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Cannabis Problem Experiences Among Users of the Tobacco-Cannabis Combination Known As Blunts

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Abstract

Background—In most of the world, cannabis smokers mix loose tobacco inside a joint, pipe, spliff, or cone. More recently, a ‘blunt’ formulation combines these two drugs by inserting cannabis into a hollowed-out cigar. Epidemiological research linking simultaneous use of these two drugs and the development of cannabis use disorders (CUD) remains unclear. This study estimates associations linking blunt smoking with levels and subtypes of cannabis problems.

Methods—Cross-sectional data on 27,767 past-year cannabis users were analyzed from the US National Survey on Drug Use and Health (NSDUH) conducted from 2009–2012. Ten self-reported items of DSM-IV CUD features elicited a single latent trait of cannabis problem (CP) severity, which was then regressed on past-year blunt smoking and past-month blunt frequency measures within the context of a conceptual model. Differential item functioning (DIF) analysis evaluated potential bias in CP feature response by blunt smoking history.

Results—Past-year blunt smoking was associated with higher CP severity compared to cannabis users who did not smoke blunts. Days of blunt smoking in the past month also predicted higher CP severity than less frequent blunt use. Those smoking blunts experienced more subjectively felt tolerance and having spent more time obtaining or using cannabis, but were less likely to experience other problems, even at the same level of CP severity.

Conclusions—These findings suggest smoking blunts might promote the development of problematic cannabis use. Responses to cannabis problems differed by history of blunt smoking, possibly implicating an influence of tobacco on measurement of cannabis use disorders.

Keywords

cannabis; blunts; tobacco; mulling; cannabis use disorder; severity; nicotine

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CONFLICT OF INTEREST

The author declares no conflicts of interest.

1. INTRODUCTION

The nature and extent tobacco, combined with cannabis, contributes to the experience of cannabis use disorders (CUDs) deserves considerably more attention. Tobacco and cannabis co-use is highly common, and 90% of cannabis users have smoked tobacco in their lifetime (Agrawal et al., 2012; Ramo et al., 2013). In many countries, users consume cannabis by mixing it with loose tobacco (Akre et al., 2010; Amos et al., 2004; Burns et al., 2000; Hammersley and Leon, 2006; Highet, 2004; Ream et al., 2006). In Switzerland, four out of five users mix tobacco with cannabis and expose themselves to significant levels of nicotine -- even if they do not self-identify as cigarette smokers (Belanger et al., 2013, 2011). Further, pre-clinical research supports functional interactions between nicotine and cannabinoids suggesting potential harmful effects of this drug combination over-and-above either drug's additive effects (Viveros et al., 2006). In the United States, the 'blunt' formulation is a popular method of mixing tobacco and cannabis (i.e., made by rolling cannabis inside a cheap cigar shell). Thus, this study seeks to add new evidence of the degree to which the tobacco-cannabis combination known as blunts contributes to the experience of cannabis problems (CP).

Cannabis users in the US typically do not mix loose tobacco with cannabis in a joint or pipe, and may shun tobacco altogether, in contrast to smoking practices elsewhere in the world (Johnson et al., 2006; Ream et al., 2006; Sifaneck et al., 2003). Therefore, blunt smoking represents a uniquely American way of combining tobacco and cannabis (although the popularity of blunts outside of the US has not been empirically examined). Half of adolescents who currently smoke cannabis have also smoked a blunt in the past month (Golub et al., 2005; Substance Abuse and Mental Health Services Administration, 2007). Blunt smoking tends to be over-represented among males, African-Americans, older youths, more recent birth cohorts, and urban residents (Golub et al., 2005; Timberlake, 2013). Prevalence has increased steadily over the past decade, and blunt use has become more widely diffused across racial/ethnic groups (Soller and Lee, 2010; Timberlake, 2013). Cigars used for blunts and 'blunt wraps' (i.e., cigar rolling papers) are widely available in tobacco shops, convenience stores, and liquor stores (Lipperman-Kreda et al., 2014; Sifaneck et al., 2005). Youths may prefer blunts to joints (i.e., cannabis rolled in cigarette paper) because blunts hold a larger quantity of cannabis, it burns slower, is easier to transport and conceal, and it culturally distinguishes their cannabis use from the older "hippie" generation of cannabis users (Mariani et al., 2011; Sifaneck et al., 2005).

Tobacco and cannabis co-use, including blunt smoking, is a health concern. Compared to cannabis-only use, co-use is associated with increased risk of CUDs, poorer psychological outcomes, and difficulties quitting cannabis (Peters et al., 2012; Ramo et al., 2012). Compared to tobacco cigarettes, blunts are perceived as safer and less addictive, yet evidence suggests smoking blunts is associated with being more nicotine dependent, thus potentially increasing the risk of tobacco-related illnesses (Dunlap et al., 2006; Sinclair et al., 2013; Timberlake, 2009). There is further concern that users may add other dangerous drugs to blunts (e.g., codeine, cocaine, ecstasy, hallucinogens; Elwood, 1998; Soldz et al., 2003).

