59) and young people (16–24) which may account for the increase in mean age of our NPS users (ACMD, 2013).

Unlike typical heroin and crack cocaine users, club drug users (i.e. NPS / ketamine users) often have good personal resources – jobs, relationships, accommodation (National Treatment Agency, 2012). In line with this we noted that the employment status of our respondents significantly altered NPS awareness and use. Employed respondents, particularly those in full-time jobs, were more NPS-aware (84%) compared to unemployed respondents (55%, $p=0.013$). NPS awareness also influenced use as NPS users were more likely to be employed (24%) rather than unemployed (6%). According to emerging clinical opinion and data, club drug users have jobs, are socially functional and are often highly educated (National Treatment Agency, 2012). Interestingly, undergraduates were more NPS aware (72%) and more likely to use NPS (16%) than postgraduate respondents (50% aware, 8% use) indicating that a higher level of educational status is not a factor related to NPS awareness or use. Here we show that, irrespective of whether a respondent is

college, school or university educated, such experience fails to influence NPS awareness or use ($p>0.05$) clearly indicating a need for improved drugs education.

NPS commonly used were the synthetic cannabinoid receptor agonist 'Spice', the synthetic cathinone mephedrone, the benzofuran benzofury, benzodiazepine analogues and nitrous oxide. Common use of these NPS is widely reported in other surveys (GDS, 2016; Penney, Dargan, Padmore, Wood, & Norman, 2016). Extensive research shows that 83% to 99% of NPS users are also users of other traditional illicit drugs (Home Office, 2014a) and preference for traditional illicit controlled drugs over their related NPS is commonly seen (Winstock & Barratt, 2013; Penney et al, 2016). Seventy-nine percent of our NPS users had also used controlled ketamine, however, our survey did not ask users about their other illicit drug use so this percentage may well be higher. We also noted that 79% of our users used ketamine compared to only 8-12% that used the ketamine legal derivatives methoxetamine (MXE), methoxphenidine (MXP) and diphenidine (DP). User preference for ketamine over MXE is similar to a recent survey of 7700 UK-based polydrug users where only 5% of the sample had ever used MXE and 4.2% reported last 12 month use of MXE compared with 49% for ketamine (Winstock, Lawn, Deluca, & Borschmann, 2016). London school children also have a preference for ketamine (48%) over MXE (29%, Penney et al, 2016). Further, some users have stated that the effects (such as depression and extremely intense experiences) of taking MXE with ketamine are more unpleasant than ketamine alone (ACMD, 2014); these may deter MXE use. Recreational ketamine and/or NPS, especially when taken with other substances like alcohol (one-third of users reported alcohol use) can affect breathing and increase heart rate, and cause feelings of anxiety and depression (Home Office 2014a).These effects were reported by our users, despite the fact most were infrequent users (less than once a month).

Our findings are in line with GDS surveys (GDS, 2015) that NPS generally do not have an effect profile that is preferred to traditional drugs by the vast majority of users and very importantly are not seen as safer than traditional drugs, despite claims on internet websites that these are safer alternatives (e.g. MXE is safer and less damaging to the bladder compared with ketamine, Morris, 2011). Half of our users (12) were aware that NPS carried potential medium to high health risks and only twelve percent (3) felt NPS were safer than illegal drugs. Despite over half of our users being risk-aware that NPS carry a medium to high risk to health they still chose to get high. In contrast, regardless of the fact that only twelve percent of users believed NPS to be safer than illegal alternatives, nearly half of users either thought NPS carried a low risk to health or did not know whether NPS posed a health risk at all (in line with the 2014 Eurobarometer survey). Motivators for initiating NPS use are often curiosity, boredom and peer pressure (Home Office, 2014a). Two-thirds (67%) of our users were influenced by their friends using NPS and fifty percent because they were aware that could experience a 'good high' without being against the law. The Eurobarometer 2014 survey and GDS surveys find similar motivations for NPS use (European Commission 2014b, GDS, 2015-2016). Legality of NPS, was therefore seen as a motivator for use in our sample, despite many users knowing that legality does not mean NPS are safer. This agrees with another study where none of the respondents perceived that legal highs were necessarily safe, although in this study, none recalled an interest in trying mephedrone because it was legal (McElrath & O'Neill, 2011). Findings on the importance of the legal status of NPS are mixed. For example, 64% of over a thousand 16-24 years old recently surveyed by the UK YMCA charity said they will likely continue to use these now 'illegal' NPS despite the UK Psychoactive Substances Act 2016 (Stone, 2016). Also the CSEW has shown that use of mephedrone by 16 to 24 year-olds has not changed significantly since its ban in the period 2012/13 to 2015/16 (Home Office, 2016a),

