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Drugs of Abuse and Novel Psychoactive Substances at Outdoor Music Festivals in Colorado

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Abstract

Background—Drugs of abuse (DOA) are widely used in the United States and are ubiquitous at outdoor music festivals. Attendees at music festivals are at high-risk for novel psychoactive substance (NPS) use, which is becoming more prevalent worldwide. No U.S. studies have employed an qualitative approach to investigate the etiologies of both traditional DOA and NPS use amongst music festival attendees.

Objectives—The objective of this study was to improve understanding of the knowledge, attitudes, beliefs, and practices of festival attendees using NPS and DOA.

Methods—We conducted semi-structured interviews of 171 attendees during the Sonic Bloom and Arise music festivals in Colorado in 2015 and 2016. Discrete variables were summarized with descriptive statistics. The anonymous, multi-domain interview documented the knowledge, attitudes beliefs, and practices underlying DOA use, which were analyzed with qualitative methods.

Results—We enrolled 171 participants that endorsed DOA use at the festivals. Most were experienced DOA users, who perceived minimal risks associated with DOA and NPS use. Nearly all unanimously reported normalization of DOA at music festivals. Participants popularly cited empathogenic, entactogenic, and entheogenic effects of DOA as their primary motivations for use.

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Author contributions

JF and AS enrolled subjects at the festivals in 2016 and drafted the manuscript. AY, CC, and EA enrolled subjects in 2015, were responsible for data management, and critically edited the manuscript. TC provided the opportunity to run this study at these festivals, supervised the research assistants on site, and critically edited the manuscript. AAM conceived the study, coordinated the study, provided critical guidance on data analyses, and edited the manuscript throughout its development.

NPS use was endorsed by 39.8% ($n = 68$) of respondents, all of whom identified as being experienced DOA users.

Conclusions—This population of novel psychoactive substance users is primarily composed of experienced drug users that endorsed use because of low cost, minimal perceived risk, accessibility, and normalization of drug use at music festivals.

Keywords

Novel psychoactive substance; ethnography; drugs of abuse; music festival; harm reduction; festival medicine; substance abuse; synthetic cannabinoid; 2C; kratom; synthetic opioid; qualitative

Introduction

Drug toxicity at music festivals poses a unique challenge to medical personnel. Abuse of novel psychoactive substances (NPS), such as synthetic cathinones, cannabinoids, and phenethylamines, is common at these venues and may result in severe clinical illness (Forrester, 2014; Monte et al., 2014; Ridpath et al., 2014). Various adverse health outcomes have been associated with these substances, including cardiotoxicity, acute kidney and liver injury, rhabdomyolysis, seizures, neuropsychiatric conditions including suicidal ideation, and death (Kueppers & Cooke, 2015; Palamar, Su, & Hoffman, 2016; Ridpath et al., 2014; Young et al., 2012). These compounds may be ingested intentionally as alternatives or supplements to traditional drugs of abuse (DOA), or unintentionally as adulterants (Moore, Dargan, Wood, & Measham, 2013; Vogels et al., 2016). Drug use at music festivals and raves has become normalized; consequently, drug-related adverse medical events are common at such venues (Hutton, Ranse, Verdonk, Ullah, & Arbon, 2014; Lim, Hellard, Hocking, & Aitken, 2008a).

The proliferation of NPS extends far beyond the use at American music festivals. A study in the Netherlands of over 40,000 samples submitted to the Drug Information Monitoring System revealed that the percentage of samples increased from 0.5% in 2007 to 7.6% in 2013, and the majority of NPS-containing samples were not marketed as NPS but rather as a traditional DOA (Hondebrink, Nugteren-van Lonkhuyzen, Van Der Gouwe, & Brunt, 2015). In the United States, between 2010 and 2011, calls to poison control centers relating to synthetic cannabinoid and synthetic cathinone abuse increased 2-fold and 20-fold, respectively (Pourmand, Armstrong, Mazer-Amirshahi, & Shokoohi, 2014).

