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Cannabis to cope with COVID-19 in college

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ABSTRACT

Objective: Cannabis use in college students has increased over time and is linked to negative consequences. During the COVID-19 pandemic, many students experienced greater stress, which could heighten cannabis use and related consequences. This study was designed to clarify motivations for cannabis use that may link pandemic-related stressors to time spent high and cannabis-related consequences.

Participants: A total of 488 cannabis-using college students (75% women) participated.

Methods: A cross-sectional survey was administered in Fall 2020 and Spring 2021 to examine students' experiences during the pandemic.

Results: Indirect effects revealed that pandemic-related social stressors were linked to coping and boredom motives, and in turn, more hours spent high and cannabis-related consequences. Similarly, pandemic-related distress was associated with more coping motives and in turn, more hours spent high and cannabis-related consequences.

Conclusions: Findings suggest prevention and intervention efforts may benefit from emphasizing alternative coping methods, including enhanced social support, during prolonged stressors.

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COVID stress; marijuana; negative consequences; self-medication; social context

Introduction

Cannabis use among college students in the United States has increased in recent years, representing a significant public health concern.^{1,2} In 2020, 44% of college students reported using cannabis in the past year, the highest prevalence in over 35 years.² Furthermore, 25% of college students used cannabis in the past month and 8% reported daily or near-daily use.² Cannabis use has been linked with a host of negative consequences, including increased risky decision making and decreased academic performance.^{3,4} More frequent use of cannabis is also associated with greater alcohol use and risk for driving under the influence, which is in turn associated with automobile accidents, unintentional injuries, and deaths.⁵⁻⁷ Thus, identifying risk factors for cannabis use in college populations is a priority to inform prevention and intervention strategies.

One contextual factor to consider is the COVID-19 pandemic, which has produced substantial stressors that could heighten risk for cannabis use among college students. The first case of COVID-19 in the United States was identified in January 2020,⁸ and by March 2020, COVID-19 had spread to most states. Many states responded by issuing stay-at-home orders and closing schools by mid-March to guard against continued spread of the virus. As a result, many college students were required to leave campus and switch to

remote learning, contributing to social changes and distress.⁹ These disruptions appeared to be related to increased cannabis use among college students,^{10,11} with students reporting 24% more cannabis use days after campus closures than before.¹² Furthermore, college students were more likely to use cannabis during the campus lockdown between March and April 2020 compared to before the pandemic onset.¹³

Although these studies provide initial support for increased cannabis use among college students during the pandemic, it is unclear if college students experienced changes in the quantity of cannabis use, amount of time experiencing subjective effects (ie, "high"), and cannabis use consequences (eg, difficulty concentrating, feeling paranoid, impacted social relationships) following the COVID-19 pandemic. Measuring cannabis use quantity in survey research is complicated due to substantial variability in modes of cannabis administration (eg, smoking, dabbing) and potency and types (eg, flower, edibles, concentrates) of cannabis products; however, findings from recent studies suggest that number of hours high may be a reasonable proxy for cannabis use quantity.^{14,15} Examination of time spent high after cannabis use following the COVID-19 pandemic has been limited among college students, despite the likelihood that students had more free time in the wake of campus closures and remote learning. Similarly, few studies have investigated

potential changes in cannabis-related consequences among college students following the COVID-19 pandemic; one study found that cannabis use consequences did not significantly differ across college students who completed surveys after campus closures in response to COVID-19 and those who completed surveys before.¹² Thus, there is a need to examine factors contributing to cannabis use outcomes more broadly among college students.