Another significant health concern is the degree to which combining tobacco and cannabis leads to more severe cannabis problems, as an estimated 1 in 11 cannabis users become dependent at some point in their lives (Anthony et al., 1994). One twin study found that females who used tobacco and cannabis simultaneously (not necessarily in blunt form) were more likely to be frequent cannabis users and experience cannabis abuse, but not dependence (Agrawal et al., 2009). Two studies have focused specifically on blunt smoking. One study of a non-probability sample of cannabis users found that their frequency of blunt smoking in the past month was independently associated with several cannabis dependence symptoms, but unfortunately, CUD diagnostic outcomes were not evaluated (Ream et al., 2008). A second study did use a probability sample of recent cannabis users and reported that current blunt smoking was linked to a two-fold excess occurrence of CUDs, but found no differences by the degree blunt smoking was preferred over overall cannabis smoking (Timberlake, 2009). Considering the widespread and increasing use of blunts to consume cannabis, replication of these findings among nationally representative samples is needed to understand the extent blunt smoking may affect the overall experience of cannabis problems.

In order to shed new light on this topic, this project turned to recent, nationally representative samples of active cannabis users with and without a history of blunt smoking. In contrast to the clinical diagnostic approach that assumes a binary case or non-case status in the experience of cannabis problems (e.g., Timberlake, 2009), this paper takes a psychometric measurement approach that assumes the experience of cannabis problems varies along a continuum of severity, defined within the framework of DSM-IV clinical features. Item response theory (IRT) is an approach that posits responses to a domain of related items may be observable manifestations of an underlying latent dimension or “trait” (Embretson and Reise, 2000). Within the context of substance use disorders, the IRT literature supports a single latent trait underlying substance abuse and dependence (Gillespie et al., 2007; Langenbucher et al., 2004; Martin et al., 2006; Saha et al., 2006), including CUDs (Compton et al., 2009; Gillespie et al., 2012; Wu et al., 2012); the current DSM-V has likewise endorsed CUD as a single construct comprised of multiple clinical features with severity levels (American Psychiatric Association, 2013). A latent trait approach has distinct advantages. It permits comparisons across levels of CP severity, the contribution of each CP feature to overall severity is allowed to vary, and it allows for identification of potential response bias across groups (i.e., differential item functioning, DIF). Presence of DIF would suggest that the measurement of cannabis problems behaves differently by blunt smoking status. A multiple indicators, multiple causes (MIMIC) modeling approach used in this paper has been used previously by others to show DIF in CP features by age and race/ethnicity (Chen and Anthony, 2003; Muthen, 1984; Wu et al., 2012).

To summarize, this paper aims to estimate the degree to which blunt smoking (past-year use and past-month frequency) is associated with CP severity among recently active cannabis users within a conceptual model. Smoking blunts is hypothesized to be associated with higher levels of CP severity compared to those who do not smoke blunts. Likewise, frequent blunt use is expected to be related to higher CP severity. Exploratory analyses probe for possible DIF in the response to individual CP features by past-year blunt smoking status. The purpose of these exploratory analyses is to explore the possibility that responses to

individual CP features vary by blunt smoking, over-and-above what the level of CP severity can explain.

2. METHODS

2.1. Study Design and Sample

The US National Survey on Drug Use and Health (NSDUH) is an ongoing series of annual, cross-sectional surveys designed to produce nationally representative estimates on the prevalence and correlates of tobacco, alcohol, cannabis, and other drug use. Publicly available data from four surveys conducted from 2009 to 2012 were used ($n = 227,310$). This study focused on a subsample that used cannabis six days or more in the past year, and who started smoking blunts for the first time more than a year prior to interview ($n=27,767$; 12% of total sample). Excluded were respondents who never smoked cannabis ($n=136,945$; 60% of total sample), or used cannabis on fewer than six days in the past year ($n=60,211$; 27% of total sample); neither group was asked about cannabis problems. Also excluded were individuals who started smoking blunts for the first time in the past year ($n=2,387$; 1% of total sample) because blunt onset may have followed the occurrence of cannabis problems.

Surveys were designed to target all civilian, non-institutionalized US persons aged 12 years or older in the population. This excluded active-duty military and persons living within institutionalized group quarters (e.g., hospitals, prisons, nursing homes, and treatment centers). An independent, multi-stage area probability sampling design selected respondents from each of the 50 US states and the D.C. Trained field staff interviewed respondents using computer assisted interviewing (CAI) methods, and offered \$30 cash for participation. Average participation levels based on completed interviews among sampled households were 67%. The local institution review board (IRB) for the protection of human subjects study deemed the analyses of anonymous NSDUH public use data exempt from full review. Further details of NSDUH methodology are published online (http://www.samhsa.gov/data/Methodological_Reports.aspx, last accessed 13 October 14).

2.2. Measures

2.2.1 Cannabis Problems—Outcome measures of cannabis problems were based on CUD clinical features in the Diagnostic and Statistical Manual for Mental Disorders, Fourth Edition (DSM-IV; American Psychiatric Association, 1994). Cannabis problems measured in the past year included: 1) Spent a great deal of time over a period of a month getting, using, or getting over the effects of cannabis; 2) Used cannabis more often than intended or was unable to keep set limits on cannabis use; 3) Needed to use cannabis more than before to get desired effects or noticed that same amount of cannabis use had less effect than before; 4) Inability to cut down or stop using cannabis every time tried or wanted to; 5) Continued to use cannabis even though it was causing problems with emotions, nerves, mental health, or physical problems; 6) Cannabis use reduced or eliminated involvement or participation in important activities; 7) Serious problems at home, work, or school caused by using cannabis; 8) Used cannabis regularly and then did something that might have put them in physical danger; 9) Use of cannabis caused them to do thing that repeatedly got them in

trouble with the law; 10) Problems with family or friends caused by using cannabis and continued to use cannabis even though they thought using cannabis caused these problems. Responses were coded as either 'yes' or 'no' (non-responses were imputed as 'no'; $n = 242$, or less than 1% of the sample).