In the U.S., organizations such as the American Association of Poison Control Centers and the Monitoring the Future survey have published limited epidemiological data surrounding NPS abuse (Miech, Johnston, O'malley, Bachman, & Schulenberg, 2015; Mowry, Spyker, Brooks, McMillan, & Schauben, 2015). Such studies rely on voluntary reporting, do not specifically focus on NPS and fail to examine reasons for use or sources of procurement. To develop effective prevention strategies, develop treatment plans, and to provide meaningful counsel to abusers of these drugs, it is insufficient to merely quantify NPS abuse. Rather, details about why people use NPS, how they are used, where they are obtained, and what symptoms are experienced with use are necessary. A qualitative approach is ideal to capture

practical information that may be used for substance abuse intervention strategies. To investigate the knowledge, attitudes, beliefs, and practices of NPS users, we conducted semi-structured interviews at two multi-day outdoor music festivals in Colorado in 2015 and 2016.

Methods

Study design and setting

Our study was a cross-sectional design using a semi-structured qualitative interview of a convenience sample of recreational drug users at two recurring outdoor music festivals over the summers of 2015 and 2016. The Sonic Bloom festival was held in Spanish Peaks County, Colorado, June 19–22, 2015 and June 16–19, 2016. The Arise festival took place in Loveland, Colorado from August 7–9, 2015 and August 5–7, 2016. Sonic Bloom attracts approximately 10,000 attendees per year while Arise has approximately 8,500 attendees per year. Both festivals feature eclectic mixes of reggae, hip-hop, blue-grass, and funk music in addition to many electronic dance music artists.

Study personnel were stationed at the medical tents. Both the Sonic Bloom and Arise medical tents were located near the main entrance, optimizing access to medical care and the study personnel. This study was approved by the local institutional review board.

Study population

The study population included attendees over age 18 years who were able to provide verbal informed consent and whom reported illicit drug. Subjects were enrolled by two routes: (1) by approaching the medical tent with interest in anonymous participation; or (2) after receiving care in the medical tent. Participants answered questions from an orally-administered semi-structured interview. Three interviewers were deployed at each festival; interviewers actively sought festival attendee participation and incentivized participation with free stickers. Each participant was given a unique study identifier and participated once.

Semi-structured interview

The interview was composed of 7 close-ended questions, 32 open-ended questions (including branching logic questions), and elements that gathered demographic data, past medical history, and drug use history. Open-ended interview questions assessed knowledge, attitudes, beliefs, and practices of drug use, as well as questions about the characteristics of the primary drug used at the festival including cost (in USD/g or USD/dose), ease of access (as graded by the user on an integer scale ranging from 1 [very easy to obtain] to 5 [very difficult to obtain]), and primary route of administration. Open ended question responses were documented verbatim in the response fields. The “knowledge” domain evaluated how long users had known about the drug, where they learned about the drug, and how many people they knew that used the drug. The “attitudes” domain included questions regarding users’ likes and dislikes about the drug, and yielded insights into common opinions of traditional DOA and NPS. The “beliefs” domain evaluated users’ perceived risks, perceived benefits of the drug, and identified users’ perceptions of availability and popularity of the drug. Popularity was assessed by prompting users to estimate how many people they know

who also use the drug. The “practices” domain sought specific information about the context of drug use. Subjects were asked to share information on the general source of the drug (e.g. friend, family, stranger), to elaborate on other patterns of use, including co-ingestion of other drugs and use of drugs to improve sex. Lastly, participants were asked to describe the somatic and emotional effects of the primary drug as they experienced them. In order to identify common subjective experiences. Interviewers captured quotations in written format. They explored and clarified user experiences with probing questions when themes around use presented themselves. Interviews were administered and responses were recorded (handwritten) by trained investigators.

Analysis

Descriptive statistics were used to characterize the study population. Transcripts were coded by JF and AS. The interview elements were analyzed with qualitative methods, coding responses into knowledge, attitude, belief, and practice domains with major topic elements summarized and illustrative comments presented in quotation format. Major topic themes of these domains were identified by frequency of mention and summarized with interpretations, provided with context of the spoken phrase, by the PI, AM (Charmaz, 2006). When possible, topics that were amenable to discreet coding, such as the level of knowledge of a drug class, were coded into integer scales for summary purposes. All analyses were performed using RStudio (v. 1.0.136)

Results

Demographics of participants

Between 2015–2016, 95 attendees at Sonic Bloom and 76 attendees at Arise completed the interview. The demographic characteristics of the cohort are summarized in Table 1. The median age of participants was 25.5 years (IQR = 21–29), and 141 (85.5%) reported at least some college or technical school education. As expected with this demographic, the majority of respondents reported no significant past medical history (73.7%, $n = 126$) or psychiatric history (60.8%, $n = 104$).

