



Retrospective Recall of Marijuana Use Patterns Following the COVID-19 Outbreak Vary as a Function of User Type Among Adolescents in Washington State

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ABSTRACT

Marijuana use in middle and late adolescence is a significant public health concern given that an earlier age of onset is prospectively associated with numerous marijuana misuse outcomes. The outbreak of COVID-19 resulted in stay-at-home orders and social distancing guidelines across the United States yet the impact of these orders on adolescent marijuana use is unknown in the U.S. The aims of this study were to examine adolescents' recall of changes in marijuana use patterns following the COVID-19 outbreak as a function of one's typical levels of use, and to qualitatively assess reasons for perceived change. A screening survey for a larger study was completed by 156 adolescents (ages 15-18, 78% male) after the stay-at-home order was put in place in Washington state in March 2020. The cross-sectional survey included self-reported demographic information, marijuana use, and retrospective recall of changes to marijuana use following the state's stay-at-home order. Initial findings did not reveal any pattern of change that described the entire sample, however adolescents' recall of changes in use significantly varied as a function of typical use such that moderate/heavy users had higher odds of reporting maintained (5.04 times higher) or increased use (3.07 times higher) compared to irregular/light marijuana users. Primary reasons for decreasing use included decreased availability and socialization. Primary reasons for increasing use included more free time and coping with stress and anxiety. The findings suggest that pandemic-related changes in marijuana use are not consistent across adolescents and that moderate and heavy users may be at increased risk of marijuana misuse under pandemic conditions.

Key words: marijuana; cannabis; adolescents; COVID-19; pandemic

Adolescence is an important developmental period with regard to marijuana use. Many individuals initiate and escalate use during adolescence, in particular, middle and late adolescence which encompasses youth in high school and early college, and early age of onset is associated with negative outcomes (Ellickson et al., 2004; Griffin et al., 2010; Gruber et al., 2014; Schuster et al., 2016). Further, adolescent marijuana use is a timely public health concern in the U.S. More states continue to legalize

recreational and medical marijuana use, while adolescents' perceptions of marijuana's harms are at their lowest in the history of the Monitoring the Future Study (Johnston et al., 2020). Marijuana use may have recently been impacted by the stay-at-home orders and social distancing guidelines during the outbreak of COVID-19. When the pandemic began, many late adolescents were ordered to stop in-person attendance in high schools and colleges, and adapted to remote learning. In Washington state, an official stay-at-

home order was issued on March 23rd, 2020, mandating all residents to stay at home unless pursuing essential, socially-distant activities. These restrictions resulted in societal changes that could alter adolescents' marijuana use, including changes to marijuana availability, parental/guardian supervision, amount of free time, and stress.

Despite these possible changes, little is known about the impacts of the COVID-19 pandemic on late adolescent marijuana use in the U.S. In one known study on this topic, Dumas et al. (2020) surveyed Canadian high school students in April 2020 about their recent and pre-pandemic substance use. They found prevalence of marijuana use decreased from 17.0% pre-COVID-19 to 13.8% during COVID-19, but frequency of marijuana use increased from 0.94 days pre-COVID-19 to 1.10 days during COVID-19. Recent research in adults also indicates broad pandemic-related changes in marijuana use. In a national survey among Canadian adults following the COVID-19 outbreak, marijuana consumption increased in 6% of adults and decreased in 4% of adults (Canadian Centre on Substance Use and Addiction [CCSA], 2020). Common reasons for increased use included lack of a regular schedule, stress, and boredom, whereas the most common reason for decreased use was not being a typical marijuana user (CCSA, 2020). For those who were previously marijuana users, in a study of Israeli and Russian social work students, about half increased their marijuana consumption during COVID-19 (Yehudai et al., 2020). Similarly, among adults in Poland who use recreational drugs, 21% reported increased use in April 2020, whereas 18% decreased use (Chodkiewicz et al., 2020). Such research among adults has most often highlighted mental health challenges during the pandemic and framed changes in substance use as an attempt to cope with distress.

