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ORIGINAL ARTICLE

## Don't wake and bake: morning use predicts cannabis problems

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### ABSTRACT

Heavy, frequent cannabis use covaries with cannabis-associated problems. With cannabis policy changing worldwide, identifying risk factors for cannabis-associated problems is crucial. While researchers have consistently studied frequency and quantity of use as important risks, clinical lore suggests that the timing of use might also contribute to problems. Similar to morning use of alcohol among alcohol-dependent individuals, morning use of marijuana may indicate dependence and increased cannabis-related impairment. Morning use also has the potential to lend itself to straightforward intervention. The present study sought to examine the relation between morning cannabis use and self-reported cannabis-associated problems. The study compared daily marijuana users who reported morning use ( $n=257$ ) to daily marijuana users who reported no use before noon ( $n=76$ ) using the brief Cannabis-Associated Problems Questionnaire. Morning users reported significantly more problems than non-morning users, and morning use accounted for significant unique variance in problems. Exploratory mediational analyses did not support the idea that morning use led to problems via withdrawal. The present study provides evidence that timing of cannabis use is an important factor in examining the cannabis-associated problems.

### ARTICLE HISTORY

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Cannabis; marijuana; drug problems; morning drug use

### Don't wake and bake: morning cannabis use accounts for unique variance in problems

Lifetime or past-year cannabis use appears to be on the rise in North America, potentially leading to more cannabis-related problems (Hasin et al. 2015; Rotermann & Langlois 2015). World estimates of lifetime use now exceed 200 million (Degenhardt & Hall 2012). Although experts often rate cannabis as less harmful than some legal and illegal drugs (Gore & Earleywine 2007; Nutt et al. 2007), heavy use definitely covaries with negative consequences. Those who start young and use large quantities frequently are particularly likely to report symptoms of dependence and respiratory irritation (Fergusson & Boden 2008; Hall & Degenhardt 2009; Loflin & Earleywine 2015). Heavy users also report complaints from family and friends, memory troubles, and low productivity or reduced energy (Lavender et al. 2008). Predicting problems is particularly important now that policies are changing.

Identifying users at greatest risk for developing problems with cannabis remains difficult. Risky use of the substance potentially relates to frequency and quantity of consumption as well as timing of use. Frequent use, particularly at high quantities, remains a strong predictor of negative consequences (Walden & Earleywine 2008; Zeisser et al. 2012). Daily users, especially those who consume  $>1$  g/day, are most likely to report cannabis-related troubles (Looby & Earleywine 2007; Zeisser et al. 2012). Decreasing frequency and quantity of use seem ideal targets for minimizing problems, too. The timing of cannabis use has received markedly less attention

than quantity or frequency of use, but might lend itself to straightforward harm reduction strategies. Alcohol researchers have long emphasized morning drinking as a sign of trouble; perhaps a comparable approach can identify cannabis users experiencing negative consequences.

The "eye-opener", an alcoholic beverage consumed early in the day, has become a hallmark of some screening devices designed to identify problem drinkers. Indeed, the "E" in brief screeners known by their acronyms stands for "eye-opener". These devices include the CAGE (Beresford et al. 1990), T-ACE (Sokol et al. 1989) and TWEAK (Cherpitel 1999). The "eye-opener" clearly correlates with alcohol problems. The mechanism behind this correlation is likely complex (Epler et al. 2014). Perhaps a drink in the morning alleviates hangover, a form of acute withdrawal, potentially maintaining a vicious cycle of drinking. A comparable process might exist with cannabis. Although documented withdrawal (Allsop et al. 2012) can vary dramatically across users (Herrmann et al. 2015), it might motivate morning use and greater consumption. Alternatively, the subjective and cognitive effects of the substance might make important daytime tasks more difficult, making those who use in the morning more likely to err than those who wait until later in the day when obligations are complete (Ehrler et al. 2015). Morning cannabis use has its own slang in the community of users. Scholars depict "wake and bake" in the published literature with some concern (Quintero 2009) or even derision (Montagne 2010). Experienced users discourage the habit, emphasizing its adverse impact on productivity (Lau et al. 2015). Nevertheless, published empirical associations

between morning use of cannabis and negative consequences are rare.