Drug use history

A summary of the cohort’s drug use history is presented in Table 2. Per self-report, the three most popular drugs used (both recent and lifetime use) were 3,4-methylenedioxymethamphetamine (MDMA), lysergic acid diethylamide (LSD), and cocaine, in that order. Recent (<30 days) and lifetime NPS use were reported by 13.5% ($n = 23$) and 39.8% ($n = 68$) of the cohort, respectively. Of those who reported recent NPS use, subjects most often endorsed using a drug in the hallucinogen/psychedelic subclass (47.8% of recent NPS users, $n = 11$), whereas subjects reporting lifetime NPS use most commonly endorsed use of the synthetic cannabinoid subclass (45.6% of lifetime NPS users, $n = 31$). Of note, very few (1.2% of total respondents, 8.7% of recent NPS users, $n = 2$) reported use of synthetic cannabinoids in the past 30 days. Of the subjects who chose the “Other” category, the three most popular drugs used recently were 3,4-methylenedioxymethamphetamine (MDA, 11.1% total respondents, $n = 19$), non-therapeutic prescription drugs (mostly benzodiazepines and opiates, 3.5%, $n = 6$), and *N,N*-dimethyltryptamine (DMT, 3.5%, $n =$

6), whereas reported lifetime use of “other” drugs was highest for DMT (24.6% of total respondents, $n = 42$), MDA (15.2%, $n = 26$), and phencyclidine (PCP, 5.8%, $n = 10$).

Illicit drug characteristics

The median cost for LSD was \$6.00/dose, for MDMA \$10.00/dose (or \$80.00/g), for MDA \$15.00/dose (or \$80.00/g), for ketamine \$80.00/g, for cocaine \$70.00/g, for 2C series hallucinogens (2Cs) \$7.50/dose, and mushrooms \$17.50/dose (or \$7.05/g). Of note, 40.0% ($n = 52$) of subjects reported receiving their primary drug for free, and were not included in the median cost calculations.

All drug classes were easily accessible at the festivals, according to respondents. The median ease of access for LSD was 1 (IQR = 1–2), for MDMA 2 (1–2.25), for MDA 3 (2–3.25), for ketamine 2 (1–3.75), for cocaine 2 (1–2), for 2Cs 1.5 (1–3.5), and for mushrooms 1 (1–2). Several subjects qualified their ease of access, claiming drugs are more easily accessed from within the music festival environment compared to other outside venues.

Oral administration was preferred by 58.5% ($n = 53$) of MDMA users, 70% ($n = 10$) of MDA users, 50.0% ($n = 3$) of 2C users, and 100% ($n = 8$) of mushroom users. Sublingual administration was preferred by 82.1% ($n = 46$) LSD users, 30.0% ($n = 3$) of MDA users, and 50.0% ($n = 3$) of 2C users. 86.7% ($n = 13$) of ketamine users and 96.0% ($n = 24$) of cocaine users preferred to insufflate their drug.

Participant knowledge of drugs of abuse

Overall, 77 (45.0%) participants reported no knowledge of the primary drug, 76 (44.4%) some knowledge, and 18 (10.5%) had extensive knowledge. Among the subset of lifetime NPS users, 25 (36.8%) reported no knowledge of the primary drug they had used, 30 (44.1%) had some knowledge, and 13 (19.1%) had extensive knowledge. Among recent NPS users, 4 (17.4%) had no knowledge, 13 (56.5%) had some knowledge, and 6 (26.1%) had extensive knowledge of the drugs.

Users reported knowledge that included summaries of drug history, chemistry, and pharmacology. For example, six LSD users recounted that “LSD-25” was first synthesized by Albert Hofmann, and some of those respondents also knew the year in which it was synthesized (1938). Similarly, 2C users related information about Alexander Shulgin (who originally synthesized the 2Cs) (Shulgin & Shulgin, 1995, 1997). Cocaine, MDMA, and “research chemical” users suggested that their doses were likely impure and “cut” with adulterants. Overall, 18 (10.5% of respondents) users could classify their primary drug by chemical class (“[2C-C] is a psychedelic phenethylamine”), pharmacologic action (“[MDMA] has serotonin effects”) or effect (“stimulant”, “empathogen”, etc.).