The variability observed in substance use changes suggests different reasons for change may be relevant for different individuals. For example, fewer financial resources and reduced accessibility of substances may lead to decreased use for some individuals (Rehm et al., 2020), whereas others may increase their use of substances to cope with stressors related to COVID-19, as has been observed in some adults (CCSA, 2020; Rodriguez et al., 2020; McPhee et al., 2020). Increased use of substances to cope may

be particularly likely for at-risk individuals with a history of chronic or regular use whose neurobiological pathways may have adapted to respond to stressors with cravings (Clay & Parker, 2020). Although there is much concern about managing potential increases in use among clinical populations of patients with substance use disorders (e.g., Columb et al., 2020; Kim et al., 2020), this emerging literature focuses primarily on alcohol use in adults, and it remains unclear how changes in substance use patterns might differ as a function of typical use.

The overarching aim of the current study was to examine late adolescents' retrospective recall of changes to their marijuana use patterns in the months immediately following the COVID-19 stay-at-home orders in Washington state. We further sought to examine whether perceived changes in marijuana use were different for adolescents who considered themselves to be irregular, light, moderate, or heavy users. Finally, to understand reasons why use changed and move beyond standard response options (CCSA, 2020), we examined open-ended responses of adolescents' primary reasons for increasing or decreasing marijuana use during this time.

METHODS

Participants

Participants were middle to late adolescents ages 15-18 recruited from the greater Seattle area who completed a screening survey for a larger study examining the associations between marijuana use and identity among adolescents. The larger study focused on this developmental period because marijuana use is already prevalent at this age (Johnston et al., 2020), thereby producing sufficient variability in identification as a marijuana user. The survey included items assessing demographics and marijuana use. Items assessing participants' recall of how the pandemic impacted their marijuana use were added on April 2nd, 2020. The University's Institutional Review Board approved the study and a federal Certificate of Confidentiality was obtained. All participants provided consent/assent to complete the screening survey. A waiver of parental consent was obtained due to the study being deemed as carrying minimal risk.

Procedures

Recruitment for the larger study was primarily conducted via advertisements requesting paid online research participation that were promoted on Instagram to reach local adolescents (ages 15-18). The larger study aimed to recruit a representative sample of adolescents in the greater Seattle area with a nearly equal number of males and females. However, at the time when COVID-19 items were added to the survey, more females had previously enrolled, and several recruitment ads were promoted for males only. No other promotion criteria aside from age, gender, and proximity to Seattle were selected that would bias the sample characteristics. Interested individuals completed a brief online survey to determine study eligibility, which included assessments of marijuana use in the previous three months and items to assess how the COVID-19 outbreak affected their use. In the larger study, 545 individuals completed screening. However, screening data described here were completed between April 2nd and May 18th, 2020 (N=156). The mean age of this subset of participants was 17.0 years (SD=1.1) and the majority (78%) were male. Among participants, 76.3% identified their race as White/Caucasian, 22.4% Asian/Asian-American, 4.5% African American, 3.8% Native Hawaiian/Pacific Islander, and 5.1% "Other," with 11.5% identifying their ethnicity as Hispanic/Latinx.

Measures

Typical marijuana use. Participants were asked to describe their typical marijuana use prior to the pandemic by indicating if they had never used marijuana or were a light, moderate, heavy or irregular user (have previously used marijuana but haven't used recently). For descriptive purposes and to examine accuracy of participants' user type self-categorization, the Marijuana Daily Questionnaire (Lee et al., 2013) was used to assess the number of marijuana use days in a typical week in the past three months.

COVID-19 impact on use. Participants were asked to respond to how COVID-19 has impacted their marijuana use (i.e., "How has the novel coronavirus (COVID-19) impacted how much marijuana you've recently used?"). Response

options were: "I have never used marijuana", "I used similar amounts of marijuana as I typically do (no change)", "I used more marijuana", "I used less marijuana", or "I stopped using marijuana."

Reasons for change. Participants were then asked to explain any perceived changes to their marijuana use patterns as a result of COVID-19 via an open-ended question (i.e., "Please explain why your marijuana use has changed.").