indicating that simply making something illegal seems to have little impact on user demand. Our sample indicates legality is a relevant issue and may help discussion regarding policy making.

According to our non-users the media (TV and Internet) is the most important source of information (26%) about side-effects and health risks, their most important reason (50%) for not using NPS. The Eurobarometer survey agrees that the internet is by far the most-used source of information (30%) about illicit drugs and drug use (European Commission, 2014a). Media reports often highlight the dangers of NPS, but also inadvertently advertise the potency, ready availability and legal status to potential users. Often, the knowledge people have about NPS is gained through peer to peer interactions, or online fora, which can reinforce a variety of myths and misconceptions (Davey et al, 2012). Being able to easily buy NPS online was a major motivator for 42% of our users and the latest GDS (2016) report show 58% users in the UK purchased online. The fact that 83% of our users either had a degree or were studying for a degree confirms that "e-Psychonauts" are typically well educated and well informed (Schifano, Deluca, Baldacchino, Peltoniemi, Scherbaum, et al, 2006).

Our survey highlights that for many non-users and users alike there is a lack of education on NPS awareness and health risks of NPS use. For many of our respondents information is sourced via the media and internet, which can often result in misinformation and misperceptions (Davey et al., 2012). Public opinion across Europe ranks information and prevention campaigns as the second most important way for policy-makers to tackle society's drug problems (second to punishing drug dealers and traffickers, European Commission 2014a) and the GDS High-way Code guide 'to a safer more enjoyable drug use' was voted for by almost 80,000 people from across the world for reducing the risks of harm while impacting little on pleasure (GDS, 2014). Implementation of the UK Psychoactive Substances Act 2016 will need to work in tandem with a comprehensive education and

targeted public awareness campaign (ideally via media and internet) highlighting the potential risks and harms from these substances, particularly for the more vulnerable risk-taking 16-24 year olds, parents and teachers (Lione, 2016). Currently, science is the only statutory subject that delivers drug education in UK schools, and this is largely confined to biological understandings of drugs (DfE, 2013). Schools are expected to cover other fundamental components of drug education –resilience to risk factors (e.g. peer pressure), social and emotional skills – within personal, social and health education (PSHE, DfE, 2012). A recent survey of 590 secondary school pupils in London and 288 teachers across England highlighted the need for an improvement in national policy on drugs education particularly in relation to subject-specific teacher training and the need for a statutory status for PSHE (Thurman & Boughelaf, 2015). Government support and professional training and development are essential ingredients in the provision of universal drug education in schools (Hargreaves, 2016). Introducing a statutory PSHE programme into the national curriculum and higher education will not only educate but build resilience and empower young people to help them make positive choices for their health including substance choices when in peer pressure situations. Applying this evidence-based approach to drugs education is also recommended by the EMCDDA (EMCDDA, 2015a, 2016a).

Strengths & weaknesses of the study

There are a number of strengths in this study. The survey was open to the general public and the majority of respondents were UK University students aged 18 to 25 years, the most dynamic NPS user group. When used alongside other sources, this survey helps build a more in-depth picture on the awareness and use of NPS, particularly in educated and employed individuals, and identifies a need for improved drugs education.