Attitudes regarding drugs of abuse

The favorable characteristics reported by users varied between drug classes. For example, 26.1% ($n = 31$) users of MDMA, MDA, LSD and 2Cs related desirable empathogenic (generating a feeling of love, emotional intimacy, and communion) properties of these drugs. In contrast, 25.8% ($n = 17$) tryptamine users appreciated the entheogenic (generating a

heightened spiritual or psychological awareness) attributes of these substances. Regardless of drug class, 13.5% ($n = 23$) respondents cited reduced social inhibitions (“I can talk about things without embarrassment”), 14.6% ($n = 25$) increased stimulation and energy (“[It’s] energizing, uplifting”; “I can dance all night”), and 3.5% ($n = 6$) enhanced creativity or focus. In addition, 7.0% ($n = 12$) users described their primary drug as “therapeutic”. For example, MDMA and MDA users described psychotherapeutic benefits (“[it] helped with a rough period”; “it is therapeutic with relationships”) whereas ketamine, cocaine, and nitrous oxide users experienced somatic pain control (“removes my knee pain for dancing”; “helps my sore muscles”). 34.5% ($n = 20$) users of LSD expressed favorable views of the enhanced sensorium elicited by the drug (“I like seeing sounds and hearing colors”), and two LSD users specifically listed desirable synergistic effects of the drug when combined with another illicit substance. While relatively few individuals mentioned such synergistic effects in the interview, it should be noted that 84.2% ($n = 144$) of all respondents reported using at least one additional secondary drug, excluding alcohol, concurrently with their primary drug while at the festival.

Common dislikes shared by the participants were specific to single drugs. For example, 33.3% ($n = 3$) MDA users described an undesirable sensation of “disorientation, disconnection”. 8.7% ($n = 4$) MDMA users cited both temperature dysregulation (“overheating, then feeling cold”) and jaw tension, and six (13.0%) reported negative or depressive thoughts (“next day, suicidal”) the subsequent day as common dislikes. Another frequently cited, undesirable psychiatric effect was acute psychosis in LSD users, eight (13.8%) of whom described unpleasant states of “neurotic loops, thought fractals”, as well as “psychosis, delusions, flashbacks”. Two thirds ($n = 14$) of those who listed cocaine as their primary drug at the festival listed the “hangover” or “come-down”, as well as nausea and habit-forming properties, as common dislikes. Interestingly, besides one user who complained that the “taste was bad”, users of 2Cs claimed there was nothing undesirable about the drug. One unspecified 2-(4-*X*-2,5-dimethoxyphenyl)-N-[(2-methoxyphenyl)methyl]ethanamine (25*X*-NBOMe, “N-Bomb”) user described a break with reality, and claimed that the drug “makes things turn evil”. Other common dislikes listed across all traditional DOA categories, cited by 12 (7.0%) users, included financial cost, as well as the excessive stimulatory effects of the drug and consequent insomnia.

Beliefs of drugs of abuse

Perceptions of drug popularity were comparable between traditional DOA and NPS. Across all traditional and novel drugs, those who provided an integer value ($n = 47$) knew a median of 25 other people who also used the primary drug; for those respondents who provided investigators with a percent value ($n = 79$), a median of 50% of the people they knew also used the primary drug. Six (3.5%) respondents declined to provide a number and instead answered vaguely with responses such as, “a lot” and “too many”; 11.1% ($n = 19$) participants declined to answer this question altogether. Of note, four participants qualified their answers, informing investigators that they know considerably more people at festivals who use the primary DOA than they do at home.

Across all drug classes, the most common dangers listed by respondents include risk of the drug containing a harmful adulterant (12.9%, $n = 22$), the challenge of achieving appropriate dosing (11.7%, $n = 20$), impaired decision-making while on the drug (10.5%, $n = 18$), environmental hazards (4.1%, $n = 7$), risk of addiction or withdrawal (5.3%, $n = 9$), and neurotoxicity (6.4%, $n = 11$). Half (50%) of 2C-B users expressed specific concern about the safety of 2C-B. Other participants, however, claimed that illicit drug can be used safely. With the exception of 26 respondents who viewed illicit drugs as safe but did not elaborate further, subjects who denied risk associated with illicit drug use argued that the drug they used at the festival was safe for one of the following reasons: (1) The subject was an experienced user and/or knowledgeable of the drug ($n = 33$), (2) The user received it from a trusted source and/or observed a friend use it first ($n = 8$), (3) It was tested to be “pure” by a colorimetric test kit ($n = 5$), and (4) (in the case of kava-kava and kratom) it is natural and therefore safe ($n = 2$).