RESULTS

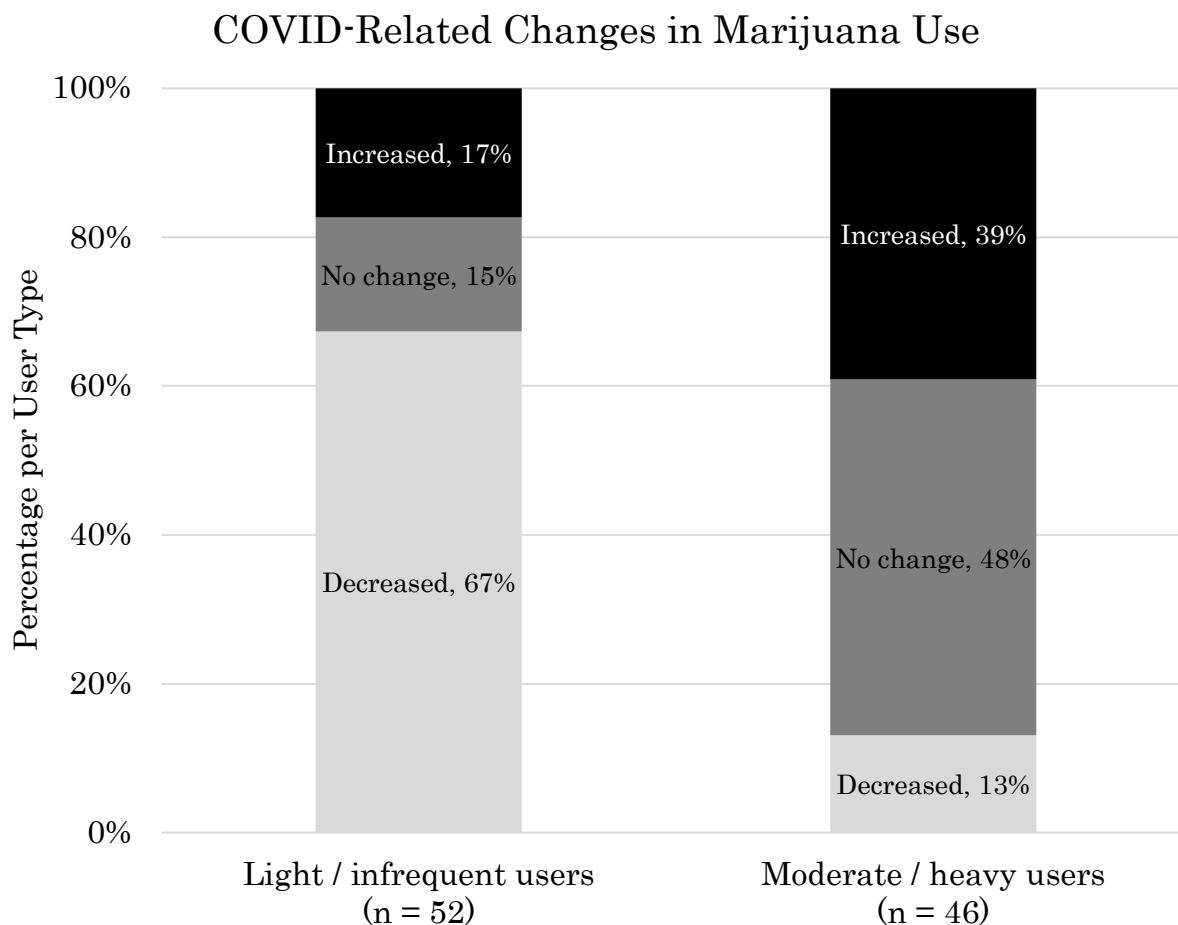
Descriptive Statistics

In the sample, 58 participants described themselves as never having used marijuana in their lifetime. Among those who had used in their lifetime, 36 described themselves as irregular users, 19 as light users, 27 as moderate users, and 19 as heavy users. Due to the relatively small sample size, irregular and light users were combined into one group ($n=55$), and moderate and heavy users were combined into another group ($n=46$) for analyses. Independent t -tests revealed that participants' self-categorization of user status aligned with reported use; moderate/heavy users reported using significantly more use days ($M=6.11$, $SD=1.69$) in a typical week in the past three months compared to irregular/light users ($M=1.09$, $SD=1.31$; $t[99]=16.81$, $p<.001$)

COVID-19 Patterns of Marijuana Use

None of the 58 participants that described themselves as never having used marijuana in their lifetime reported marijuana use after the COVID-19 outbreak. Of the 98 participants who reported any lifetime use of marijuana, 41 reported stopping or decreasing their use, 30 reported using similar amounts as before, and 27 reported increased use following the COVID-19 outbreak. Figure 1 shows perceived changes in use as a percentage of user type. Among those who used marijuana, a chi-square test of independence revealed that perceived changes in use significantly varied as a function of typical use, $\chi^2(2, N=98)=29.79$, $p<.001$. The odds of irregular/light marijuana users stopping or decreasing their use was 13.73 times higher than

Figure 1. *Percentage of participants that perceived changes in their marijuana use following the COVID-19 outbreak as a function of user type. User type was separated by light/infrequent users and moderate/heavy users.*



moderate/heavy users. Moderate/heavy users had 5.04 times higher odds of maintaining their current use and 3.07 times higher odds of increasing their use compared to irregular/light users following the COVID-19 outbreak.