This study has some limitations. The recruitment window was brief with the survey active for only 4 weeks and only available online and will therefore tend to miss those without easy online access and those with who do not speak English. The major methodological limitation with this survey is the sampling bias and the variation in size of the samples from different countries (mainly from the UK and Greece). This means caution must be used when comparing data between the different countries. The self-selecting sample were typically in their in 20s and 30s and well-educated and one suspects may have a greater interest in the topic. Of note is that the high 18 to 24 age-group sample are also more likely to go clubbing hence may be more drug aware and experienced than the general population. Advertisement of the survey through wider professional associations and organisations and drug and science fora could have led to a greater range of public response.

CONCLUSIONS

We have shown that awareness of NPS and, importantly, perceptions of the potential health risks associated with NPS use was lacking in a sample of predominantly university educated people. NPS use was higher in those in employment, was unaffected by their level of education and was influenced by factors including age, friends/peers and legal status. The fact that NPS awareness and use was higher in undergraduates compared with postgraduates requires further investigation.

Although this small international pilot survey had availability bias to well-educated young people, mainly from the UK and Greece, similar trends to larger global drugs surveys were noted. It is important that reliable and up-to-date survey data are available to inform education and policy in this area. The fact the majority of the sample were university educated highlights a need for targeted drugs education intervention by policy-makers in schools and universities. Publishing

results from such surveys will also inform the public so they are risk-aware and can make informed and educated choices about whether or not to use NPS, legal or not.

Acknowledgements

The authors would like to thank Ms Panagiota Athanasopoulou for her kind assistance in experimental design and data analysis. Thanks are also due to the survey respondents for contributing their time to this research, www.bluelight.ru for their help in advertising the survey and Terpsi Karpasitis, Tolga Arkut, Rosanna Harding, Neil Jenkins and Rachel Evans for distribution of the survey.

Contributions

L.L. and E.D. devised the study and developed the questionnaire. E.D. oversaw the data collection and conducted the statistical analysis and L.L., E.D., F.S. and J.C. contributed to the preparation of the manuscript and approved the final draft.

REFERENCES

Abdulrahim, D., Whiteley, C., Moncrieff, M., & Bowden-Jones, O. (2016). Club Drug Use Among Lesbian, Gay, Bisexual and Trans (LGBT) People. Novel Psychoactive Treatment UK Network (NEPTUNE), London, available at: http://neptune-clinical-guidance.co.uk/wp-content/uploads/2016/02/neptune-club-drug-use-among-lgbt-people.pdf (accessed 21 November 2016).

Bourne, A., Reid, D., Hickson, F., Torres Rueda, S., & Weatherburn, P. (2014). The Chemsex Study: drug use in sexual settings among gay and bisexual men in Lambeth, Southwark & Lewisham, Sigma Research, London School of Hygiene & Tropical Medicine, London, available at: http://researchonline.lshtm.ac.uk/2197245/1/report2014a.pdf (accessed 21 November 2016).

Bourne, A., Reid, D., Hickson, F., Torres-Rueda, S., Steinberg, P., & Weatherburn, P. (2015). "Chemsex" and harm reduction need among gay men in South London", International Journal of Drug Policy, 26 (12), 1171-1176.

Corkery, J.M., Loi, B., Claridge, H., Goodair, C., Corazza, O., Elliott, S., & Schifano, F. (2015). "Gamma hydroxybutyrate (GHB), gamma butyrolactone (GBL) and 1,4 butanediol (1,4-BD; BDO): a literature review with a focus on UK fatalities related to non-medical use", Neuroscience & Biobehavioral Reviews, 53, 52-78.