One such predictor of hours spent high and associated cannabis use consequences may be an individual's motivation for using cannabis.^{16,17} Coping and boredom motives in particular were associated with greater cannabis use and consequences among college students before the pandemic,^{17–20} and may have been further heightened during the pandemic. As a result of the pandemic, students experienced high levels of social isolation,²¹ and perhaps unsurprisingly, almost half of college students reported feeling bored since the start of the pandemic.²² In addition, work reductions, remote learning challenges, and residential changes during the pandemic may have contributed to changes in social relationships and distress within ongoing relationships.²³ Furthermore, recent studies suggest that social stressors and isolation during the COVID-19 pandemic were associated with greater psychological distress, including depression and anxiety among college students.^{21,24,25} Of note, rates of anxiety and depression increased by 40–48% among college students following its onset.²³ Thus, COVID-related social stressors and subsequent negative psychological outcomes could be related to increased boredom and coping motives to engage in cannabis use which may subsequently predict hours spent high and cannabis use consequences among college students.

The present study

There are some indications that cannabis use, including hours spent high and cannabis use consequences, has changed during the COVID-19 pandemic, but potential mechanisms remain unknown. To address this gap, we examined data from a large multisite study of college student experiences up to 15 months into the COVID-19 pandemic. We hypothesized that pandemic-related social stressors and distress would be associated with greater hours spent high and cannabis use consequences. We expected this association would be indirect by way of coping and boredom cannabis use motives. Social stressors were expected to increase both coping and boredom motives, and in turn, hours spent high and cannabis use consequences. Pandemic-related distress was expected to specifically increase coping motives, and in turn, hours spent high and cannabis use consequences. Furthermore, we expected that these associations would be present after accounting for theoretically related covariates, including the site location (due to varied state laws regarding cannabis use for medicinal and recreational purposes), gender identity, and age. At the time of this writing, in the United States, cannabis is legalized for medical use in 37 states and Washington, DC, and recreational purposes in 23 states and Washington, DC.²⁶

Because findings are currently mixed as to whether these laws are related to differences in cannabis use,^{1,27,28} a strength of the current study is the ability to account for legalization context.

Method

Participants and procedures

Undergraduate college students were recruited to participate in a cross-sectional online survey study on the impact of the COVID-19 pandemic on mental health, substance use, and sexual experiences.²⁹ Participants aged 18 and older were recruited from psychology or human development subject pools across four public U.S. universities in the Fall 2020 and Spring 2021 semesters (between November 2, 2020 and June 4, 2021). For participation, students received research credit for relevant course work. All procedures were approved by institutional review boards of respective universities. A total of 1,746 students completed the study (Fall 2020 $n=730$, Spring 2021 $n=1,016$). Participants were retained in current analyses if they reported past-month cannabis use ($N=495$; Fall 2020 $n=209$, Spring 2021 $n=286$). Of those, seven participants from the spring semester were removed for having also provided data in the fall semester.

The final analytic sample consisted of 488 college students with past-month cannabis use. This sample included 251 participants (51.4% of the sample) from University 1 (in a mid-sized Midwestern city where neither medicinal nor recreational cannabis is legalized), 102 (20.9%) from University 2 (in a large Southeastern city where cannabis oils with low THC are legalized for medicinal purposes but recreational cannabis is not legalized), 95 (19.5%) from University 3 (in a small Northwestern town where recreational and medicinal cannabis are legalized), and 40 (8.2%) from University 4 (in a large Northwestern city where recreational and medicinal cannabis are legalized). Universities 3 and 4 are in the same state. The University 4 sub-sample was smallest because data collection at this site only occurred during Spring 2021. At the time of survey administration, a combination of online and in-person classes were offered at Universities 1 and 2; classes were primarily offered in an online format at Universities 3 and 4. Testing for COVID-19 was available on campus for all university staff and students. At all four universities, face coverings and physical distancing were required inside campus buildings.