Reasons for Perceived Changes in Marijuana Use

Open-ended responses regarding reasons for perceived change in use were independently coded by two coders with discrepancies resolved through discussion. Because responses were open-ended, some responses were coded as having multiple reasons for a change. Table 1 lists the coded reasons for changing use endorsed by at least two participants and frequencies of endorsement separated by user type. Among those who recalled increases in use, the primary reason for this

change was increased free time and/or decreased responsibilities (70.4% of those who increased use). Other reasons for increasing use reported by two or more participants included confinement/boredom (18.5%), coping with negative affect (14.8%), and increased ease of marijuana access (14.8%). Among those who recalled decreases in or stopping use, the primary reason for this change was reduced or no marijuana access (61.4% of those who decreased use). The second-most endorsed reason for decreasing use was reduced social interactions (25.0%). Other reasons for decreasing use recalled by two or more participants included a lack of urge/interest (9.1%), increased parental/family supervision (6.8%), personal choice (4.5%), and inability to afford marijuana (4.5%).

Table 1. *Reasons Provided for Perceived Changes in Marijuana Use During Pandemic*

Reasons for decreasing use	Example quote	Endorsement by user type
Reduced or no access	“No access with COVID-19 quarantine in Washington state.”	Light/irregular, <i>n</i> = 25 Heavy/moderate, <i>n</i> = 2
Reduced socialization	“I’m home all the time and since I’m a social smoker there’s not many situations to smoke.”	Light/irregular, <i>n</i> = 10 Heavy/moderate, <i>n</i> = 1
Lack of urge or interest	“I don’t have the urge to use it.”	Light/irregular, <i>n</i> = 4 Heavy/moderate, <i>n</i> = 0
Increased parental or family supervision	“As a family, it’s harder to hide your drug use when everybody is crammed into one household all the time.”	Light/irregular, <i>n</i> = 3 Heavy/moderate, <i>n</i> = 0
Making personal choice (for health or safety)	“I felt like it was becoming an unhealthy habit and wanted to better myself by stopping early.”	Light/irregular, <i>n</i> = 1 Heavy/moderate, <i>n</i> = 1
Inability to afford marijuana	“No money.”	Light/irregular, <i>n</i> = 0 Heavy/moderate, <i>n</i> = 2
Reasons for increasing use	Example quote	Endorsement by user type
Increased free time/fewer responsibilities	“With less going on, I have become more apt to use marijuana with increased amount of free time I have been given.”	Light/irregular, <i>n</i> = 7 Heavy/moderate, <i>n</i> = 12
Confinement/boredom	“Boredom gets brutal.”	Light/irregular, <i>n</i> = 2 Heavy/moderate, <i>n</i> = 3
Coping with negative affect	“I don’t have anything else to do to cope with anxiety.”	Light/irregular, <i>n</i> = 1 Heavy/moderate, <i>n</i> = 3
Increased ease of access	“Gained very easy access because my friend’s brother had to come home from college.”	Light/irregular, <i>n</i> = 0 Heavy/moderate, <i>n</i> = 4

Note. Reasons given by two or more participants are included here.

DISCUSSION

The current study found no single pattern of perceived changes in marijuana use following the COVID-19 outbreak that represented our full sample of adolescents. Among adolescents who had ever used marijuana, at the time assessment post-outbreak of the pandemic, most retrospectively recalled having decreased or stopped their use, aligning with another recent finding reporting a decrease in the percentage of Canadian adolescents who used marijuana following the pandemic (Dumas et al., 2020). However, when examining retrospective recall of changes in marijuana use by user type, clear differences emerged with irregular/light users reporting higher odds of decreasing their use relative to moderate/heavy users. Conversely, moderate/heavy users reported stronger relative odds of maintaining or increasing their levels of use following the COVID-19 outbreak. Primary reasons for marijuana use patterns emerged in open-ended responses, with most participants citing more free time/fewer responsibilities and decreased availability as reasons for increasing and decreasing use, respectively. These open-ended responses mirror recent findings describing reasons for changes in Canadian adults' marijuana use during the pandemic (CCSA, 2020). Other reasons for increasing use included increased boredom, availability, and negative affect. Additional reasons for decreasing use included decreased socialization, increased parental supervision, and a lack of interest or urge to use.

