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Cannabis use during the COVID-19 pandemic: results from a longitudinal study of Cannabis users

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ABSTRACT

Background: The coronavirus (COVID-19) pandemic has shifted life in the United States. It is reasonable to expect the challenges of cannabis use in the U.S. are amplified given the vast shutdowns and economic insecurity. The purpose of the research is to examine changes in adult cannabis use during COVID-19.

Methods: This one-group, longitudinal, cohort study reports results from an online survey and six-month follow-up. Both surveys examined cannabis use and additional questions regarding COVID-19 were added to the follow-up. Quantitative analysis (e.g., ANOVA) was conducted on the questionnaire and thematic analysis was performed on a text question.

Results: A majority of the sample (65.7%) reported no significant change in cannabis use as a result of COVID-19. A one-way ANOVA of CUDIT-R scores showed statistical significance ($p < .01$) between age groups. Contrary to the quantitative analysis, thematic analysis revealed many changes in cannabis use as a response to COVID-19.

Conclusions:. Self-efficacy can be seen through the empowered behaviors to change cannabis products but those with an increase in CUDIT-R scores may need targeted assessments and education to promote healthier cannabis use. Additionally, this study calls for a larger examination of changes in cannabis use by age and working conditions.

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Cannabis; marijuana; pandemic; coronavirus

In March of 2020, the United States began efforts to contain a rapidly spreading SARS-CoV-2 outbreak (known as COVID-19), which included the enactment of a crisis response team, increased active and antibody virus testing, and encouragement for the federal and state governments to begin efforts to shut down their states to allow citizens to quarantine in their homes through the use of "stay-at-home" orders. With extreme business closures and 17 million new unemployment claims between March and April 2020, the U.S. government passed a 2 USD trillion stimulus package which included a one-time payment for each adult and relief for small businesses which was quickly exhausted (Bartik et al., 2020; Bayer et al., 2020). In the face of a global pandemic, cannabis sales in some states saw a rise with Colorado bringing in over 300 USD million during March and April and Illinois breaking sales records in May and June (Colorado Department of Revenue, 2020; Illinois Department of Financial and Professional Regulation, 2020; State of Illinois, 2020).

Motivations for using cannabis range from enjoyment, relaxation, medicinal properties, and coping with negative emotions. Use associated with relief from psychological distress is most commonly associated with heavier use that may be problematic at subclinical or clinical levels (Lee et al., 2007; Moitra et al., 2015). Social cognitive theory may help to explain some of the motivation behind an individual and their marijuana usage, suggesting that individuals make choices based on three primary factors – internal factors, external factors, and behavioral factors (Bandura, 2001). Outcome expectancies can be applied to various relationships, including between an individual and substances such as marijuana. An individual's consumption rate, dependence levels, and treatment methods are impacted by their expectations regarding a substance (Gullo et al., 2017). Self-efficacy is necessary for an individual to be able to adapt to their society as well as for an individual to explore their usage with substances including marijuana (Bandura, 1999). Additionally, self-efficacy is necessary within an individual for them to interact with their external factors, further developing their cognitive factors and attitudes toward behavioral intent and ultimately behaviors.

Some research has shown important differences in cannabis use by age. In particular, Mauro et al. (2018) showed that, between 2002 and 2014, adults aged 26 to 34 years had a greater increase in cannabis use (daily and non-daily) prevalence than all other age groups. As such, there is need to update cannabis use trends by age group and explore potential reasons for changes in use.

Purpose of study

Current literature has provided initial insights into the psychological and behavioral impacts of the COVID-19 pandemic on the general population. This study aims to further the literature by examining the effects felt by a sample of cannabis users. Quantitative methods were used to understand the relationship between cannabis use and life changes, beliefs, and sociodemographic characteristics. A thematic analysis of a text question provides further insight into changes and the areas most

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affected by respondents. In this study, we attempt to answer the following questions:

Q1: What impact has the coronavirus pandemic had on cannabis use among recent cannabis users?

Q2: What is the relationship between CUDIT-R scores and the level of impact on cannabis use?

Q3: What is the relationship between CUDIT-R scores and perception of infection risk from coronavirus?

Q4: Is there a relationship between CUDIT-R scores and worry about the impact of coronavirus in one's life?

Q5: Is there a difference in follow-up CUDIT-R scores based on sociodemographic characteristics?

Q6: Were there any group differences in CUDIT-R scores between baseline and follow-up?

Methods

Sampling design

We obtained a convenience sample of cannabis users by recruiting individuals through Facebook and Reddit during the month prior to recreational cannabis legalization in Illinois. One author used his personal Facebook account to create a shareable post with the survey link, which was in turn shared by his own network. Additionally, we used five cannabis-specific subreddits for recruitment after receiving permission from the moderators. Respondents were emailed in June 2020 for a follow-up survey for which they had 30 days to complete. Inclusion criteria included (a) residence in the United States and (b) being 18 years of age or older.