Davey, Z., Schifano, F., Corazza, O., Deluca P., & on behalf of the Psychonaut Web Mapping Group (2012). e-Psychonauts: Conducting research in online drug forum communities, Journal of Mental Health, 21 (4) 386-394, DOI: 10.3109/09638237.2012.682265

Deligianni, E., Corkery, J.M., & Lione, L.A. (2016). "Global Survey on Novel Psychoactive Substances & Effects of Ketamine in Lower Urinary tract", poster presented at the Fourth International Conference on Novel Psychoactive Substances, Hotel Benzçur, Budapest – May 30 - 31 2016.

DfE. (2012). DfE and ACPO drug advice for schools: Advice for local authorities, headteachers, school staff and governing bodies, Department for Education, London, available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/270169/drug_advice_for_schools.pdf (accessed 21 November 2016).

DfE. (2013). Personal, social, health and economic (PSHE) education, Department for Education, London, available at: https://www.gov.uk/government/publications/personal-social-health-and-economic-education-pshe/personal-social-health-and-economic-pshe-education (accessed 21 November 2016).

European Commission. (2014a). Report: Flash Eurobarometer 401: Young People and Drugs. TNS Political & Social, Luxembourg, available at: http://ec.europa.eu/public_opinion/flash/fl_401_present_en.pdf (accessed 21 November 2016).

European Commission. (2014b).”International Day against Drug Abuse: new study shows increasing use of 'legal highs' among young Europeans”, June 26, 2014, available at: http://europa.eu/rapid/press-release_MEMO-14-445_en.htm (accessed 21 November 2016).

European Monitoring Centre for Drugs and Drug Addiction. (2011). 2011 Annual report on the state of the drugs problem in Europe- Lisbon: EMCDDA, Publications Office of the European Union, Luxembourg, available at: http://www.emcdda.europa.eu/publications/annual-report/2011 (accessed 21 November 2016).

European Monitoring Centre for Drugs and Drug Addiction. (2014). EMCDDA–Europol 2013 Annual Report on the implementation of Council Decision 2005/387/JHA: In accordance with Article 10 of Council Decision 2005/387/JHA on the information exchange, risk assessment and control of new psychoactive substances, Publications Office of the European Union, Luxembourg, available at: http://www.emcdda.europa.eu/attachements.cfm/att_229598_EN_TDAN14001ENN.pdf (accessed 21 November 2016).

European Monitoring Centre for Drugs and Drug Addiction. (2015a). European Drug Report 2015: Trends and Developments, Publications Office of the European Union, Luxembourg, available at: http://www.emcdda.europa.eu/publications/edr/trends-developments/2015 (accessed 21 November 2016).

European Monitoring Centre for Drugs and Drug Addiction. (2015b). New psychoactive substances in Europe – An update from the EU Early Warning System-Lisbon: EMCDDA, Publications Office of the European Union, Luxembourg, available at: http://www.emcdda.europa.eu/attachements.cfm/att_235958_EN_TD0415135ENN.pdf (accessed 21 November 2016).

European Monitoring Centre for Drugs and Drug Addiction and Europol. (2016a). EU Drug Markets Report: In-Depth Analysis, EMCDDA–Europol Joint publications, Publications Office of the European Union, Luxembourg, available at: http://www.emcdda.europa.eu/system/files/publications/2373/TD0216072ENN.PDF (accessed 21 November 2016).

European Monitoring Centre for Drugs and Drug Addiction. (2016b). Health responses to new psychoactive substances, Publications Office of the European Union, Luxembourg, available at: http://www.emcdda.europa.eu/system/files/publications/2812/TD0216555ENN.pdf (accessed 21 November 2016).

Global Drugs Survey. (2014). "The Global Drug Survey 2014 findings", available at: https://www.globaldrugsurvey.com/past-findings/the-global-drug-survey-2014-findings/ (accessed 21 November 2016).

Global Drugs Survey. (2015). "The Global Drug Survey 2015 findings", available at: https://www.globaldrugsurvey.com/the-global-drug-survey-2015-findings/ (accessed 21 November 2016).