Participants were, on average, 19.88 years old ($SD=2.10$, Range = 18–39). Most participants self-identified as cisgender women (75%, $n=364$), followed by cisgender men (23.0%, $n=112$), and gender minoritized individuals (eg, gender queer, nonbinary, gender fluid; 2.4%, $n=12$). Most participants self-identified as heterosexual (68.4%) followed by bisexual (15.8%), lesbian or gay (12.5%), something else (1.8%), or did not know (1.4%). The racial/ethnic composition of the sample was 73.4% White, 22.3% Hispanic/Latinx, 17.4% Black or African American, 11.1% Asian, 1.8% American Indian or Alaska Native, 0.6% Middle Eastern or Arab, and 0.4% Native Hawaiian or Other Pacific Islander (percentages exceed 100% because participants could select

multiple categories). Living situations included off-campus without parents (40.0%), residence halls/dormitory rooms (28.1%), off-campus with parents (23.0%), sorority or fraternity housing (8.2%), and “other” locations (0.8%), with no significant difference in living situation by recruitment period (ie, fall versus spring semester), $X^2(4)=3.46$, $p=.49$. At the time of survey completion, nearly all participants (91.0%) were residing in the same state as their university.

Measures

Pandemic-related social stressors

Participants reported on social stressors related to the COVID-19 pandemic using three items drawn from a validated measure of pandemic-related stressors.³⁰ Participants reported how concerned they were about COVID-19 (a) making you feel isolated or alone, (b) placing a strain on your social life, and (c) placing a strain on relationships with those you live with (response options: 1=*not at all* to 5=*extremely*). A mean score was calculated from these three items ($\alpha = .81$) with higher scores representing higher social stressors.

Pandemic-related distress

To assess worries and experiences related to the COVID-19 pandemic, participants were first presented with a modified version of the COVID-19 Stress Scale.³¹ This 36-item measure is comprised of five subscales (compulsive checking, danger/contamination fears, fears of economic consequences, traumatic stress, xenophobia) and can be summed for a total distress score. The full measure (36 items; all subscales) was presented in Fall 2020, but shortened for Spring 2021 by removing the fears of economic consequences and xenophobia scales that were deemed to be potentially less relevant at that time. Thus, 24 items were administered in both semesters, representing three subscales: compulsive checking (eg, “I checked social media posts concerning COVID-19”), danger/contamination (eg, “I am worried about catching the virus”), and traumatic stress (eg, “I had trouble sleeping because I worried about the virus”). Response options ranged from 0=*never* or *not at all* to 4=*almost always* or *extremely*. A mean score of the 24 items was calculated ($\alpha = .95$) with higher scores representing higher distress.

Cannabis use motives

Participants reported on their motivations for using cannabis during the past month with the Comprehensive Marijuana Motives measure.¹⁷ Participants were shown a list of 36 items and asked how often they used cannabis for the following reasons (response options: 1=*never* or *almost never* to 5=*always* or *almost always*). This measure is comprised of 12 subscales (alcohol-related, altered perception, availability, boredom, celebration, conformity, coping, enjoyment, experimentation, low risk, social anxiety, sleep). In the present study, we focused on the two subscales that were of primary conceptual interest during the COVID-19 pandemic: coping motives (3 items; current study $\alpha = .87$; eg, “to forget

your problems”) and boredom motives (3 items; current study $\alpha = .86$; eg, “because you have nothing better to do”).

Cannabis use

The Daily Marijuana Questionnaire was used to assess hours spent high during a typical week in the past month.³² Using a format similar to the Daily Drinking Questionnaire,³³ participants were first presented with a response table that included each day of the week. They were then asked to report on how many hours they were high from cannabis use during each day in a typical week (text responses were required to be numbers between 0 and 24). To calculate the total number of hours high during a typical week in the past month, we computed a sum score across all days of the week.

Cannabis-related consequences

Participants were presented with the Marijuana Consequences Checklist.³⁴ Participants were asked to indicate the frequency that they had experienced each of 26 consequences in the past month (response options: 0=*0 times* to 4=*10+ times*). Example items included “had trouble concentrating or paying attention,” “had trouble following through on things,” and “spent too much money on marijuana.” Items were summed to represent the total frequency of consequences experienced in the past month ($\alpha = .93$).³⁵

Data analysis

To characterize the sample, we first examined descriptive statistics and Pearson’s r correlations via SPSS v.27. Next, to test the hypothesized path model, we estimated a parallel mediation model in Mplus Version 8.4.³⁶ Specifically, we examined how pandemic-related distress and social stressors were associated with cannabis use (ie, hours high) and consequences by way of coping and boredom motives.