Materials

CUDIT-R

We used the Cannabis Use Disorder Identification Test-Revised (CUDIT-R) to screen for clinical levels of Cannabis Use Disorder (CUD) among respondents. This brief, 8-question scale is validated in four categories of consumption and is able to identify likely cases and severity of CUD, even among subpopulations. Questions are answered on a Likert scale and scored from 0 to 4. An example question from the CUDIT-R is thus: "How often during the past 6 months did you find that you were not able to stop using cannabis once you had started?" The internal consistency of the CUDIT-R is α = .91 and the single sum score has a one-factor solution which accounts for 63.6% of the variance. Although originally validated under the DSM-IV, it has been shown to identify likely cases and severity along the current DSM-V criteria (Adamson et al., 2010; Loflin et al., 2018).

Coronavirus impacts

The first scheduled follow-up in this study occurred during June 2020. Given the COVID-19 pandemic, five additional questions were added to the original follow-up survey to understand specific impacts of the pandemic on cannabis use. The questions asked of respondents in this study are provided in *Appendix A*. A Likert-type question was used to quantify the impact of coronavirus on cannabis use, which was followed by an open-ended question allowing participants to provide more details about this impact. Two questions about risk perception and one question about risk reduction behaviors were also included in this follow-up (Center for Economic and Social Research, 2020).

Data analysis

Data management and analysis occurred in two phases: a quantitative phase and then a qualitative phase. Statistical analyses were performed using IBM SPSS Statistics v.27. In the first phase, many of our questions were answered through descriptive analyses and mean comparisons (e.g., one-way ANOVA). In order to answer the specific research questions of this study, we only included those who indicated past 6-month cannabis use for analysis (N = 67). Three age groups (Group 1: 29 years or less; Group 2: 30 to 45 years; Group 3: 46 years and above) were created according to grouping in Hasin et al. (2016) to allow for testing procedures and exploratory data analysis.

Qualitative analysis was conducted manually using an inductive thematic approach, as outlined by Braun and Clarke (2006) to identify the major impacts experienced by respondents. This approach provides the opportunity to develop new research questions and gain insight into the current experiences of cannabis users.

Results

Sample characteristics

A total of 67 respondents indicated 6-month cannabis use and were considered for analysis. Among this sample, there were 31 (46.3%) women, 32 (47.8%) men, three respondents who identified as non-binary/other gender (4.1%), and one missing answer. Educational attainment varied among the sample with most respondents (52.3%) reporting a bachelors or graduate degree. Ages ranged from 18 to 65 years with a mean of 35.11 (*SD* = 11.315). A majority (73.1%) of the sample had a household income below 74,999, USD with 37.3% (n = 25) of the total sample earning 24,999 USD or below. Forty-one (61.2%) participants were employed full-time or part-time and 11 (16.4%) were unemployed. The rest of participants were students, unable to work/retired/disabled, or did not respond.

Most respondents (76.2%) used cannabis at least once a day and the average age of onset for cannabis use was 19.70 years (SD = 7.425). Most of the sample spent up to 4 hours intoxicated on a typical day of use 53 (79%) reported using one to 5 g weekly. Baseline CUDIT-R scores ranged from 0 to 20 (*M* = 9.87, SD = 4.299) and follow-up CUDIT-R scores ranged from 1 to 25 (*M* = 9.94, SD = 5.114). Changes in CUDIT-R scores from baseline ranged from −8 to 13 with an average increase of .07 (SD = 4.453).

A majority (65.7%) reported little to no impact on cannabis use due to COVID-19. Worry about the impact of coronavirus was high among the sample with 74.7% reporting at least some

worry. Belief about being infected produced no majority consensus leaning toward likely or unlikely. Handwashing and social distancing were the prevention strategies used by most of the sample (94% each). Face masks were worn by 91% of the sample and most reported canceled appointments (65.7%). Only thee respondents indicated they were taking no additional strategies for coronavirus prevention.

Group differences

A one-way between-groups analysis of variance was conducted to explore the differences in follow-up CUDIT-R scores. Participants were divided into three groups according to their age (Group 1: 29 yrs or less; Group 2: 30 to 45; Group 3: 46 and above). There was a statistically significant difference at the $p < .05$ level in CUDIT-R scores for the three age groups: F (2, 62) = 4.685, $p < .01$, as shown in Table 1. The actual difference in mean scores between the groups was also practically significant. The effect size, calculated using eta squared, was .13. Post-hoc comparisons using the Tukey HSD test indicated that the mean score for Group 2 (M = 11.58, SD = 5.68) was significantly different from that of Group 3 (M = 6.58, SD = 3.68). Group 1 (M = 9.41, SD = 4.20) did not differ significantly from either Group 2 or Group 3.