Practices with drugs of abuse

Participants provided a diverse array of contextual responses to the question, “why do you use the drug?” Common responses across all drug classes included “to have fun”, “to party”, and “because I’m at a music festival” ($n = 42$, 24.6% total respondents). 10 (17.1%) individuals also answered “for escape”, citing the desire to “break free” from past traumatic experiences, or to find temporary refuge outside of an otherwise “boring” life. Others claimed that they used the primary drug for its stimulatory and desirable somatic effects. For example, we recorded 27 (15.8%) responses to the effect of “because it feels good” and “to wake up”; one user of nitrous oxide claimed that it provides a “quick, short buzz” that “helps with back pain”.

A common response arose in the cohort reporting a hallucinogen (LSD, tryptamines) as the primary drug consumed at the festival. Regarding the context of their illicit drug use at the festival, 9 (13.6%) of these participants cited the desire to forge connections with fellow users (“to become more synchronized”, “to enjoy each other”), and 20 (30.3%) sought to enable philosophical and spiritual exploration (“to broaden my perception”, “to expand my mind”, “for philosophical exploration”). These final two common contextual reasons for drug use corroborate the positive attitudes towards the empathogenic and entheogenic potential of many of the popular drugs used at these festivals. None of the respondents using a NPS as their primary drug cited similar empathogenic or entheogenic motivations for using NPS.

There were distinct motivations for using NPS. One common response regarding the context of NPS use was “I wanted the novel experience”—namely, to experiment with the unique effects elicited by NPS. Other respondents chose NPS as more desirable alternatives to traditional DOA. For example, one 2C-B user related that he wanted to go deeper than MDMA; another respondent claimed that he started using kratom to wean off prescription opioids, while a 2,5-dimethoxy-4-methylamphetamine (DOM) user cited the low cost of the NPS as a reason for using it.

Of all respondents, 23.5% ($n = 24$) endorsed using drugs to improve sex, and 10 (41.7%) of those answering affirmatively reported using MDMA or a related analog to do so. None of the respondents reported using a NPS to improve sex.

Several respondents were reluctant to report the source of their primary drug, but of those who did respond, 122 (81.3% respondents) reported receiving the primary drug from a friend, family member, or trusted source. Only 22 (14.7%) respondents received the primary drug from a stranger.

Reported effects of drugs of abuse

Most traditional drug users either reported feeling a sense of euphoria (30.0%, $n = 45$), enhanced sensorium (30.0%, $n = 45$), or feeling a sense of wakefulness (6.8%, $n = 11$). Other respondents, especially those who reported using empathogens such as MDMA, described a heightened emotional state (16.1%, $n = 26$). “I was exploding with love” and “I was more open, sensitive” are model quotations of this effect, and many other respondents described a similarly enhanced sense of communality with their fellow users. One participant went so far as to describe a personal guilt that arose from his freedom to have a liberating experience while much of the world is oppressed and suffering.

Some users reported decidedly negative feelings. Among MDMA and LSD users, 7.7% ($n = 8$) claimed that the drug could amplify negative emotions, 11.5% ($n = 12$) described body temperature fluctuations, and 10.4% ($n = 10$) others complained of bruxism. Some respondents endorsing cocaine use described feeling “numbness” or apathy (“stripped of emotion”). Feelings of anxiety were also common, particularly among users of drugs with stimulant properties (such as cocaine). Most (66.5%, $n = 107$) reported effects for traditional DOA were positive, however. Also, similar to many hallucinogen and phenethylamine (e.g. MDMA) users interviewed, some subjects used 2C-B and N-bomb in order to also enhance the music festival sensorium, although these subjects claimed that “visuals” on these NPS were markedly different than those experienced on traditional DOA.

With the exception of 2C-B, kratom, and kava kava users, NPS users reported negative effects. A DOM user reported an “awful taste”, blackouts, and fever. Temperature dysregulation and clenched jaw was a commonly reported effect amongst 2C-B and N-bomb users, although while 2C-B users described these effects as mild, N-bomb users described them as uncomfortable. Finally, one N-bomb and a 2,5-dimethoxy-4-iodophenethylamine (2C-I) user complained of “bad visuals” and a headache.