2.2.2 Past-Year Blunt Smoking and Past-Month Blunt Frequency—Blunt smoking was assessed specifically from general cannabis use, and items about blunt smoking were asked regardless of prior responses to cannabis use. Individuals giving inconsistent answers to cannabis and blunt questions were asked for clarification. The definition provided for blunts read: "Sometimes people take some tobacco out of a cigar and replace it with marijuana. This is sometimes called a 'blunt'." Past-year blunt smoking was defined as smoking a blunt at least once in the past 12 months: "How long has it been since you last smoked part or all of a cigar with marijuana in it?" Days of blunt smoking in the past month were defined from the item: "On how many of the past 30 days...did you smoke part or all of a cigar with marijuana in it?" Count responses (range: 1–30) in this variable were recoded to four ordinal categories with cut-points chosen to correspond to no blunt use (zero days; imputed from blunt recency item), blunt use less than one day per week (1–3 days), at least once per week, but no more than five days per week (4–20 days), and every day, or nearly every day of the month (21–30 days). Recoding was necessary to account for digit preferences in responses (e.g., preferences for values in multiples of five and seven).

2.2.3 Covariates—Conceptual models attempted to account for additional factors that might plausibly explain the relationship between cannabis/blunt use and problematic cannabis use experiences. A standard set of items assessed time-invariant, exogenous background characteristics, such as sex, age, and race/ethnicity, which are known to vary in relation to cannabis/blunt use and the occurrence of CUD (Golub et al., 2005; Stinson et al., 2006). Using self-reported age-of-onset data for cannabis, cigarettes, cigars, alcohol, other recreational drug use (e.g., cocaine, heroin, inhalants, hallucinogens, etc.), and a two-week spell of depressed mood, five binary indicator variables (yes vs. no) defined whether each of these behaviors occurred prior to cannabis onset. Prior substance use and depressed mood often co-occur with cannabis use and is associated with CUDs (Stinson et al., 2006; Windle and Wiesner, 2004). Individuals high on risk taking/sensation seeking and who are likely to break societal rules (i.e., conduct problems) have a greater risk of using cannabis and CUDs (Barkley et al., 2004; Crowley et al., 1998; Martin et al., 2002; Miles et al., 2001). Thus, models considered measures of risk taking operationalized by responses to three items: getting a 'kick out of doing dangerous things', 'test themselves doing risky things', and 'wear a seatbelt when driving/front passenger' of a vehicle. Indicators of rule breaking were assessed based upon past-year experience of selling drugs, stealing, assault, or arrest. A general measure of overall health (excellent, very good, good, fair, or poor) was included to control for possible use of cannabis for self-medication (Grella et al., 2014; Ogborne et al., 2000; Wilsey et al., 2008). Finally, religiosity is known to be protective for using cannabis and CUDs, therefore a frequency measure of religious attendance was included (Miller et al., 2000; Nonnemaker et al., 2003).

2.3. Statistical Analysis

The first step of analysis estimated the annual prevalence of each CP feature by blunt smoking measures. The second step of analysis estimated a series of models that regressed a single latent trait of CP severity (based on confirmatory factor analysis of the ten CP features) on each blunt smoking measure separately. The distribution of CP severity was continuous and scaled to have a mean of zero and variance of one. Estimates are presented as unstandardized regression beta coefficients (β). Initial models estimated the unadjusted relationship between blunt smoking measures and CP severity, while subsequent models adjusted for the influence of sex, age, and race/ethnicity, and then later for age of cannabis onset (linear, quadratic, and cubic terms), cigarette smoking, alcohol, other recreational drug use, depressed mood, risk taking behaviors, social behaviors, and overall health. Estimates were produced for individual survey years, and then summarized across years using meta-analysis methods for fixed effects via the user defined Stata command *metan* (Borenstein et al., 2010; Harris et al., 2008; StataCorp, 2011). The I-squared quantity and associated p-value assessed estimate heterogeneity across survey years (Higgins et al., 2003).

In the final set of exploratory analyses, DIF in the bivariate response to each CP feature by past-year blunt smoking was explored using the pooled data (Muthén, 1989). MIMIC ('multiple indicators, multiple causes') models estimated the direct association of past-year blunt smoking on the log odds of experiencing each CP feature, while statistically controlling for level of CP severity and other covariates. A second set of exploratory analyses probed whether days of cannabis use in the past year (ordinal: 1–11 days, 12–49 days, 50–99 days, 100–299 days, 300–365 days) might explain the relationship between blunt smoking and CP severity.

Precision in estimates are stressed using 95% confidence intervals (CI), and p-values are included to aid in interpretation. Estimates accounted for probability sampling weights and the complex survey design. Latent trait analysis and MIMIC models were fit using Mplus version 7 (Muthén and Muthén, 2012).

3. RESULTS

3.1. Characteristics of Past-Year Cannabis Users by Blunt Smoking

The majority of past-year cannabis users smoked a blunt in the past year (66%), and a sizable proportion smoked a blunt within the past 30 days (40%; Table 1). Around 8% smoked blunts heavily, or on 21–30 days in the past month. Males were over-represented among cannabis users in general (65%), and only modestly more prominent in the moderate (4–20 days) and high frequency (21–30 days) blunt-using groups (68% and 67%, respectively). Blunt smoking was particularly concentrated among youths 18–25 years old (50%) relative to their proportion in the sample (36%). Similarly, non-Hispanic Black respondents represented only 15% of the sample, but 41% of those smoking blunts 21–30 days in the past month. Blunt smoking was also more prevalent among individuals with incomes less than \$50,000 and in urban populated areas.

