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A survey study to characterize use of Spice products (synthetic cannabinoids)

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Abstract

Background—Synthetic cannabinoids are a rapidly emerging class of abused drugs. Synthetic cannabinoids are typically sold as “herbal blends” or “incense,” commonly referred to as Spice products. No controlled human experiments have been conducted on the effects of Spice products or the synthetic cannabinoids they often contain.

Methods—An internet-based survey study was conducted with adults reporting at least one lifetime use of a Spice product.

Results—Respondents were primarily male, Caucasian and ≥12 yrs of education. Use of other psychoactive drugs was common, though 21% identified Spice products as their preferred drug. Spice products were most frequently obtained from retail vendors and smoked, though other forms of ingestion were endorsed. Mean age of first use was 26 and mean frequency of use in the past year was 67 days (range 0–365). Primary reasons for use were curiosity, positive drug effect, relaxation, and to get high without having a positive drug test. Acute subjective effects were similar to known effects of cannabis, and a subset of users met DSM criteria for abuse and dependence on Spice products.

Conclusions—Participants exhibited a diverse profile of use patterns as is typical for other drugs of abuse. There was evidence that users continued to seek and use these drugs after being banned by local authorities. This study should be interpreted with caution due to methodological limitations. Controlled laboratory research is needed to further examine the behavioral pharmacology of individual synthetic cannabinoids found in Spice products.

Keywords

Spice; K2; Synthetic Cannabinoids; Cannabis; Marijuana

1. Introduction

Synthetic cannabinoids represent a rapidly emerging class of drugs. Sold as “herbal blends” or “incense,” Spice products (named for one of the more popular brands) are readily available in retail stores and over the internet. In order to circumvent drug laws and

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regulation, Spice products contain package labels indicating they are to be used as “incense” and are “not for human consumption.” However, they are frequently marketed as legal/ natural alternatives to cannabis (marijuana) and are generally purchased for the purpose of getting intoxicated (Vardakou et al., 2010).

Forensic toxicology analyses have identified over a dozen synthetic cannabinoids in these products, none of which are included on package labeling (Dresen et al., 2010; Lindigkeit et al., 2009; Hudson and Ramsey, in press). Many of the cannabinoids found in samples of Spice products have an affinity for the CB1 receptor that is 4–5 times greater than THC and have demonstrated greater potency compared with THC on classical cannabinoid tetrad tests (Aung et al., 2000; Wiley et al., 1998). Variability also exists in the combinations and concentrations of the synthetic cannabinoids within Spice products such that using different brands, or even different batches of the same brand, can produce markedly different effects (Auwärter et al., 2009; Dresen et al., 2010).

Evidence is emerging to suggest synthetic cannabinoid use can be problematic. Case reports suggest that tolerance develops quickly and withdrawal has been observed following chronic use (Zimmermann et al., 2009). Case reports of adverse events following use of Spice products confirmed to contain JWH-018 and JWH-073 indicate these drugs can produce anxiety, disorientation, panic, tachycardia, and acutely exacerbate psychotic episodes (Schneir et al., 2010; Müller et al., 2010a; Müller et al., 2010b). German physicians have reported cardiovascular and nervous system problems following chronic synthetic cannabinoid exposure, and poison control centers in Sweden have reported an increase in the number of people suffering from “Spice toxicity” (EMCDDA, 2009). The American Association of Poison Control Centers reported that calls related to synthetic cannabinoids and Spice products increased from 13 calls in 2009 to about 3000 calls in 2010 (AAPCC, 2010).

There are limited epidemiological data regarding the use of synthetic cannabinoids and there is a lack of published data regarding the subjective and behavioral effects of Spice products among individuals not seeking emergency care. The aim of this study was to collect data on the characteristics and beliefs of individuals who have used Spice products, independent of whether they had previously experienced unwanted or serious side effects.

2. Methods

An anonymous internet-based survey study was conducted using a paid account on the internet survey host SurveyMonkey.com. Participants were recruited via posts on e-mail listserves and internet message boards/forums containing references to Spice products (e.g., drugs-forum.com; shroomery.org). Participants were excluded if they had never used Spice products, were not fluent in English, were under the age of 18, and/or if they had already completed the survey. No remuneration was provided for completing the survey.

Survey questions included basic demographics and questions pertaining to use of Spice products including: use initiation and frequency, reasons for use, beliefs about the content and safety, source of product, and subjective ratings of acute and chronic effects. When possible, survey questions were adopted from established assessments (e.g., DSM-IV checklist (Feingold and Rounsaville, 1995), Addiction Severity Index (McLellan et al., 1985), Marijuana Withdrawal Checklist (Budney et al., 1999), National Survey on Drug Use and Health). The survey took approximately 15 minutes to complete.