Global Drugs Survey. (2016). "Key findings from the Global Drug Survey 2016", available at: https://www.globaldrugsurvey.com/past-findings/the-global-drug-survey-2016-findings/ (accessed 21 November 2016).

Hargreaves, P. (2016), "School-based drug education and prevention: the impact of inspection and curriculum provision", Drugs and Alcohol Today, Vol. 16 No. 2, pp. 131 – 141.

Home Office. (2014a). New Psychoactive Substances Review: Report of the Expert Panel, Home Office, London, available at:

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/368583/NPSexpertReviewPanelReport.pdf (accessed 21 November 2016).

Home Office. (2014b). Drug Misuse: Findings from the 2013/14 Crime Survey for England and Wales, Home Office, London, available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/335989/drug_misuse_201314.pdf (accessed 21 November 2016).

Home Office. (2016a). Drug Misuse: Findings from the 2015/16 Crime Survey for England and Wales, Home Office, London, available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/541542/drug-misuse-1516.pdf (accessed 14 November 2016).

Home Office (2016b). Psychoactive Substances Act 2016, Home Office, London, available at: https://www.gov.uk/government/collections/psychoactive-substances-bill-2015 (accessed 25 November 2016).

King, L.A., and Nutt, D.J. (2014). “Deaths from "legal highs": a problem of definitions”, Lancet, 383 (9921) 952.

Kokkevi, A., Fotiou, A., Kanavou, E., Stavrou, M., & Richardson, C., (2016). "Smoking, alcohol, and drug use among adolescents in Greece – 2015 update and secular trends 1984-2015", Archives of Hellenic Medicine, 33 (2), 249-257.

Lione, L.A., (2016). "Banning psychoactive substances is not enough, we need education too", British Pharmacological Society Pharmacology Matters, 9, (3) 10-12. available at: https://www.bps.ac.uk/BPSMemberPortal/media/BPSWebsite/Assets/Pharmacology-Matters-November-online.pdf?ext=.pdf (accessed 28 November 2016).

McElrath, K., & O'Neill, C., (2011). Experiences with mephedrone pre- and post-legislative controls: Perceptions of safety and sources of supply. International Journal of Drug Policy 22 120–127.

Measham, F., Wood, D., Dargan, P., & Moore, K., (2011). "The rise in legal highs: prevalence and patterns in the use of illegal drugs and first and second generation 'legal highs' in South London gay dance clubs", Journal of Substance Use, 16 (4) 263-272.

Morris, H., (2011). "Interview with a ketamine chemist: or to be more precise, an arylcyclohexylamine chemist", Vice Magazine, available at: http://www.vice.com/read/interview-with-ketamine-chemist-704-v18n2 (accessed 21 November 2016).

National Treatment Agency for Substance Misuse. (2012). Club Drugs: Emerging Trends and Risks, National Treatment Agency, London, available at: http://www.nta.nhs.uk/uploads/clubdrugsreport2012%5B0%5D.pdf (accessed 21 November 2016).

Penney, J., Dargan, P. I., Padmore, J., Wood, D. M., & Norman, I. J., (2016). Epidemiology of adolescent substance use in London schools. QJM, 109(6), 405-409. 10.1093/qjmed/hcv171.

Schifano, F., Deluca, P., Baldacchino, A., Peltoniemi, T., Scherbaum, N., & Torrens, M., (2006). Drugs on the web; The Psychonaut 2002 EU project. Progress in Neuropsychopharmacology and Biological Psychiatry, 30 (4), 640–646.

Shapiro, H., (2015). Not for human consumption – An updated and amended status report on new psychoactive substances (NPS) and 'club drugs' in the UK, DrugScope, London, available at: http://www.drugwise.org.uk/wp-content/uploads/not-for-human-consumption.pdf (accessed 21 November 2016).