3.2. Prevalence of Cannabis Problems by Blunt Smoking

Annual prevalence for each CP feature was greater for cannabis users who smoked blunts in the past year than those who did not (Table 2). The largest proportionate difference was for ‘trouble with the law’ (3.3% vs. 1.2%, respectively; 2.7 times larger), while the smallest was for ‘used in hazardous situations’ (7.1% vs. 4.2%, respectively; 1.7 times). ‘Spending a great deal of time’ getting, using, or getting over the effects of cannabis was the problem most experienced among those who smoked blunts (57%), or those who did not (23%). The next most prevalent cannabis problem was tolerance (38% and 16%, respectively). The least experienced problem by either group was ‘trouble with the law’.

The prevalence of cannabis problems was higher with greater past-month blunt involvement (Table 2). For example, 21% of cannabis users who did not smoke blunts in the past month experienced tolerance, but was 34% for 1–3 days of blunt use, 45% for 4–20 days of blunt use, and 54% for 21–30 days of blunt use. The problems of ‘trouble with the law’ and ‘inability to cut down’ were two-fold higher when comparing infrequent blunt use (1–3 days) to frequent blunt use (21–30 days).

3.3. Cannabis Problem Severity and Past-Year Blunt Smoking

Past-year blunt smoking was associated with higher CP severity in both unadjusted and covariate adjusted models (Table 3). Unstandardized regression coefficients across survey years in unadjusted models ranged from 0.63 (95% CI: 0.53, 0.74) in 2009 to 0.81 (95% CI: 0.70, 0.91) in 2011. Overall, the meta-analytical summary estimate was 0.71 (95% CI: 0.66, 0.76). Effect sizes were reduced in models adjusting for sex, age, and race/ethnicity (overall $\beta = 0.56$; 95% CI: 0.50, 0.62), and in the final model that adjusted for all covariates (overall $\beta = 0.45$; 95% CI: 0.39, 0.51). Nevertheless, both individual year and overall summary estimates remained statistically above the null value of zero. Further, I-square p-values indicated no statistically significant heterogeneity in year-by-year estimates ($p > 0.05$; not shown in table).

3.4. Cannabis Problem Severity and Days of Blunt Smoking in the Past Month

Days of blunt smoking in the past month was linked to higher levels of CP severity in a dose-response fashion (Table 3). For example, overall summary estimates in the unadjusted model showed a statistically higher CP severity for those who smoked blunts on 1–3 days ($\beta = 0.40$; 95% CI: 0.33, 0.47), 4–20 days ($\beta = 0.72$; 95% CI: 0.66, 0.77), and 21–30 days ($\beta = 0.86$; 95% CI: 0.79, 0.94) as compared to cannabis users who did not smoke blunts in the prior month. Non-overlapping confidence intervals indicated that estimates were distinct from one another. Covariate adjustment attenuated these estimates, and overall effect sizes for each blunt frequency category remained above null, but those in the 4–20 day and 21–30 day blunt using groups were not longer distinct. Some estimates were heterogeneous across survey years. For example, estimates for the 21–30 day frequency category in unadjusted models were notably higher in 2010 and 2011 than other years (I-squared = 63.4%; $p = 0.042$), and in general, estimates appeared higher in 2011 than for other years.

3.5. Differential Item Functioning in Cannabis Problems by Past-Year Blunt Smoking Status

Exploratory analyses of DIF estimated differences in the probability of reporting individual cannabis problem features by blunt smoking status, even when controlling for the underlying severity of CP and other covariates. Figure 1 depicts a MIMIC model of the direct association between past-year blunt smoking and the CP1 feature (i.e., ‘spending more time’). The slope estimate ($\beta = 0.31$) can be interpreted as the change in the log-odds of experiencing the CP feature in relation to smoking blunts in the past-year versus not. Regression beta coefficient values greater than zero indicate those who smoke blunts were more likely to experience said CP feature over-and-above what could be explained by latent CP severity or other covariates. Values less than zero indicate the opposite. MIMIC models were repeated for each CP feature with estimates shown in Table 4.

DIF by past-year blunt smoking status was present for eight of the ten CP features. Past-year blunt smoking was inversely related to using cannabis ‘more often than intended’ ($\beta = -0.04$) and ‘inability to cut down’ ($\beta = -0.09$), but estimates were no different than null (both $p > 0.05$). However, those who smoked blunts were more likely to report having ‘spent a great deal of time’ ($\beta = 0.31$; $p < 0.001$) and tolerance ($\beta = 0.18$; $p < 0.001$) related to cannabis as compared to those who did not smoke blunts. Conversely, those who smoked blunts were less likely to report all other features with point estimates especially lower for ‘serious problems at home, work, or school’ and ‘trouble with the law’ (both $\beta = -0.23$; p -values < 0.001).

