



Full length article

Associations between butane hash oil use and cannabis-related problems



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ARTICLE INFO

Keywords:

Cannabis
 Marijuana
 Concentrate
 Butane hash oil
 Dabs
 Cannabis dependence

ABSTRACT

Background: High-potency cannabis concentrates are increasingly popular in the United States, and there is concern that use of high-potency cannabis might increase risk for cannabis-related problems. However, little is known about the potential negative consequences of concentrate use. This study reports on associations between past-year use of a high-potency cannabis concentrate, known as butane hash oil (BHO), and cannabis-related problems.

Methods: A sample of 821 college students were recruited to complete a survey about their health and behavior. Participants who had used cannabis in the past year (33%, $n = 273$) completed questions about their cannabis use, including their use of BHO and cannabis-related problems in eight domains: physical dependence, impaired control, academic-occupational problems, social-interpersonal problems, self-care problems, self-perception, risk behavior, and blackouts.

Results: Approximately 44% ($n = 121$) of past-year cannabis users had used BHO in the past year. More frequent BHO use was associated with higher levels of physical dependence ($RR = 1.8$, $p < 0.001$), impaired control ($RR = 1.3$, $p < 0.001$), cannabis-related academic/occupational problems ($RR = 1.5$, $p = 0.004$), poor self-care ($RR = 1.3$, $p = 0.002$), and cannabis-related risk behavior ($RR = 1.2$, $p = 0.001$). After accounting for sociodemographic factors, age of onset of cannabis use, sensation seeking, overall frequency of cannabis use, and frequency of other substance use, BHO use was still associated with higher levels of physical dependence ($RR = 1.2$, $p = 0.014$).

Conclusions: BHO use is associated with greater physiological dependence on cannabis, even after accounting for potential confounders. Longitudinal research is needed to determine if cannabis users with higher levels of physiological dependence seek out BHO and/or if BHO use increases risk for physiological dependence.

1. Introduction

The cannabis landscape in the United States is rapidly changing as more states legalize medical and recreational cannabis use. A potentially concerning new trend is the rise in popularity of butane hash oil – a high-potency cannabis concentrate known variously as honey oil, BHO, wax, dab, crumble, shatter, glass, honeycomb, or budder (Daniulaityte et al., 2015; Krauss et al., 2015; Stogner and Miller, 2015a,b). Butane hash oil (BHO) is produced by extracting delta-9-tetrahydrocannabinol (THC), the primary psychoactive constituent of cannabis, from cannabis plant material using butane as a solvent (Raber et al., 2015). Butane extraction yields cannabis concentrates that vary in consistency (e.g., wax = waxy substance that looks like earwax, shatter = brittle substance that easily shatters) but have similarly high THC content, with recent studies suggesting average THC concentrations of > 50 – 60% (ElSohly et al., 2016; Raber et al., 2015; Smart et al., 2017). By comparison, marijuana (dried plant buds and leaves) confiscated in the U.S. has an average THC concentration of 12% (ElSohly

et al., 2016). Thus, BHO tends to be much more potent than marijuana. This is concerning because use of high-potency cannabis could potentially increase risk for cannabis-related problems, particularly if, as research suggests, cannabis users who use high-potency cannabis are exposed to more THC despite titrating their dose (Freeman et al., 2014; van der Pol et al., 2014).

Only a few studies have reported on associations between BHO use and cannabis-related problems (Cavazos-Rehg et al., 2016; Keller et al., 2016; Loflin and Earleywine, 2014; Pierre et al., 2016). The first study administered an online survey to a group of 357 BHO users recruited via Craigslist and found a link between BHO use and increased physiological dependence on cannabis (Loflin and Earleywine, 2014). Specifically, participants reported that their BHO use had increased their tolerance and withdrawal symptoms. A second study analyzed BHO-related social media posts on Twitter and found that BHO users reported experiencing extreme physiological, psychological, and cognitive effects, including passing out or losing consciousness, confusion and distorted reality, and memory problems (Cavazos-Rehg et al.,

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<http://dx.doi.org/10.1016/j.drugalcdep.2017.06.015>

Received 11 April 2017; Received in revised form 11 June 2017; Accepted 12 June 2017

Available online 14 July 2017

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Table 1
Comparison of cannabis users who had and had not used butane hash oil (BHO) in the past year.

Correlate	BHO Users (N = 121) M/% (SD)	Non-Users of BHO (N = 152) M/% (SD)	OR	95% CI	p
Demographics					
Age	20.6 (4.3)	21.1 (4.8)	0.9	0.7, 1.2	0.394
Sex (% male)	48	24	2.9	1.7, 4.8	< 0.001
SES	3.3 (0.9)	3.0 (0.9)	1.3	1.0, 1.7	0.037
Sensation Seeking	29.2 (4.4)	27.2 (5.0)	1.6	1.2, 2.0	< 0.001
Age of Onset of Cannabis Use	16.0 (2.5)	16.8 (2.3)	0.7	0.5, 0.9	0.008
Frequency of Cannabis Use ^a	4.5 (1.7)	2.2 (1.6)	4.1	2.9, 5.7	< 0.001
Medical Cannabis Card (% with card)	8	3	2.6	0.9, 8.0	0.083
Methods of Cannabis Use^a					
Frequency of Vaping Cannabis	2.0 (1.7)	0.4 (0.9)	5.9	3.5, 9.7	< 0.001
Frequency of Consuming Cannabis Edibles	1.2 (1.0)	0.5 (0.70)	2.7	1.9, 3.8	< 0.001
Other Substance Use^a					
Frequency of Binge Drinking	2.9 (1.5)	2.1 (1.6)	1.8	1.4, 2.3	< 0.001
Frequency of Tobacco Use	1.3 (1.9)	0.6 (1.4)	1.5	1.2, 2.0	0.001
Frequency of Other Illicit Drug Use	0.8 (1.2)	0.2 (0.7)	2.1	1.5, 3.0	< 0.001