Several covariates were included in the path model. Categorical covariates were represented via $k-1$ dummy variables. To account for potential site differences based on state legalization status, the state in which the college was located was included as a covariate, with location represented by Midwestern (State 1), Southeastern (State 2), and Northwestern (State 3) states. Because State 3 laws regarding cannabis use were most liberal, this state was selected as the reference group. For other categorical variables, the largest group was designated as the reference group. Because college women report more negative social and psychological pandemic-related outcomes,³⁷ but men have higher rates of cannabis use and problems,³⁸ gender identity was included as a covariate, represented by three categories: men, gender fluid/nonbinary, and women (reference group). Lastly, given that recreational cannabis use is limited to those ages 21 and over where it is legalized, we included age of 21 or older (1=*yes*, 0=*no*) as a covariate. Both location and gender identity were regressed on all endogenous variables (coping motives, boredom motives, hours spent high, cannabis use consequences); because we expected age to affect access to cannabis but not motivations for use, age 21+ was only

regressed on hours spent high and cannabis use consequences.

Regarding additional model specifications, all exogenous variables were allowed to covary. Coping and boredom motives were covaried to account for shared measure variance. Hours spent high and cannabis-related consequences were also covaried because of the expected positive association. Bias-corrected bootstrapping with 5,000 samples was used to obtain 95% confidence intervals (CI) for the indirect effects.³⁹ If the CI does not include zero, an indirect effect can be considered to be supported. The variables representing hours spent high and gender identity (gender fluid/nonbinary) were positively skewed. Although all other variables were within acceptable limits of skew ($< |3|$) and kurtosis ($< |10|$),⁴⁰ the bootstrapped 95% CIs were used when examining all coefficients to ensure estimates were robust to nonnormality.

Covariance coverage ranged from 99.6% to 100%. Full information maximum likelihood (FIML) was used to retain observations with missing data. To assess global model fit, we evaluated Chi-Square Test of Model Fit, Comparative Fit Index (CFI), Tucker-Lewis index (TLI), Root Mean Square Error of Approximation (RMSEA), and Standard Root Mean Residual (SRMR). Adequate fit would be evidenced by a nonsignificant chi-square statistic, $CFI \geq .90$, $RMSEA \leq .10$, and $SRMR \leq .08$.⁴⁰ For each endogenous variable, the amount of variance explained by the model (R^2) was examined.

Results

Descriptive statistics

Descriptive statistics and bivariate correlations are described in Table 1. These unconditional associations revealed that greater pandemic-related social stressors were associated with greater pandemic-related distress, coping motives, boredom motives, and cannabis-related consequences. Greater pandemic-related distress was associated with greater coping and boredom motives as well as cannabis-related

consequences. Neither pandemic-related social stressors nor distress were associated with hours spent high. Greater coping motives were associated with greater boredom motives, hours spent high, and cannabis-related consequences. Greater boredom motives were associated with more hours spent high and greater consequences. Finally, hours high and consequences were positively associated.

Path model

Model fit

The structural equation model demonstrated good global fit, $\chi^2(3) = 2.13$, $p = .55$, $CFI = 1.00$, $TLI = 1.00$, $RMSEA = 0.00$ [90% CI: 0.000, 0.067], $SRMR = .009$. As indicated by R^2 , a significant proportion of variance was explained in coping motives (13.6%, $p < .001$), boredom motives (5.5%, $p = .01$), hours high (20.6%, $p < .001$), and cannabis-related consequences (41.8%, $p < .001$).

Predictors of cannabis use motives

Estimated model paths between primary study variables and covariates are included in Table 2 and primary model paths are depicted in Figure 1. Greater pandemic-related social stressors were associated with greater coping and boredom motives when controlling for pandemic-related distress, location, and gender identity. Similarly, greater pandemic-related distress was associated with greater coping motives when controlling for other predictors. Neither location nor gender identity were uniquely associated with coping or boredom motives.