The findings demonstrate the importance of user type when examining marijuana use patterns during the COVID-19 outbreak. Specifically, adolescents who consider themselves to be moderate/heavy users may be at increased risk for elevated marijuana use and may experience accompanying marijuana-related consequences. Although irregular/light users were likely to report decreased use and access to marijuana, moderate/heavy users may have more reliable access to marijuana that was less affected by stay-at-home orders. Assuming fewer barriers to access, the increased free time resulting from stay-at-home orders contributed to increased marijuana use according to many moderate/heavy users. Another prominent reason for decreased use was a lack of socialization, and irregular/light

users have been previously shown to be more likely to use in social settings compared to daily users (Phillips et al., 2018). Indeed, most Canadian adolescent users recently reported solitary marijuana use post-pandemic (Dumas et al., 2020). Therefore, those most likely to decrease use may be those who typically (or solely) use in social contexts. Although we did not assess marijuana use motives, future research might examine marijuana use changes as a function of motives.

Current findings have important implications for intervention and prevention strategies targeting adolescent marijuana misuse. First, the conditions created during stay-at-home orders may represent a high-risk time for marijuana misuse among those already at most risk (i.e., moderate/heavy users). Given that the most frequently endorsed reason for increased use was a decrease in responsibilities, preventative strategies may include providing adolescents with substance-free, socially-distant activities. Regarding decreased use, the most frequently endorsed reason was reduced access to marijuana. This highlights the importance of marijuana availability and access among adolescents, who are below the legal age to purchase marijuana and rely on illegal means of access. Understanding how adolescents access marijuana may inform preventative strategies to reduce access among this age range. Finally, although less frequently endorsed, some participants also reported increases in marijuana use due to increased negative affect. Providing adolescents with healthy ways to cope with negative affect and ensuring safe access to mental healthcare (e.g., telehealth) may also be important.

There are several important study limitations to highlight. First, our screening survey did not distinguish between medical and recreational use, which has implications for access. However, only a small minority (4.2%) of those enrolled in the larger study reported medical access, suggesting legal access to medical marijuana was rare in the current sample. Second, the current study involved a cross-sectional design, precluding direct observation of changes in use. Third, despite instructions to consider pre-pandemic use, it is still possible that pandemic-related changes in marijuana use may have contributed to one's identification as an irregular/light user or moderate/heavy user. Further, the categorization

of user type was self-reported and open to participant interpretation. However self-categorized groups significantly differed by self-reported typical marijuana use lending some credence to participants' ability to self-categorize themselves into meaningfully different groups. Fourth, although all participants in the study were under 21, the impact of state-wide legal access to recreational marijuana for adults (aged 21+) on norms in adolescents is unclear and whether results generalize to other states is unknown. Further limiting generalizability, the current sample was predominantly male and White with only Asians and Asian-Americans being well-represented among racial minority groups. Finally, data were collected between April 2nd and May 18th, 2020 and therefore represent what might be immediate impacts of the stay-at-home orders. Follow-up research may clarify whether any perceived changes in use persist for longer durations.

Overall, using participants' recall of what their use was like prior to the pandemic, findings show a stark difference in changes in marijuana use between irregular/light users and moderate/heavy users following the COVID-19 outbreak. Moderate/heavy users were more likely to recall increases rather than decreases in marijuana use during this time, which is a significant public health concern. Thus, there is a timely and pressing need for preventative interventions. Drawing on adolescents' own reasons for increasing use, preventative strategies may include engaging adolescents in substance-free activities to reduce boredom and building strategies to cope with pandemic-related stressors to mitigate escalations in marijuana use.

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Funding and Acknowledgements: This research was supported by the Alcohol and Drug Abuse Institute at the University of Washington and by NIDA R21DA045092 (PI: Ramirez). The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health. The authors declare no competing interests.

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