^a Frequency of use was scored as follows: no use in the past year = 0, less than 5 times = 1, more than 5 times but less than once a month = 2, about once a month = 3, once a week = 4, a couple times a week = 5, nearly every day = 6, and more than once a day = 7. Continuous variables were standardized to M = 0, SD = 1 prior to analyses, so estimates for continuous variables reflect the increase in odds of butane hash oil use given a 1 SD increase in the correlate. Statistically significant estimates are shown in bold.

2016). Finally, two recent case studies collectively reported on three men ages 17–34 who developed severe psychotic symptoms following BHO use (Keller et al., 2016; Pierre et al., 2016).

There is also evidence from studies of potency variations in cannabis of much lower potency than BHO that suggests that use of higher potency cannabis is associated with greater risk of cannabis-related problems than use of lower-potency cannabis. For example, an online survey of cannabis users in the United Kingdom (UK) asked participants to report on their use of three different types of cannabis that vary in potency: sinsemilla (buds/leaves from plants cultivated without seeds; ~15% THC in the UK), other marijuana (buds/leaves; ~9% THC in the UK), and hash (~5% THC in the UK). Among individuals who had used sinsemilla, other marijuana, and hash, more frequent use of higher potency cannabis (sinsemilla), but not lower potency cannabis (other marijuana and hash), was associated with more severe cannabis dependence. Moreover, studies of individuals with first-episode psychosis and comparison individuals living in South London showed that self-reported use of sinsemilla was associated with an especially heightened risk of psychotic disorder and psychosis relapse compared with use of lower-potency cannabis (Di Forti et al., 2015, 2009; Schoeler et al., 2016).

Thus, initial evidence suggests that use of higher potency cannabis may be associated with increased risk of cannabis dependence, extreme acute effects, and psychosis. However, only a few studies have examined associations between use of BHO, perhaps the most potent cannabis available today, and cannabis-related problems. Given its ultra-high potency and increasing popularity in the U.S., more systematic research is needed on the potential negative consequences of BHO use. Moreover, no studies have investigated factors that distinguish cannabis users who use BHO from those who do not, which could have important implications for understanding factors that might confound the association between BHO use and cannabis-related problems.

The purpose of the present study was to test associations between BHO use and a variety of cannabis-related problems in a sample of cannabis users, some of whom used BHO. In addition, the study aimed to identify person factors that might distinguish BHO users from non-users, with a focus on factors shown in previous research to be associated with novel methods of cannabis use (e.g., vaping) as well as problem use, as these may also be associated with BHO use. Person factors included male sex, sensation-seeking traits, early-onset cannabis use, more frequent cannabis use, and other substance use (Chen et al.,

2005, 1997; Jones et al., 2016; Kaynak et al., 2013; Lankenau et al., 2017; McGee et al., 2000).

2. Methods

2.1. Participants

Participants were undergraduate students enrolled in psychology courses at a university located in a U.S. state where medical cannabis use is legal but recreational use is not. Students had the opportunity to complete an online survey about their health and behavior as part of course credit or extra credit. Participants were informed that their responses were confidential, that they could skip any question, and that they would not be asked to identify themselves on the survey. A total of 821 students completed the survey. Participants' mean age was 22.6 (SD = 6.3), and 65.1% were women. Most participants were White (78.7%), 5.5% were Black, 11.8% were Asian, 1.4% were Native Hawaiian, and 2.5% were American Indian. These demographics closely match the demographics of the entire undergraduate population with one exception: women were overrepresented in this study (65% vs. 49% in the entire undergraduate population). Analyses report on the 33.3% of respondents (n = 273) who had used cannabis in the past year. The annual prevalence of cannabis use in this sample is similar to that reported among college students in the Monitoring the Future study (37.9%) (Johnston et al., 2016). Demographic information for past-year cannabis users is reported in Table 1. Participants were automatically notified if they skipped a question and were given another opportunity to answer the question. There were no missing data. All participants provided informed consent. This study was approved by the University's Institutional Review Board.

2.2. Frequency of butane hash oil use

Participants reported on their past-year frequency of BHO use (defined as use of a butane hash oil product, also known as dab, wax, shatter, budder, etc.). Response options were: no use in the past year (scored '0'), less than 5 times (scored '1'), more than 5 times but less than once a month (scored '2'), about once a month (scored '3'), once a week (scored '4'), a couple times a week (scored '5'), nearly every day (scored '6'), and more than once a day (scored '7').

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