Group differences in CUDIT-R change scores were analyzed using a one-way between-group analysis of variance. Participants were put into age groups and we detected a statistically significant difference in CUDIT-R scores for the three age groups: F (2, 62) = 5.648, $p < .01$, as shown in Table 2. The actual difference in mean scores between the groups was practically significant with the effect size, calculated using eta squared, being .15. Post-hoc comparisons using the Tukey HSD test indicated that the mean score for Group 2 (M = 1.74, SD = 4.351) was significantly different from that of Group 3 (M = −2.92, SD = 3.502). Group 1 (M = −.27, SD = 4.188) did not differ significantly from either Group 2 or Group 3.

No significant difference was found in CUDIT-R scores or difference scores when factored by coronavirus impact on cannabis use or other sociodemographic factors. Additionally, worry about coronavirus impact or belief of infection did not produce significant results when the relationship between these variables and CUDIT-R scores was explored.

Table 1. One-way ANOVA table investigating differences in follow-up CUDIT-R scores by age group.

	df	SS	MS	F	p
Between groups	2	224.432	112.416	4.685	.013*
Within Groups	62	1487.783	23.997		
Total	64	1712.615			

*$p < .05$

Table 2. One-way ANOVA table for differences in CUDIT-R change scores by age group.

	df	SS	MS	F	p
Between groups	2	195.184	97.592	5.648	.006**
Within Groups	62	1071.216	17.278		
Total	64	1266.400			

**$p < .01$

Thematic analysis

Despite most respondents indicating little to no impact on cannabis use as a result of COVID-19, 60 people (89.6%) answered the open-ended question "How has your cannabis use changed as a result of coronavirus?" A thematic analysis revealed the recurrence of key issues, such as: changes in cannabis quantity, alteration of habits, challenges and successes in purchasing, and motivations behind changes. We identified two major themes: "Changes in use" and "Impacts on purchasing." A minor theme, "Reasons for behavior" was identified but this theme is best understood by informing the major themes.

Changes in use

Changes in use is comprised of fluctuations in consumption quantities, routines, and routes of administration (ROA). Increases in quantity and the number of cannabis using days were often mentioned as was starting earlier in the day due to work from home policies. *"Since working from home, I use more cannabis than when I was going to my workplace*" (11). For others, increasing their quantity or frequency of use provided relief from distressing emotions and mental states *"I would estimate maybe a 10–20% uptick, most due to needing to calm down over upsets from new" (2).* Another respondent said, *"Well my stress level is through the roof and cannabis is helping me calm as society as we know it collapses around us" (57).*

Some participants reported that they have decreased their consumption quantity or stopped altogether. *"Reducing use to make it last longer, and firmer boundaries on use due to working from home" (23).* For others, health-driven changes included decreases in social use and changes in ROA: "*it is in my best interest to lower my risk of respiratory issues as much as possible within my control*" (59).

Impacts on purchasing

Despite financial concerns, bulk purchasing was common to reduce the amount of time in public spaces. For those in states with recreational cannabis laws, dispensaries adjusted hours and pickup procedures while implementing online ordering. One person noted that it was "*Easier to buy-stores moved to reservations and online order taking a lot of early chaos out of newly legal market" (65)* while another said " *… Dispensaries … have even less product available, and have switched to online pre-purchases for health reasons … " (54).*

The availability of product was problematic and changed purchasing patterns for both dispensary and black-market purchases alike. One participant experienced a change in purchasing legality: *"I normally travel to a legal state to purchase, but since I've been unable to do that I've been buying from a friend, and it is of less quality" (64).*

Not everyone was affected by coronavirus. There were many who reported that there were no changes to the cannabis use or purchasing due to the pandemic with one person noting "*Hasn't changed anything, our cannabis use is for alleviation of anxiety and depression" (35).*

Discussion

One potential explanation for individuals and their marijuana-related behaviors is by looking through the lens of social cognitive theory to understand how individuals are forming their beliefs around COVID-19 and how that impacts their actions. This is especially true for individuals who live with others, including those living with relatives. This observational component leads individuals to develop their self-efficacy, per the framework of social cognitive theory, as well as two other components: imitation and modeling (or experimentation) (Bandura, 1991). In the development of self-efficacy, individuals may experiment with substances if they have observed it in housemates or their social network, which may look like virtual programming or contacts while quarantining. Additionally, if the individual demonstrates marijuana-related behaviors at home and are employed outside of the house, it is understandable that they might increase their usage while quarantining and working remotely if they were afforded that option.