3.6. Exploring the Blunt Smoking and CP Severity Relationship by Overall Past-Year Frequency of Cannabis Use

An explanation not ruled out in these analyses is whether the relationship between blunt smoking and CP severity might be due to overall frequency of cannabis consumption. While heavy cannabis use might precede onset of blunt smoking, and thus be a potential confounder, it might also be a consequence of blunt smoking, and therefore be a mediator. Exploring the data revealed that 50% of those who just started using cannabis within the last two years had already smoked a blunt, while only 10% of the same users smoked cannabis on more than 100 days in the past year (54% used on fewer than 12 days). Further, half (55%) of blunt onsets tended to occur within the same year as cannabis onset; 85% of blunt onsets occurred within the first two years. This evidence suggests that the time between cannabis and blunt onsets is relatively short, and cannabis users are more likely to initiate blunt smoking sooner than heavy cannabis use. Therefore, the main analyses did not adjust for past-year frequency of cannabis use, since it could potentially be a strong mediator.

Nevertheless, exploratory analyses of the pooled data revealed that when covariate-adjusted models controlled for days of cannabis use in the past year, estimates of the association between past-year blunt smoking and CP severity were reduced, but were not completely rendered null ($\beta = 0.15$; 95% CI: 0.10, 0.19; $p < 0.001$). Estimates for past-month blunt frequencies of 1–3 days, 4–20 days, and 21–30 days (compared to zero days) were similarly reduced, but statistically significant (β s = 0.07, 0.10, and 0.17, respectively; all p -

values<0.01). Even when conditioning on a potential mediator, blunt smoking continued to be associated with higher CP severity.

4. DISCUSSION

The main findings of this study can be summarized as follows: (a) recently active cannabis users who have smoked a blunt at least once in the past year experience higher severity of current cannabis problems than those who recently abstain from smoking blunts, (b) cannabis problem severity is higher for those who smoke blunts more frequently, (c) these relationships are fairly consistent across independently collected, nationally representative samples of cannabis users, and (d) those who smoke blunts over-report tolerance and spending more time getting, using, and getting over the effects of cannabis, but under-report other problems, even after accounting CP severity and other factors. Overall frequency of cannabis consumption could not completely explain the relationship between blunt smoking and CP severity. Prior qualitative work suggested blunt smoking within social groups promoted moderate rather than excessive cannabis intoxication (Dunlap et al., 2006). However, findings from this study are consistent with prior observational studies that show blunt smoking increases the risk of individual cannabis dependence symptoms and cannabis use disorders (Ream et al., 2008; Timberlake, 2009).

Blunt smoking is related to more severe cannabis problems, and therefore its use could indicate individuals especially in need of treatment. Cannabis cessation outcomes are adversely affected by concurrent tobacco and cannabis use (Peters et al., 2012). Clinicians and patients might be concerned that tobacco cessation may interfere with cannabis abstinence. The efficacy of treating both substances simultaneously has recently received attention, and preliminary evidence suggests such treatment strategies do not adversely affect cessation outcomes for either drug (Hill et al., 2013; Lee et al., 2014). Nonetheless, cannabis users who prefer blunts and are trying to quit could be at a greater risk for relapse, and increase their tobacco consumption to compensate for nicotine withdrawal. This issue might be especially relevant to African-American patients undergoing cannabis treatment, who are more likely to smoke blunts, and who typically have poorer cessation outcomes (Montgomery et al., 2012; Peters et al., 2014; Saloner et al., 2014).

The association between blunt smoking and severity of cannabis problems has a number of implications for tobacco control strategies and regulation of the burgeoning market for legal cannabis consumption in the US and elsewhere. Lessons from tobacco cigarettes are clear: Tobacco companies target their products to low-income, high minority populations, and manipulate flavoring (e.g., menthol) to attract young and novice users (Hackbarth et al., 1995; John et al., 2009; Kreslake et al., 2008; Moore et al., 1996). The US Food and Drug Administration (FDA) has only recently banned fruit and candy flavored cigarettes, while considering a similar ban for menthol (Deyton et al., 2010). By contrast, flavored cigars used for blunts and 'blunt wraps' remain prominent in the market where tobacco cigarette products are sold, have increased market share over time, and yet have escaped similar regulatory scrutiny (Delnevo et al., 2014; Lipperman-Kreda et al., 2014). Presently, tobacco companies do not appear to target these cigar products in poor and minority areas, yet this could change as cannabis becomes increasingly legal and profitable (Lipperman-Kreda et

al., 2014). Thus, there is a clear need for better surveillance of cigar products and consideration of their impact on cannabis consumption, especially among minority and novice users.

Exploratory findings further suggest blunt smoking may influence the measurement of CUDs. Users who smoke blunts are more likely to experience tolerance, which is consistent with pre-clinical evidence showing that nicotine attenuates THC tolerance (i.e., THC being the main psychoactive constituent of cannabis; Valjent et al., 2002). Smoking blunts is also positively associated with ‘spending more time’ getting, using, and getting over the effects of cannabis. This could be due to the added time and expense of obtaining cigars and constructing blunts, or the social ritual of smoking blunts, rather than an indication of underlying pathology. Conversely, those who smoke blunt under-report all other problems as compared to those who do not smoke blunts. Socially maladaptive behaviors, such as ‘serious problems at home, work, or school’, ‘trouble with the law’, and ‘continued use despite problems with friends/family’ may occur less often among those whose blunt smoking is more socially accepted within their peer/family group. For example, family, friends, and legal concerns appear to have less influence on quit attempts for blunts than for cannabis (Sinclair et al., 2013). Blunts can also appear as regular cigars and mask the smell of cannabis, which might help conceal cannabis use from authority figures (Sifaneck et al., 2005). Whether these differences can be attributed to the tobacco content, or specific social or practical aspects of blunt smoking remain to be studied.