Stephenson, G., & Richardson, A., (2014). New Psychoactive Substances in England, Crime and Policing Analysis Unit, Home Office Science, London, available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/368587/NPSevidenceReview.pdf (accessed 21 November 2016).

Stone, J., (2016). "Legal highs: Two-thirds of young people who take substances intend to ignore incoming ban, research finds", Independent, available at: http://www.independent.co.uk/news/uk/home-news/legal-highs-two-thirds-of-young-people-who-take-the-substances-intend-to-ignore-incoming-ban-new-a7047476.html (accessed 21 November 2016).

Thurman, B., & Boughelaf, J., (2015) “We don’t get taught enough”: an assessment of drug education provision in schools in England”. Drugs and Alcohol Today, 15 (3) 127-140.

United Nations Office on Drugs and Crime (UNODC), (2014). Global Synthetic Drugs Assessment: Amphetamine-type stimulants and new psychoactive substances, United Nations, New York, available at: http://www.unodc.org/documents/southeastasiaandpacific/2014/05/gsda/2014_Global_Synthetic_Drugs_Assessment_embargoed_Tokyo_web.pdf (accessed 21 November 2016).

United Nations Office on Drugs and Crime (UNODC), (2016). World Drug Report 2016. United Nations, New York, available at: https://www.unodc.org/doc/wdr2016/WORLD_DRUG_REPORT_2016_web.pdf (accessed 21 November 2016).

Winstock, A.R., & Barratt, M.J., (2013). “Synthetic cannabis: A comparison of patterns of use and effect profile with natural cannabis in a large global sample”, Drug and Alcohol Dependence, 131 (1-2) 106-111.

Winstock, A.R., Lawn, W., Deluca, P., & Borschmann, R., (2016). “Methoxetamine: An early report on the motivations for use, effect profile and prevalence of use in a UK clubbing sample”, Drug and Alcohol Review, 35 (2) 212–217.

Table 1. Demographics of respondents.

Characteristics	Total Respondents (n=168)	
	n	%
Gender		
Male	63	37.5%
Female	105	62.5%
Age (years)		
<Under 18	1	0.6%
18-25	140	83.3%
26-35	16	9.5%
36-50	10	6.0%
>Over 50	1	0.6%
Sexual orientation		
Straight/heterosexual	154	91.7%
Homosexual	7	4.2%
Bisexual	7	4.2%

Table 2. Demographics of respondents and their NPS awareness.

Gender	Aware	Unaware	**Totals**
Male	41	22	63
Female	68	37	105
Totals	109	59	168
Age (year)	Aware	Unaware	**Totals**
<Under 18	0	1	1
18-25	91	49	140
26-35	8	8	16
36-50	9	1	10
>Over 50	1	0	1
Totals	109	59	168
Sexual orientation	Aware	Unaware	**Totals**
Straight/heterosexual	96	58	154
Homosexual	6	1	7
Bisexual	7	0	7
Totals	109	59	168
Highest level of education (completed/still in progress)	Aware	Unaware	**Totals**
High school	6	3	9
College	8	11	19
Undergraduate studies	81	31	112
Postgraduate studies	14	14	28
Totals	109	59	168
Current employment status	Aware	Unaware	**Totals**
Full Time	32	6	38
Part Time	30	15	45
Not employed but looking for work	15	16	31
Not employed and not currently looking for work	24	16	40
Other*	8	6	14
Total Responses	109	59	168

* **Other: On the current employment status were reported responses such as full time research student, full-time master student and student in gap year*

Table 3. Relationship between NPS awareness and sexual preference and employment.

	Awareness	Gender	Age	Sexual preference	Employment	Education
Pearson Correlation	1	0.003	-0.093	-0.181	0.191	0.008
Sig. (2-tailed)		0.967	0.232	*0.019	*0.013	0.919
N	168	168	168	168	168	168
* Correlation is significant at the 0.05 level (Chi squared test, 2-tailed).						

Table 4. Demographic characteristics associated with NPS use.