Limitations

We collected data from two regional, medium-sized music festivals that attract a specific demographic that may vary from users at large. A larger sample size could more thoroughly describe drug patterns and behavior. These data represent two consecutive years at each of these festivals, though no significant variation in use patterns were noted. The study only captured subjects willing to discuss their drug use and many of these subjects self-presented to the medical tent, thus this sample may be biased toward negative perceptions. Data may be limited by voluntary participation design, resulting in selection bias. Furthermore, it has

been shown that the specific style of music featured at a festival influences substance use; therefore, we may be limited by sampling attendees of only two types of music festivals (Lim, Hellard, Hocking, & Aitken, 2008b). Data may also be limited by participant memory and recall bias, as several participants endorsed novel psychoactive substances, but could not specify details. The preferences for certain illicit drugs may also vary regionally, which may affect the frequency of particular drugs reported in this study (Miech et al., 2015).

Discussion

While traditional DOA use was common, few individuals knowingly ingested NPS at music festivals. Though a large proportion of festival attendees self-reported lifetime NPS use. Of these respondents, all of them also endorsed lifetime use of two or more traditional DOA, suggesting that in our study population, NPS users were experienced drug users. This may be further evidenced by the fact that overall, more NPS users demonstrated at least some knowledge of what they ingested at the festival compared to traditional DOA users ($p = 0.038$). While NPS users most commonly endorsed past synthetic cannabinoid use, only two participants self-reported synthetic cannabinoid use in the past month. This may reflect a festival atmosphere that prompts experimentation with newer drugs, drugs less available outside of the festival environs, and/or substances with a more desirable effect profile than synthetic cannabinoids, which were unanimously described by experienced subjects in this study as unpleasant, corroborating published accounts (Monte et al., 2014; Trecki, Gerona, & Schwartz, 2015).

The lower prevalence of synthetic cannabinoid abuse at these festivals could also be secondary to the rising accessibility of other NPS. For example, 2Cs were a popular NPS among participants self-reporting NPS use at the festival and in the past 30 days. To NPS users, these drugs have a multifaceted appeal. The 2Cs were reportedly less expensive than more traditional substituted phenethylamines like MDMA and MDA. In addition, users graded 2Cs as easier to access than MDMA, MDA, cocaine, and ketamine. This finding may reflect the fact that two thirds of 2C users received their dose for free from friends, or could alternatively be related to the reportedly prohibitive cost of traditional DOA as reported by several respondents.

Most 2C users liked that they could experience the empathogenic and hallucinogenic effects of 2C without experiencing the negative effects characteristic of other traditional drugs of abuse. For example, subjects noted that while using 2Cs, they did not experience hyperthermia, hangover, or overwhelming visual hallucinations, which were commonly reported dislikes and negative effects of MDMA, cocaine, and LSD, respectively. Further reinforcing the appeal of NPS is our observation that 2C users reported no dislikes, with the exception of a single user who complained of a bad taste upon ingestion. Therefore, one appeal of the 2Cs could arise from the fact that users hold more positive attitudes and fewer negative attitudes relative to comparable DOA. Since the 2Cs are clearly associated with the aforementioned negative clinical effects, this misconception is ripe for targeted substance abuse education (Nelson, Bryant, & Aks, 2014).

Our results indicate a perception of widespread drug popularity at these festivals, both traditional and NPS. In addition, a lack of perceived danger and general insouciance associated with illicit substance use could underlie (and perhaps reinforce) this normalization. Many subjects replied that there was still minimal risk associated with ingestion of traditional DOA; most of those who did perceive risk did not seem deterred by it. In general, subjects who denied risk argued that the drug they used at the festival was safe for one of the following reasons: (1) It was tested to be “pure” by a colorimetric test kit, (2) The subject was an experienced user of the drug, (3) The user self-described as being knowledgeable of the pharmacology of the drug, and (4) (in the case of plant-derived NPS) it is natural and therefore safe. While these answers may not eliminate risk, they do reflect the user’s desire to reduce risk, and therefore they may inform potential future avenues of intervention and education.