Findings in this study should be considered within the context of several important limitations. First, data for this study are cross-sectional and reflect self-selection processes; therefore, definitive causal statements cannot be made. For example, smoking blunts may constitute a self-selected non-random segment of the cannabis smoking population; whatever prompted blunt smoking also might account for the associations observed here. In addition, while conceptual models favored the causal assumption that blunt smoking influences CP severity, the alternative interpretation that cannabis problems influence the initiation and frequency of blunt smoking cannot be completely ruled out until longitudinal data on blunt smoking and cannabis problems are collected. Second, blunt smoking measures did not allow analyses to take into account the amount of cannabis consumed not in blunt form, or the degree by which cannabis/blunts were consumed simultaneously with other tobacco products (e.g., cigars). Third, cannabis withdrawal was not measured in these data, and therefore it is unclear whether smoking blunts influences this experience. Finally, blunt smoking appears anecdotally to be a uniquely American practice, and it is uncertain the degree to which these results generalize to other populations where tobacco-cannabis combinations prevail.

In summary, smoking blunts may be a riskier form of consuming cannabis than tobacco-less cannabis joints in the development of cannabis problems. Studies of cannabis users in the US and elsewhere should neither assume cannabis-smoking practices are heterogeneous, nor ignore the potential role of simultaneous tobacco consumption in users’ experience of CUDs. Clinicians should be aware that patients who prefer blunts might be more vulnerable to severe cannabis problems and treatment need. More detailed information is necessary to address the specific impact of cigars used-for-blunts, ‘blunt wraps’, and blunt flavors on

rates of harmful tobacco and cannabis use. Such information will help inform whether regulations are necessary limit marketing or prohibit these tobacco products in order to reduce adverse health outcomes associated with blunts.

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Highlights

- Smoking blunts in the past year is associated with more severe cannabis problems than those who did not smoke blunts.
- Frequency of blunt smoking in the prior month was related to more severe cannabis problems in a dose-response fashion.
- Those who smoke blunts over-report experiencing tolerance and spending more time getting and using cannabis, but under-report all other problems, even at the same level of cannabis problem severity.

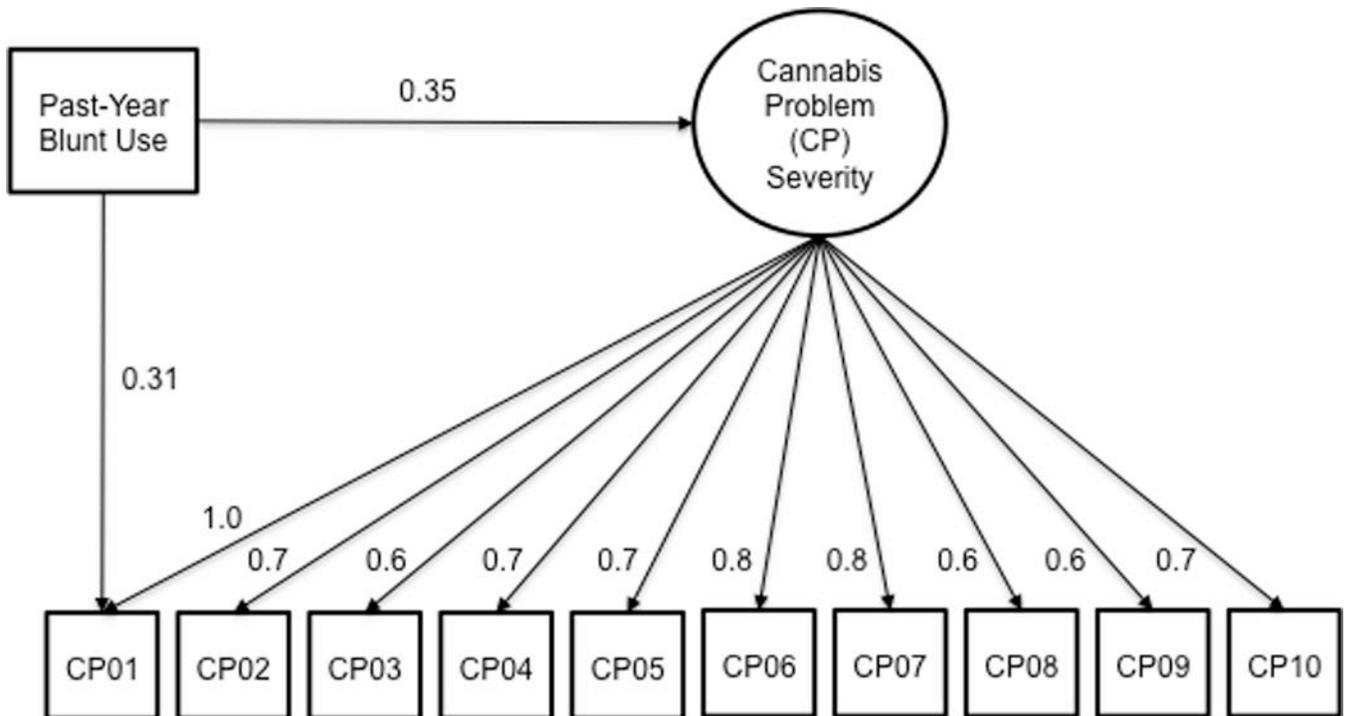


Figure 1. MIMIC model of cannabis problem (CP) severity among past-year cannabis users. US National Survey on Drug Use and Health, 2009–2012. Unstandardized regression coefficients presented. Model additionally adjusted for background characteristics, substance use, depressed mood, risk taking, social factors, and overall health (not depicted in figure). Descriptions and parameter estimates for other CP items shown in Table 4.