The differences found between age groups in both CUDIT-R scores and the change scores reflect higher levels of use and the possibility of higher CUD prevalence among those aged 30 to 45. This aligns with findings of increased prevalence of adult use over the past two decades (Carliner et al., 2017; Compton et al., 2016) but reflects a different age group with higher CUD prevelence than Hasin et al. (2019) found with young adults. However, a study using the National Survey on Drug Use and Health data found a significant decrease in CUD prevalence across all ages with a decrease among those under 26 (Santaella-Tenorio et al., 2019). As one ages, social support may be used to help regulate emotions (Carstensen et al., 2006) and the use of avoidant strategies for emotional regulation decreases (Aldwin et al., 1996; Aldwin, 1991). The middle-age group has been suddenly disconnected from their social supports and ability to socialize in employment locations in addition to new challenges in employment and child-rearing. Coping strategies can be situationally dependent on the appraisal of current stressors (Lazarus & Folkman, 1984) and cannabis use may present an opportunity to problem solve and increase functioning by reducing stress while use may be indicative of avoidance or distraction for others or at different times.

If an individual experiences some negativity that causes them to become stressed or upset, it can be understood why they would increase their usage of marijuana. This could be because they have seen housemates or someone in their social network acting in that manner or if they perceive it as a social norm based on media consumption. The same can be stated for individuals who decreased their usage; they may have seen someone develop negative behaviors with increased usage. A significant remark related to the consumption of marijuana focused on decreasing usage based on decreasing negative impacts on their respiratory system because of a perceived belief based on media reports that COVID-19 has a negative impact on the respiratory system. This action would be based on the observation component of social cognitive theory. The application of social cognitive theory encourages the focus to be on the individual's ability to develop and make choices based on their social cognition, through the framework of self-efficacy based on internal and external aspects and how the individual makes empowered actions or behaviors based on that.

With an increasing number of states that have decriminalized and legalized various formats of medicinal and recreational marijuana, there is a social effort to destigmatize marijuana usage amongst Americans. Currently, marijuana is fully legal (both recreational and medicinal) in eleven states, with and additional thirty-one states having some sort of marijuana usage law in place (decriminalized, CBD oil only, or medicinal) (DISA Global Solutions, 2020). Past studies have noted that marijuana legalization has been associated with harm-reduction toward other substances, particularly opioids (MacMillan & Gorey, 2020, Manuscript submitted for publication). With that in mind, there is the potential that marijuana usage is a harm-reduction act that can occur on multiple levels, from the individual level to the societal level. This harm-reduction factor should be researched further to gain a better understanding the role that marijuana can play in impacting societal issues such as the opioid crisis and alcohol-related issues.

Additionally, more research is needed about the various methods of consuming marijuana and the possibilities of harm-reduction through the forms, especially in middle-age adults. Addressing the individual who had reduced their marijuana usage due to the perceived impact on their respiratory system, providing education about micro-dosing, edibles, tinctures, and topicals could potentially allow the individual to maintain their original usage, which may improve their outlook. Education, policy, and health promotion could be one way of potentially destigmatizing marijuana usage and could be an excellent harm-reduction technique. More research on these techniques would be needed to provide a better understanding of the impact and should be considered as more states place marijuana policies on their ballots.

Limitations

The limitations of this study should be recognized. The sample of this study used a recruiting method on social media. By focusing on only Reddit and Facebook, only users of those platforms were considered for participation. This impacts the generalizability of the study to the larger population, as these users had technological knowledge on these platforms, which may not be the case for the larger population. The small sample size is another limitation of this study. However, this study does provide direction for future research and identifies potential groups to investigate. Lastly, this study did not include a control group, which eliminated the possibility of inferring a causal relationship between the initiation of the coronavirus pandemic and changes in cannabis use.

Conclusion

Few studies have examined the relationship between the coronavirus pandemic and changes in cannabis use among United States adults. This study showed that cannabis use

changed between December 2019 and June 2020 among individuals with prior cannabis use aged 30–45 years. Targeted outreach and programming is needed for this population during the coronavirus pandemic. Future studies should also be carried out in order to better understand the relationship between the coronavirus pandemic and cannabis use.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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Appendix

(1) Has coronavirus changed your cannabis use?
(2) How has your cannabis use changed as a result of coronavirus (open-ended)?
(3) How worried are you about the impact of coronavirus on you personally?
(4) Do you believe that you are likely to be infected with coronavirus in the next three months?
(5) Which of the following actions have you taken in the past month to reduce your risk of coronavirus infection or transmission?