Data were collected between January 4, 2011 and February 7, 2011. During that time, 391 respondents accessed the survey, of which 168 met the eligibility criteria and completed the survey questions. Survey data collection ended after no new respondents completed the

survey for approximately 2 weeks. Descriptive statistics were used to evaluate the demographic and drug use characteristics of respondents. Missing data were rare, but, when present, were not included in data calculations.

3. Results

3.1. Participants

Study completers represented 13 different countries and 42 of the 50 U.S. states. They were primarily male (83%), Caucasian (90%), and had never been married (67%). The majority (96%) had a high school level of education, and 48% had a college degree. At the time of survey completion, 47% were employed full time, 28% were students, 9% were unemployed, and 38% were subject to drug testing procedures.

Respondents endorsed lifetime use of a variety of licit and illicit drugs including: alcohol (92%), cannabis (84%), tobacco (66%), hallucinogens (37%), prescription opioids (34%), MDMA (29%), benzodiazepines (23%), amphetamines (22%), cocaine (17%), salvia divinorum (17%), heroin (7%), inhalants (7%), dissociative anesthetics (6%), methamphetamine (3%), and miscellaneous drugs (mephadrone, dextromethorphan, kratom; 12%). Spice was reported as the drug of choice among 21% of respondents, and 25% reported no plans for future Spice use.

3.2. Drug Supply

Respondents reported obtaining Spice products from retail vendors (e.g., head shops, gas stations/convenience stores; 87%), the Internet (38%) or from friends and/or relatives (29%). Though 49% of respondents reported living in an area where local legislation had been passed to ban Spice products or individual synthetic cannabinoids, only 2% reported obtaining Spice from an illicit drug dealer.

3.3. Characteristics of Spice product use

Mean (SD) age of first use of Spice products was 26 (9). Mean days of use in the past year was 67 (SD: 102; range: 0 – 365) and mean number of uses per day was 4 (SD: 4; range: 0–20). A subset of respondents endorsed regular Spice use, with 55% and 39% reporting use in the past month and past week, respectively. Spice products were primarily smoked (via pipe, cigarette, blunt, or water pipe/bong), though administration via vaporization, oral ingestion, and rectal ingestion were also reported. During an average episode, participants reported consuming a mean of 4.8 (4.2) “hits” or 1.0 (1.2) grams of product. The average duration of subjective intoxication lasted 93 (SD: 69, range: 10–360) minutes. The maximum amount consumed in a single episode was reported as 7.6 (5.8) “hits” or 1.5 (1.6) grams of product, and the greatest duration of intoxication lasted 170 (SD: 152, range: 10–780) minutes.

Spice use generally occurred alone (44%) or in small groups (42%), as opposed to large social gatherings (14%). Primary reasons for use were curiosity (78%), liked the effects (58%) and relaxation (48%), though 30% endorsed using Spice products to achieve intoxication while avoiding detection in drug urinalysis testing. Spice was used in conjunction with other drugs on at least one occasion by 65% of participants. Alcohol (54%), cannabis (40%), and tobacco (38%) were the most frequently reported drugs combined with Spice products.

3.4 Subjective effects of Spice products

Subjective effects of Spice products are provided in Table 1. Most respondents (85%) indicated that Spice products produced subjective effects similar to cannabis, and fewer than 10% reported similarities between Spice products and other licit and illicit drugs. Despite

producing effects similar to marijuana, 54% of respondents reported Spice products did produce subjective effects that were unique and discernable from other licit and illicit drugs. The frequency of hallucinations (28%) following Spice product use is also greater than what would be expected for cannabis consumption.

Most respondents (87%) reported having a positive experience following use of a Spice product, though negative or unwanted effects following use were reported by 40% of the sample. The quantity of Spice product consumed did not vary significantly between respondents who did and did not have a history of negative effects. Interestingly, 11% reported that multiple uses of the same brand of Spice product resulted in variable and unpredictable effects.

3.5 Perceived safety of Spice products

The majority (88%) of participants were aware that Spice products contained chemical constituents that were added to a plant product to produce intoxication; however, 11% believed that Spice products contained only “natural herbs and spices” and 14% agreed that “If Spice products were not safe for human use, they would not be marketed and sold in stores.” Although most reported that Spice products were “generally safe for human use,” 68% also believed there was an inherent danger or harm associated with Spice product use. Mean (SD) rating of overall harm of Spice product use on a scale of 0 (not at all) to 10 (extreme) was 2.7 (2.3), with 18% of respondents endorsing “no risk” (0) and <1% endorsing “extreme risk” (10).