Table 1
 Selected Characteristics of Past-Year Cannabis Users by Past-Year Blunt Smoking and Days of Past-Month Blunt Smoking Behavior. Data from the US National Survey on Drug Use and Health, 2009–2012.

Background Characteristic	Past-Year Blunt Smoking			Days of Past-Month Blunt Smoking							Total (n = 27,767)			
	n	wt%	Yes (n = 18,197)	Zero Days (n = 16,676)	1–3 Days (n = 3,795)		4–20 Days (n = 4,937)		21–30 Days (n = 2,359)					
					n	wt%	n	wt%	n	wt%		n	wt%	
Sex														
Female	4,127	35.9	7,010	35.0	7,115	36.4	1,492	35.8	1,751	31.6	779	32.7	11,137	35.4
Male	5,443	64.1	11,187	65.0	9,561	63.6	2,303	64.2	3,186	68.4	1,580	67.3	16,630	64.6
Age														
12–17 Years Old	1,916	6.1	3,556	10.5	3,336	7.5	703	9.6	1,014	11.7	419	9.1	5,472	8.5
18–25 Years Old	4,224	18.9	12,198	50.1	8,895	28.0	2,547	48.1	3,370	54.1	1,610	52.1	16,422	35.8
26–34 Years Old	1,243	20.1	1,605	23.5	1,921	21.9	347	22.3	356	19.9	224	25.8	2,848	21.9
35 or Older	2,187	54.8	838	15.9	2,524	42.6	198	20.0	197	14.3	106	12.9	3,025	33.8
Race or Ethnicity														
Non-Hispanic White	6,541	76.1	10,790	59.4	11,235	73.3	2,401	63.5	2,768	55.8	927	36.4	17,331	67.1
Non-Hispanic Black	850	8.4	3,253	20.6	1,720	10.1	497	16.3	1,037	24.1	849	41.0	4,103	15.0
Hispanic	1,212	10.5	2,674	15.4	2,172	11.7	568	15.3	738	15.9	408	18.0	3,886	13.1
Other/	967	5.0	1,480	4.7	1,549	5.0	329	4.9	394	4.2	175	4.6	2,447	4.8
Total Family Income														
Less than \$20,000	2,875	24.8	6,057	31.0	5,112	26.2	1,272	30.3	1,695	33.4	853	33.6	8,932	28.2
\$20,000 – \$49,999	3,322	32.8	6,345	36.1	5,790	33.7	1,313	35.8	1,707	34.9	857	40.3	9,667	34.6
\$50,000 – \$74,999	1,357	15.4	2,339	13.1	2,290	14.7	486	13.6	628	13.8	292	11.8	3,696	14.2
\$75,000 or More	2,016	26.9	3,456	19.7	3,484	25.5	724	20.3	907	18.0	357	14.3	5,472	23.0
Population Density														
CBSA with 1 million or more	3,705	52.0	8,299	56.0	6,674	52.4	1,666	56.0	2,410	57.7	1,254	60.8	12,004	54.1
CBSA with less than 1 million	4,974	42.0	8,957	40.4	8,618	42.1	1,943	40.8	2,336	39.6	1,034	35.8	13,931	41.2
Segment not in a CBSA	891	6.0	941	3.6	1,384	5.5	186	3.3	191	2.6	71	3.4	1,832	4.7

wt% = weighted percent; CBSA = Core Based Statistical Area

Other category included non-Hispanic Asian, Native American/Alaska Native, Native Hawaiian/Other Pacific Islander, and multi-racial groups

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Annual Weighted Prevalence (%) of Cannabis Problems by Blunt Smoking Status Among Past-Year Cannabis Users. Data from the US National Survey on Drug Use and Health, 2009–2012.

Table 2

Cannabis Problem (CP)	Past-Year Blunt Smoking			Days of Past-Month Blunt Smoking					Total
	No	Yes	p-value ¹	Zero Days	1–3 Days	4–20 Days	21–30 Days	p-value ¹	
CP1 Spent a great deal of time	23.3	56.9	<0.001	30.0	48.7	69.1	82.6	<0.001	41.4
CP2 More often than intended	3.9	9.1	<0.001	4.9	8.2	10.3	14.8	<0.001	6.7
CP3 Tolerance	16.3	38.2	<0.001	20.8	34.3	45.2	53.8	<0.001	28.1
CP4 Inability to cut down	3.8	7.7	<0.001	4.3	6.9	8.6	13.7	<0.001	5.9
CP5 Continued to use despite emotional/physical problems	4.9	9.1	<0.001	5.6	9.6	10.5	11.4	<0.001	7.1
CP6 Reduced or gave up important activities	6.0	12.9	<0.001	7.6	11.2	16.0	15.5	<0.001	9.7
CP7 Serious problems at home, work, or school	3.5	7.9	<0.001	4.4	6.0	9.8	10.8	<0.001	5.8
CP8 Used in hazardous situations	4.2	7.1	<0.001	4.8	6.9	8.1	8.4	<0.001	5.7
CP9 Trouble with the law	1.2	3.3	<0.001	1.7	2.5	3.9	5.7	<0.001	2.4
CP10 Continued use despite problems with friends/family	2.7	7.0	<0.001	3.5	7.0	8.1	10.4	<0.001	5.0

¹ p-value based on Pearson design-based chi-square test of differences between groups.