The current study examines the hypothesis that morning use of cannabis covaries with problems. Daily cannabis users who reported morning use and comparable users who abstained until at least noon completed several measures. Given that earlier use might simply serve as a proxy for more frequent use in larger amounts, we assessed frequency and quantity of consumption as well as an index of cannabis-related problems. In an exploratory effort to see if withdrawal might lead to morning use and subsequent problems, we also examined associations among withdrawal, morning use and problems other than withdrawal. We conducted mediational analyses to see if morning use might mediate the relation between withdrawal and other problems. Although this approach has serious limitations with cross-sectional data, the analyses can reveal if longitudinal work examining these variables appears justified.

## Method

### Procedure

Participants responded to an e-mail request to complete an internet survey on cannabis use and attitudes. To target potential cannabis users, the initial e-mail was sent to members of a listserv associated with cannabis law reform. The e-mail stated that participants could complete the internet questionnaire and forward it to others (the “snowballing” technique; Callow 1996), for a chance to win a cannabis vaporizer. Participants had the option to send their email address and a secret number to a separate email account if they wanted to be eligible for the prize. The first online page of the study stated that continued participation beyond the first page implied participant consent. All procedures were in accordance with and approved by the local Institutional Review Board.

### Participants

An initial 964 participants responded to an email query sent to 1310 members of a listserv. The link offered a chance to win a cannabis vaporizer for participation. Three participants failed infrequency items and were removed. Of the remaining participants, we targeted the 257 who reported that they used cannabis before noon on 7 days/week and the 76 who reported that they used cannabis 7 days/week but never used before noon. (All other respondents used cannabis less than daily when asked “How many days per week do you use cannabis?”) The daily morning and non-morning users had an average age of 43.9 ( $SD = 14.1$ ) and included 232 (69.7%) men and 101 (30.3%) women. Caucasians were the most common ethnic group (85%) followed by mixed race (7%), Latino or Hispanic (6%), African or Caribbean descent (1%) and Asian or Pacific Islander (1%). About 47% were married, 14% reported being in another form of committed relationship and 39% were single. Modal education was “some college” (34%) with a range from “some high school” (1%) to “advanced degree” (13%). Median income was \$50,000 per year.

## Measures

### Cannabis frequency

Participants were asked, “Approximately how many days per week do you use cannabis? 0–7”. We selected those who reported 7 in an effort to target daily users who did or did not consume cannabis in the morning.

### Cannabis quantity

Participants reported the number of grams of cannabis they used on an average occasion of use ranging from “less than half a gram” to “more than 4 grams per occasion” in  $\frac{1}{2}$  gram increments. Mean grams used per occasion for this sample was 1.54 ( $SD = 1.31$ ).

### Morning use

Participants chose the number of days per week they consumed cannabis before noon on a 9-point scale from 0 (not at all), <1 day/week, 1 day/week and so on through 7 days/week. We chose those who reported 0 and those who reported 7 to form the morning use groups.

### Problems

A short version of the Cannabis-Associated Problems Questionnaire developed in an effort to avoid items with gender bias (Lavender et al. 2008), served as an index of problems. Participants rated 14 problem items from 0 (not at all) to 5 (a great deal). Questions concerned problems with family, work, productivity, withdrawal, finances and sense of self. Internal consistency (Cronbach’s alpha) was 0.80. Alpha-if-item-deleted statistics revealed that dropping items would not improve internal consistency. Total scores averaged 3.34 ( $SD = 5.24$ ). When the withdrawal item was removed for analyses linking withdrawal to problems via morning use, the mean dropped to 3.0 ( $SD = 4.77$ ).

### Withdrawal

One item from the Cannabis-Associated problems scale asked: Has your cannabis use caused you withdrawal symptoms? Participants rated it from 0 (not at all) to 5 (a great deal). A single-item assessment of withdrawal is likely inferior to cannabis withdrawal scales with multiple items, but previous work suggests that single items can prove reliable and valid (Dollinger & Malmquist 2009). We thought the single item could prove suggestive in an exploratory analysis of the role of withdrawal in the link between morning use of cannabis and problems. The mean for the withdrawal item was 0.34 ( $SD = 0.86$ ).