Gender	Users	Non-users	**Totals**
Male	13	50	63
Female	11	94	105
Totals	24	144	168
Age (years)	Users	Non-users	**Totals**
<Under 18	0	1	1
18-25	16	124	140
26-35	4	12	16
36-50	3	7	10
>Over 50	1	0	1
Totals	24	144	168
Sexual orientation	Users	Non-users	**Totals**
Straight/heterosexual	23	131	154
Homosexual	0	7	7
Bisexual	1	6	7
Totals	24	144	168
Highest level of education(completed/still in progress)	Users	Non-users	**Totals**
High school	2	7	9
College	2	17	19
Undergraduate studies	18	94	112
Postgraduate studies	2	24	26
*Other**	0	2	2
Totals	24	144	168
Current employment status	Users	Non-users	**Totals**
Full Time	13	25	38
Part Time	7	38	45
Not employed but looking for work	2	29	31
Not employed and not currently looking for work	2	38	40
*Other***	0	14	14
Totals	24	144	168
Agreed statements	Users	Non-users	**Totals**
Legal highs/NPS are safer than illegal highs	4	57	61
Legal highs/NPS would make a night out much better	6	7	13
Legal highs/NPS should be made illegal	7	76	83
Taking legal highs/NPS is normal among my friends	12	15	27
Total responses	29	155	184

**Other: On highest level of education (still in progress) have been reported responses such as a full-time master student and a full-time postgraduate student.*

*** Other: On current employment status have been recorded responses such as full time student, student in gap year, and postgraduate students.*

Table 5. Relationship between NPS use and demographics.

	Use of NPS	Gender	Age	Sexual preference	Level of education	Employment
Pearson Correlation	1	0.141	-0.220	0.039	0.070	0.311
Sig. (2-tailed)		0.069	*0.004	0.618	0.366	*0.000
N	168	168	168	168	168	168
*. Correlation is significant at the 0.01 level (2-tailed) (Chi squared test, 2-tailed).						

Table 6. Non-user reasons for not using NPS.

Statements relate to why have never tried NPS/legal highs		
	n	% non-user (144)
Have never heard of legal highs	36	25.0
Have heard of legal highs but do not know enough about them	36	25.0
Find them too expensive	6	4.2
Have seen people that are having health problems by taking legal highs	18	12.5
Know people that have faced problems in school/work because of use of legal highs	18	12.5
Know people that had problems in their relationships with family/ friends because of use of legal highs	16	11.1
Do not know from where could get them	20	13.9
Believe that they are highly risky for health and can cause serious complications	72	50.0
Have been informed from news on TV and social media about risks and deaths related to use of legal highs	38	26.4
Total Responses (n)	260	100.0

Table 7. Reasons for trying NPS.

Main reasons for trying NPS	Total Responses (n=73)	Total Users (n=24)
	n	**% of user**
Friends have taken them	16	66.7
Give me a good high	12	50.0
Make a night out much better	9	37.5
Make me more confident to socialise	5	20.8
They are cheaper than other drugs	6	25.0
They are safer than other illegal drugs	3	12.5
I know I was not against the law	12	50.0
I was able to buy them easily online	10	41.7

Table 8: Effects caused after use of NPS.

Effects	Total Responses (n=79)	Total Users (n=24)
	n	% of user
Felt relaxed	16	66.7
Felt aggressive	1	4.1
Felt anxious	8	33.3
Felt nauseous	6	25.0
Had headaches	3	12.5
Had hallucinations	8	33.3
Felt depressed	6	25.0
Had lower inhibitions	7	29.2
Felt paranoid	5	20.8
Had faster heart beating	7	29.2
Felt drowsy	3	12.5
Felt pain	0	0.0
Other	9	37.5
*Other: There were reported difficulties in sleeping, feeling that 'sleep would never come again' (use of more than one substances mixed together), happiness and not any changes		