Unlike traditional DOA, NPS use arose in an experimental context—a practice endorsed by NPS users in other studies (González, Ventura, Caudevilla, Torrens, & Farre, 2013). It may be useful to consider these experimental practices alongside the self-reported effects of NPS, as such effects were largely negative compared to traditional DOA. For example, users of 2,5-dimethoxy-4-chlorophenethylamine (2C-C) and 2C-I reported minimal mood elevation and unpleasant hallucinations, respectively, whereas one N-bomb user described agitated delirium, which is a documented negative effect of this NPS (Weaver, Hopper, & Gunderson, 2015). Notably, the positive psychonautic, therapeutic, and energizing effects reported by traditional DOA users were largely absent in self-reports of NPS effects.

We can target interventions at NPS users who undertake perceived risk reduction strategies. These individuals are invested in risk reduction, but are often misinformed on how to do so effectively. To begin, NPS and traditional DOA users should understand that knowledge, familiarity, and experience do not beget safety. It is widely known that dangerous NPS can be cut into traditional DOA, and that drugs can vary in their composition of active compound and adulterant (Gladden, Martinez, & Seth, 2016; Lawn, Barratt, Williams, Horne, & Winstock, 2014; McIntyre, Trochta, Gary, Malamatos, & Lucas, 2015). This danger cannot be averted by “experience” alone. Furthermore, drug users should be educated that colorimetric test kits, which are popular amongst music festival drug users and utilized to assess purity of common DOA, are not an effective means of risk reduction (Murray et al., 2003). Finally, our investigators were surprised that approximately nine out of 10 study participants—among those many subjects who valued risk reduction strategies—endorsed poly-substance use at the festival. Currently, harm reduction efforts and education are being made at the two festivals described in this study. At both venues, there are roaming emergency medical technicians (EMTs) and paramedics who administer medical treatment in the field, as well as tents with trained volunteers who counsel attendees through overwhelming experiences encountered at the festival. Such resources have been used for harm reduction purposes in similar settings (Munn, Lund, Golby, & Turris, 2016).

Conclusion

NPS are reportedly inexpensive, popular, and easily accessible to music festival attendees. Users attempted risk reduction strategies, but these are likely ineffective. Educational

interventions and revised testing strategies may promote safer drug use and reduce adverse outcomes.

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Declaration of interests

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Table 1

Demographic characteristics of subjects, Sonic Bloom and Arise music festivals, 2015–2016.

Characteristic		<i>n</i> (% of total respondents) <i>N</i> = 171
Sex	Male	106 (62.0)
	Female	65 (38.0)
Race	Caucasian	91 (89.2)
	Hispanic	8 (7.8)
	Black	3 (2.9)
	American Indian/Alaska Native	3 (2.9)
	Asian	1 (1.0)
Marital status	Single	140 (81.9)
	Married or living as married	23 (13.5)
	Separated/divorced	6 (3.5)
	Other	2 (1.2)
Current student		61 (35.9)
	College	45 (26.5)
	Technical/trade school	5 (1.9)
	Graduate/professional school	11 (4.1)
Highest level of education	High school (some)	5 (3.0)
	High school (complete)	19 (11.5)
	Technical/trade school (complete)	10 (6.1)
	College (some)	75 (45.5)
	College (complete)	49 (30.0)
	Graduate/professional school (complete)	7 (4.2)
Alcohol misuse	Never	130 (76.0)
	Past	25 (14.6)
	Current	13 (7.6)
	Unknown	3 (1.8)
Lifetime prescription drug misuse		78 (45.6)
Past medical history	None	126 (73.7)
	Asthma	7 (4.1)
	Cardiac arrhythmia/murmur	5 (2.9)
	Chronic pain syndrome	5 (2.9)
	Malignancy (past)	2 (1.2)
	Other	23 (13.5)
Past psychiatric medical history		

Characteristic	<i>n</i> (% of total respondents) <i>N</i> = 171
None	104 (60.8)
Depression	30 (17.5)
Anxiety disorder	25 (14.6)
ADHD	17 (9.9)
PTSD	9 (5.3)

ADHD, attention deficit hyperactivity disorder; PTSD, post-traumatic stress disorder

Table 2

Illicit drug use per self-report at Sonic Bloom and Arise music festivals, 2015–2016.