## Results

We conducted all analyses with SPSS 23, Armonk, NY (IBM Copr 2014). Significant skews appeared for key variables, necessitating transformations to satisfy the assumptions of

**Table 1.** Cannabis use and problems in morning users and non-morning users.

	Morning users	Non-morning users	t(df)
Grams	1.74 (1.33)	0.85 (0.98)	6.60 (131.36)*
Problems	3.60 (5.49)	2.46 (4.18)	2.82 (331.00)*
Withdrawal	0.38 (0.91)	0.20 (0.67)	2.24 (157.84)*
Remaining problems	3.22 (5.02)	2.26 (3.75)	2.61 (329.00)*

\* $p < 0.05$ .

df, adjusted for significantly different variances based on Levene's test; grams, grams used per occasion; problems, Cannabis-associated Problems Questionnaire Score; withdrawal, withdrawal item from Cannabis-associated Problems Questionnaire; remaining problems, Cannabis-associated Problems Questionnaire Score minus Withdrawal item.

parametric statistics (Osborne 2010). Skews and optimal transformed skews included: problems (initial skew = 3.03; Box-Cox-transformed skew = 0.03) and grams consumed per occasion (Skew = 0.92; Box-Cox transformed skew = 0.02). (The SE of the skew for a sample of this size is 0.13). We performed parametric tests on these transformed variables but report means and SDs of the untransformed variables in an effort to make interpretation easier. (The patterns of significance were identical in analyses with the untransformed variables despite the violations of assumptions.) We first examined group differences associated with morning use, then employed multiple regression with simultaneous predictors and covariates to test if using cannabis in the morning might account for unique variance in problems relative to other established predictors.

For the exploratory analyses focused on withdrawal as a potential mechanism for morning use leading to problems, we compared groups on the withdrawal item as well as the sum of all the problems but withdrawal. Skews were large for these variables as well, but they improved with transformations. Problems without withdrawal had a skew of 3.01 but a Box-Cox transformation dropped it to  $-0.02$ . Withdrawal's initial skew was 3.16 but a Box-Cox transformation dropped the skew to 1.67.

### Group differences related to morning use

Despite established gender differences in use (Hasin et al. 2015; Rotermann & Langlois 2015), those who used cannabis daily in the morning did not include a significantly higher proportion of men (67% versus 78%,  $Z = 1.72$ ,  $p > 0.05$ ) in this sample. As Table 1 reveals, morning users consumed more grams of cannabis per occasion, experienced more problems, reported more withdrawal and gave a higher rating of problems other than withdrawal.

### Predicting problems from morning use

Given the elevated cannabis involvement among those who used daily in the morning, we examined whether morning use accounted for unique variance in problems once quantity was controlled. If morning use simply served as a proxy for frequent use in large amounts, it would not seem worthy of assessing. Age and gender also served as covariates given their established links to cannabis-related problems (Moss et al. 2014). A multiple regression with simultaneous entry of age, gender, grams consumed per occasion and morning use revealed that both gender and morning use accounted for

**Table 2.** Predicting problems from age, gender, grams per occasion and morning use.

Variable	B	SE B	$\beta$	t	Sig.
Age	<0.01	<0.01	-0.04	-0.69	0.49
Gender	0.19	0.07	0.16	2.84	<0.01*
Grams	-0.12	0.09	-0.08	-1.30	0.19
Morning Use	0.25	0.08	0.18	3.14	<0.01*

$F(4,490) = 2.75$ ,

\* $p < 0.05$ .

unique variance in problems (Table 2). These results support the hypothesis that, among daily users, consuming cannabis in the morning increases problems even when age, gender and quantity of consumption are taken into account.

### Withdrawal-mediated links between morning use and remaining problems

We used Hayes (2013) PROCESS program to examine indirect effects of morning use on problems via withdrawal with bias-corrected 95% confidence intervals using bootstrapping with 10,000 resamples. Age and gender served as covariates. We tested the true indirect effect for the mediation models using bootstrapped estimates of the product of the paths from morning use to withdrawal and from withdrawal to remaining problems. Gender proved a significant covariate [ $t(326) = 2.63$ ,  $p < 0.05$ ] and the main effects were significant for morning use [ $t(326) = 2.41$ ,  $p < 0.05$ ] and withdrawal [ $t(326) = 7.95$ ,  $p < 0.05$ ]. Nevertheless, the normal theory test for the indirect effect was not significant ( $Z = 1.41$ ,  $p > 0.05$ ).

### Discussion

In light of established links between morning use (the "eye-opener") of alcohol and ethanol dependence or problems (Sokol et al. 1989; Beresford et al. 1990; Cherpitel 1999), we examined morning use of cannabis ("wake and bake") as a potential correlate of cannabis-related troubles. Predictors of cannabis problems might be particularly important as prohibitions change worldwide. Morning use would lend itself to straightforward harm reduction strategies as well. Researchers and clinicians often interpret morning use of intoxicants as a sign of the need to relieve withdrawal, so we also examined a single-item withdrawal question as a potential mediator of the link between morning use and cannabis-related problems. Alternatively, subjective or cognitive effects of drugs experienced earlier in the day might alter mood or judgment in ways that make negative consequences more likely. The idea of use in the morning has become part of the cannabis subculture's argot (e.g. "wake and bake"), and experienced users discourage the practice (Lau et al. 2015), but its links to negative consequences have received little attention in published empirical work. The current data attempt to address this gap in the literature.