3.6. Spice use disorders and withdrawal

A subset of respondents met DSM-IV criteria for abuse (37%) and dependence criteria (12%). Using Spice in a hazardous situation was the most commonly endorsed abuse criteria (27%), and being unable to cut down or stop Spice use (38%), experiencing symptoms of tolerance (36%), using for longer periods than originally intended (22%) and having interference with other activities (18%) were the most commonly reported dependence criteria. Despite endorsing problems related to Spice use, none had ever sought or received treatment.

Withdrawal symptoms following cessation of Spice use were rare, and most prevalent among more frequent users. The most commonly reported withdrawal effects were headaches (15%), anxiety/nervousness (15%), coughing (15%), insomnia/sleep disturbance (14%), anger/irritability (13%), impatience (11%), difficulty concentrating (9%), restlessness (9%), nausea (7%), and depression (6%).

4. Discussion

Synthetic cannabinoids are a rapidly emerging class of psychoactive drugs for which little scientific data is available. To date, most published reports have been limited to toxicology reports focused on identifying the chemical constituents of commercial Spice products or case reports of individuals who present to hospitals following an adverse drug effect. Participants in this survey were generally experienced drug users, having reported use of a number of other psychoactive substances, in many cases concurrently with Spice products. Acute administration was predominantly associated with positive drug effects, though negative or unwanted effects and risk of tolerance/dependence were also commonly endorsed, consistent with prior case reports (Zimmermann et al., 2009; Schneir et al., 2010; Müller et al., 2010a). Most participants recognized that use of Spice products carried a risk, but most believed the likelihood/severity of potential harm to be low.

The most frequently reported reason for using Spice products was for the pleasurable effects associated with intoxication. One in five participants reported that Spice products were their current “drug of choice,” and many reported continued use of Spice products following local legislation banning these products or their constituents. These findings are important because they suggest an established market for synthetic cannabinoids. Thus, legislation prohibiting these products and/or availability of commercial drug testing resources to identify use of Spice products may not eliminate use.

Interpretation of this survey should be considered with caution due to significant methodological limitations. First, the sample size was relatively small, and there is selection bias and an inability to calculate response rate when conducting an internet-based survey. Study participants were limited to those with internet access, and who were willing to complete the survey without compensation. Second, because questions were mostly retrospective in nature, the data is subject to recall bias. Third, the chemical constituents of Spice products used by survey respondents cannot be known, and may be varied. Thus, there is no way to attribute the effects reported by study participants to a specific chemical, and the influence of non-cannabinoid constituents of Spice products or concurrently used drugs on reported effects cannot be known. Also of note, this survey was conducted prior to federal United States legislation that placed 5 synthetic cannabinoids commonly found in Spice products under Schedule I restriction.

In summary, the present case report survey indicates that Spice product use is similar to that of other abused drugs. The frequency, manner, and consequences of use vary widely, and range from those who engage in sporadic use without negative consequence to those who experience acute adverse reactions to the drug, and those who develop significant problems related to chronic use. Provided the similarities between the subjective effects of Spice products reported in this study and the known behavioral pharmacology of cannabis, it is likely that this survey indeed provides an evaluation of synthetic cannabinoid use in humans. However, given the limitations of a retrospective survey, use of an undefined/heterogeneous sample, and our inability to confirm the composition of Spice products administered by respondents, replication of these results is needed using more sophisticated survey methods and/or controlled laboratory studies.

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Table 1

Subjective Effects of Spice Products

	Never	Sometimes	Most of the time	Every time
Positive Effects				
Felt a pleasant high	4%	17%	42%	37%
Had increased appetite	27%	36%	23%	14%
Produced a dream-like state	32%	42%	23%	3%
Felt stimulated/energetic	32%	50%	15%	3%
Felt a floating feeling	33%	46%	17%	4%
Unable to control laughter	51%	33%	11%	5%
Felt more focused than usual	52%	30%	14%	4%
Negative Effects				
Had a dry mouth	22%	34%	30%	14%
Felt drowsy/tired	25%	55%	17%	3%
Felt lightheaded	26%	43%	18%	13%
Had trouble remembering things	36%	43%	16%	5%
Felt heart racing	41%	43%	10%	6%
Felt clumsy	43%	43%	10%	4%
Felt heavy/sluggish feeling	37%	42%	16%	5%
Felt nervous or anxious	46%	41%	11%	2%
Felt paranoid	46%	43%	10%	1%
Felt dizzy	49%	36%	10%	5%
Felt nauseous	64%	33%	3%	0%
Had slurred speech	70%	24%	5%	1%
Hallucinated	72%	25%	2%	1%
Had decreased appetite	76%	21%	2%	1%
Had ringing in ears	80%	14%	5%	1%
Vomited	90%	9%	1%	0%