Illicit Drug	Past 30 days <i>n</i> (% of total respondents) <i>N</i> = 171	Lifetime <i>n</i> (% of total respondents) <i>N</i> = 171
LSD	94 (55.0)	127 (74.3)
Cocaine	91 (53.2)	126 (73.7)
Marijuana	69 (40.4)	77 (45.0)
MDMA	102 (59.6)	145 (84.8)
Ketamine	38 (22.2)	77 (45.0)
Mushrooms	47 (27.5)	101 (59.1)
Amphetamines	19 (11.1)	65 (38.0)
Heroin	2 (1.2)	28 (16.4)
Any NPS	23 (13.5)	68 (39.8)
Synthetic cannabinoids ^a	2 (1.2)	31 (18.1)
Synthetic cathinones, amphetamines, phenethylamines, and piperazines ^b	4 (2.3)	16 (9.4)
Dissociative anesthetics ^c	1 (0.6)	5 (2.9)
Hallucinogens/psychedelics ^d	11 (6.4)	29 (17.0)
Plant-derived/herbal psychotropics ^e	9 (5.3)	18 (10.5)
Sedatives/hypnotics ^f	2 (1.2)	3 (1.8)
Opioids	0 (0.0)	0 (0.0)
Other ^h	33 (19.3)	84 (49.1)

LSD, lysergic acid diethylamide; MDMA, 3,4-methylenedioxymethamphetamine; NPS, novel psychoactive substance

^a“spice”, “K2”, “Miyagi War Paint.”

^b“bath salts”, 3,4-methylenedioxy-N-methylcathinone (methyline), “MDxx”, mephedrone, α -pyrrolidinopentiophenone (α -PVP), 2-fluoroamphetamine (2-FA), 4-fluoroamphetamine (4-FA), 4-fluoromethamphetamine (4-FMA), phenethylamine, N-ethyl-hexedrone, 6-(2-aminopropyl)-2,3-dihydrobenzofuran (6-ADPB), 6-(2-aminopropyl)benzofuran (6-APB), 1-(benzofuran-5-yl)-N-methylpropan-2-amine (5-MAPB), 5,6-methylenedioxy-2-aminoindane (MDAI).

^cmethoxetamine (MXE), 3-methoxyphencyclidine (3-MeO-PCP).

^dd-lysergic acid amide (ergine, LSA), 6-allyl-6-nor-LSD (AL-LAD), 1-acetyl-LSD (ALD-52), 2,5-dimethoxy-4-bromophenethylamine (2C-B), 2,5-dimethoxy-4-chlorophenethylamine (2C-C), 2,5-dimethoxy-4-ethylphenethylamine (2C-E), 2,5-dimethoxy-4-iodophenethylamine (2C-I), 2,5-dimethoxy-4-propylthiophenethylamine (2C-T-7), 5-methoxy-N,N-dimethyltryptamine (5-MeO-DMT), 4-hydroxy-N-methyl-N-isopropyltryptamine (4-HO-MiPT), 4-hydroxy-N-methyl-N-ethyltryptamine (4-HO-MET), *O*-acetylpsilocin (4-AcO-DMT), α -methyltryptamine (AMT), diisopropyltryptamine (DiPT), 5-methoxy-N-methyl-N-isopropyltryptamine (5-MeO-MIPT), 2,5-dimethoxy-4-methylamphetamine (DOM), 2,5-dimethoxy-4-iodoamphetamine (DOI), 2-(4-I-2,5-dimethoxyphenyl)-N-[(2-methoxyphenyl)methyl]ethanamine (25I-NBOMe), “research chemicals.”

^e*Echinopsis pachanoi* (san pedro), *Lophophora williamsii* (peyote), *Salvia divinorum* (salvia), *Sceletium tortuosum* (kanna), *Piper methysticum* (kava kava), *Mitragyna speciosa* (kratom), *Nymphaea caerulea* (lily), ibogaine, ayahuasca

^f γ -hydroxybutyric acid (GHB), etizolam, promethazine.

^hOther drugs scheduled by UN Single Convention on Narcotic Drugs, 1961, or UN Convention on Psychotropic Substances, 1971. *N,N*-dimethyltryptamine (DMT), 3,4-methylenedioxyamphetamine (MDA), phencyclidine (PCP), mescaline, 4-methylaminorex (4-MAR), opium, dextromethorphan, dramamine, prescription drugs scheduled by UN (alprazolam, clonazepam, codeine, oxycodone, unspecified “opiates” and “benzodiazepines”), “Yaba”, “domino”, and “inhalants” (nitrous oxide).