Table 3

Estimated Association Between Each Blunt Smoking Measure and Severity of Cannabis Problems (CP) Among Past-Year Cannabis Users, Unadjusted and Covariate Adjusted Models. Data from the US National Survey on Drug Use and Health, 2009–2012.

		Unadjusted Models			Adjusted for Sex, Age, and Race/Ethnicity			Adjusted for All Covariates [†]		
Survey	Frequency Category	Regression Coefficient (β)	95% CI	Regression Coefficient (β)	95% CI	Regression Coefficient (β)	95% CI	Regression Coefficient (β)	95% CI	
Past-Year Blunt Smoking (Reference: No)										
2009		0.63	0.53 0.74	0.52	0.39 0.64	0.39	0.64	0.39	0.27 0.51	
2010		0.66	0.54 0.78	0.46	0.33 0.59	0.38	0.59	0.38	0.26 0.50	
2011		0.81	0.70 0.91	0.69	0.56 0.81	0.57	0.81	0.57	0.45 0.68	
2012		0.73	0.62 0.84	0.56	0.43 0.69	0.44	0.69	0.44	0.32 0.56	
Overall [‡]		0.71	0.66 0.76	0.56	0.50 0.62	0.45	0.62	0.45	0.39 0.51	
Past-Month Days of Blunt Smoking (Reference: Zero Days)										
Survey	Frequency Category	Regression Coefficient (β)	95% CI	Regression Coefficient (β)	95% CI	Regression Coefficient (β)	95% CI	Regression Coefficient (β)	95% CI	
2009	1–3 Days	0.27	0.12 0.41	0.16	0.01 0.32	0.14	0.32	0.14	0.00 0.29	
	4–20 Days	0.65	0.55 0.75	0.52	0.42 0.63	0.38	0.63	0.38	0.27 0.48	
	21–30 Days	0.83	0.68 0.98	0.71	0.57 0.84	0.60	0.84	0.60	0.46 0.74	
2010	1–3 Days	0.35	0.21 0.50	0.24	0.09 0.39	0.18	0.39	0.18	0.04 0.32	
	4–20 Days	0.70	0.59 0.81	0.52	0.41 0.63	0.43	0.63	0.43	0.31 0.54	
	21–30 Days	0.99	0.81 1.16	0.85	0.66 1.04	0.72	1.04	0.72	0.51 0.92	
2011	1–3 Days	0.46	0.31 0.61	0.38	0.23 0.53	0.28	0.53	0.28	0.14 0.42	
	4–20 Days	0.85	0.74 0.96	0.77	0.65 0.88	0.65	0.88	0.65	0.53 0.77	
	21–30 Days	0.99	0.84 1.15	0.91	0.75 1.06	0.70	1.06	0.70	0.55 0.84	
2012	1–3 Days	0.50	0.37 0.62	0.40	0.26 0.54	0.35	0.54	0.35	0.22 0.48	

	Unadjusted Models		Adjusted for Sex, Age, and Race/Ethnicity ¹		Adjusted for All Covariates ¹				
4–20 Days	0.68	0.57	0.80	0.52	0.38	0.65	0.44	0.32	0.55
21–30 Days	0.75	0.63	0.87	0.63	0.50	0.76	0.54	0.41	0.67
Overall ²	0.40	0.33	0.47	0.30	0.23	0.38	0.24	0.17	0.31
4–20 Days	0.72	0.66	0.77	0.58	0.52	0.64	0.47	0.41	0.52
21–30 Days	0.86	0.79	0.94	0.75	0.68	0.82	0.62	0.55	0.70

CI = Confidence Interval

¹Model adjusted for sex, age, race/ethnicity, income, population density, use of cigarettes, cigars, alcohol, other recreational drugs, and depressed mood prior to cannabis onset, risk taking, religious attendance, selling drugs, stealing, assault, past-year arrest, and overall general health.

²Overall estimates represent the meta-analytical derived summary estimate across survey years.

Estimated Differential Item Functioning Between Past-Year Blunt Smoking Status and Individual Cannabis Problems within MIMIC Model Accounting for Severity of Cannabis Problems and Adjusted for Other Covariates¹. Data from the US National Survey on Drug Use and Health, 2009–2012.

Table 4

Cannabis Problem (CP)	Regression Coefficient (β)	95% CI	p-value
CP1 Spent a great deal of time	0.31	0.23 0.39	<0.001
CP2 More often than intended	-0.04	-0.13 0.05	0.343
CP3 Tolerance	0.18	0.12 0.24	<0.001
CP4 Inability to cut down	-0.09	-0.19 0.01	0.072
CP5 Continued to use despite emotional/physical problems	-0.15	-0.25 -0.05	0.002
CP6 Reduced or gave up important activities	-0.17	-0.24 -0.09	<0.001
CP7 Serious problems at home, work, or school	-0.23	-0.33 -0.14	<0.001
CP8 Used in hazardous situations	-0.15	-0.25 -0.04	0.006
CP9 Trouble with the law	-0.23	-0.34 -0.11	<0.001
CP10 Continued to use despite problems with friends/family	-0.13	-0.23 -0.03	0.012

CI = Confidence Interval

¹ Model adjusted for sex, age, race/ethnicity, income, population density, use of cigarettes, cigars, alcohol, other recreational drugs, and depressed mood prior to cannabis onset, risk taking, religious attendance, selling drugs, stealing, assault, past-year arrest, and overall general health.