Cannabis users completed an internet survey assessing morning use, frequency and quantity of use and a measure of problems that included a withdrawal item. Over 200 participants who reported using cannabis daily before noon also consumed the substance in larger average quantities, more frequently, and with more problems than a sample of 76 comparable daily users who never used before noon.



Regression analysis revealed that morning use accounted for unique variance in problems even when quantity of consumption, age and gender were controlled, suggesting that the habit of morning use might create troubles over and above those associated with heavy use alone. Despite withdrawal's ability to account for significant variance in the remaining problems, the indirect effect of morning use via withdrawal did not reach statistical significance. We discuss the implications of these results below, but first offer some cautions given limitations of the data.

Limitations of these data generally arise from aspects of sampling and procedure. Using the internet to gather data has pros and cons. Internet access necessitates basic computer skills and financial resources that might prevent participants in low socioeconomic or educational status from participating. Those who are particularly impaired by hard drugs or alcohol might not be able to contribute data via the internet. Thus, these results might not apply to all cannabis users. Nevertheless, it seems unlikely that having fewer educational or financial resources would somehow buffer morning users from negative consequences. In addition, the internet might provide a greater diversity of responses than face-to-face interviews in the field or laboratory. Participants tend to believe that the internet provides greater anonymity than alternative procedures (Reips 2002; Rhodes et al. 2003). One experiment revealed that respondents tend to report more drug use on an internet survey than on a comparable paper-and-pencil survey (Wang et al. 2005). Those who are particularly involved with cannabis or experiencing negative consequences may be too suspicious or inconvenienced to travel to a laboratory; they might also minimize negative consequences if they have to mention them to an interviewer. Perhaps this approach allowed participants in the current study to report candidly on their morning use, regular consumption and cannabis-related problems. In an effort to identify participants who were likely to use in the morning, we focused on those involved in cannabis law reform. These participants might be motivated to minimize their problems in an effort to make it look harmless, possibly leading to an under-reporting of troubles. Alternatively, an astute and anonymous reviewer of a previous draft of this paper emphasized that this sample was likely content with their cannabis use and probably uninterested in treatment, potentially making their reports of problems more credible (even despite their devotion to legal reform). In a sense, any links between morning use and problems might be particularly important in a sample like this one. Comparing samples like these to samples drawn from users in treatment or the general public might reveal a different link between morning use and problems. The current data suggest that efforts along these lines could prove useful.

Despite these limitations, these findings support the idea that those who use cannabis regularly in the morning experience more problems. In the current sample, the habit of using in the morning accounted for significant variance in problems over and above that accounted for by other established predictors of problems, particularly quantity of use. Morning use might be a correlate rather than a cause of these negative consequences. Some facet of temperament, comorbid psychiatric problems or skills deficits might account for the variance

between morning use and the development of problems. A more elaborate measure of withdrawal with multiple items might be necessary to detect this potential mechanism underlying the relation between morning use and problems. The limited reliability of a single-item index, as well as the relatively small group of daily users who did not consume cannabis in the morning, likely left this mediational analysis underpowered. A multiple-item withdrawal scale and a larger sample would provide a better test of the idea that relief from withdrawal motivates the morning use that covaries with problems. In addition, other correlates of morning use like subjective sedation or deviant cognitive experiences might serve as the mechanism. Establishing the causal role of morning use on problems would require manipulating morning use randomly.

Given the established effects of acute intoxication on cognitive functions (Ehrler et al. 2015), the idea that morning use contributes to problems has considerable intuitive appeal. Straightforward implications of these results underscore the need for cannabis users to avoid consumption before noon. The most obvious strategy for eliminating cannabis problems arguably might involve total abstinence (Hoch et al. 2014). Nevertheless, consistent attempts to avoid the substance until late in the day might engage problem users who are uninterested in abstinence. Those who experience continued problems despite an absence of morning use might reassess the need for abstinence as a treatment goal (Denning & Little 2011). Further work on morning use of cannabis and its links to cannabis-related problems appears warranted.

## Disclosure statement

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of this article.

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