Predictors of cannabis use outcomes

Greater coping motives were associated with more hours spent high and cannabis-related consequences when accounting for pandemic-related social stressors and distress, boredom motives, location, gender identity, and age. Similarly, greater boredom motives were associated with greater hours high and consequences when controlling for all other model variables. Location was not associated with hours high or

Table 1. Descriptive statistics and bivariate correlations.

	1	2	3	4	5	6	7	8	9	10	11
1. Pandemic-related social stressors	–	.43***	.34***	.21***	.06	.23***	–.15**	.07	–.15**	.06	–.12*
2. Pandemic-related distress		–	.26***	.13**	.04	.17***	–.07	.13**	–.13**	.02	.02
3. Coping motives			–	.52***	.35***	.58***	–.11*	.10*	–.04	.05	–.01
4. Boredom motives				–	.34***	.54***	–.03	–.03	.05	.01	.01
5. Hours high from cannabis					–	.48***	–.07	.04	.18***	.07	.11*
6. Cannabis-related consequences						–	–.06	.03	.09	.05	–.01
7. State 1 (Midwest)							–	–.53***	.09*	–.14**	.03
8. State 2 (Southeast)								–	–.04	.15**	–.07
9. Identify as men									–	–.09	.03
10. Identify as gender fluid										–	–.01
11. Age 21+											–
M / %	2.96	0.93	1.94	2.59	14.27	13.79	51.4%	20.9%	23.0%	2.5%	26.4%
SD / n	1.16	0.71	1.14	1.26	21.59	13.62	251	102	112	12	129
Range	1–5	0–3.50	1–5	1–5	0–168	0–82	0, 1	0, 1	0, 1	0, 1	0, 1

Note: * $p < .05$. ** $p < .01$. *** $p < .001$.

Table 2. Model paths.

Primary study variables	<i>b</i>	95% CI
Pandemic-related social stressors → coping motives	0.29	0.198, 0.377 ^a
Pandemic-related social stressors → boredom motives	0.25	0.145, 0.343 ^a
Pandemic-related social stressors → hours spent high from cannabis	-0.58	-2.376, 1.282
Pandemic-related social stressors → cannabis-related consequences	0.24	-0.647, 1.143
Pandemic-related distress → coping motives	0.18	0.029, 0.319 ^a
Pandemic-related distress → hours spent high from cannabis	-0.65	-4.256, 2.424
Pandemic-related distress → cannabis-related consequences	0.57	-1.071, 2.392
Coping motives → hours spent high from cannabis	4.92	3.048, 7.351 ^a
Coping motives → cannabis-related consequences	4.79	3.591, 6.044 ^a
Boredom motives → hours spent high from cannabis	3.57	1.890, 5.314 ^a
Boredom motives → cannabis-related consequences	3.39	2.489, 4.283 ^a
Covariates		
State 1 (Midwest) → coping motives	-0.06	-0.298, 0.164
State 1 (Midwest) → boredom motives	-0.08	-0.348, 0.176
State 1 (Midwest) → hours spent high from cannabis	-2.53	-7.289, 1.350
State 1 (Midwest) → cannabis-related consequences	-0.38	-2.592, 1.712
State 2 (Southeast) → coping motives	0.15	-0.166, 0.434
State 2 (Southeast) → boredom motives	-0.18	-0.501, 0.149
State 2 (Southeast) → hours spent high from cannabis	-0.31	-6.357, 5.552
State 2 (Southeast) → cannabis-related consequences	-0.53	-3.527, 2.419
Gender identity (man) → coping motives	0.08	-0.127, 0.302
Gender identity (man) → boredom motives	0.26	-0.002, 0.521
Gender identity (man) → hours spent high from cannabis	8.77	3.984, 14.609 ^a
Gender identity (man) → cannabis-related consequences	3.04	0.779, 5.279 ^a
Gender identity (nonbinary) → coping motives	0.15	-0.639, 0.985
Gender identity (nonbinary) → boredom motives	0.07	-0.849, 0.980
Gender identity (nonbinary) → hours spent high from cannabis	8.80	0.687, 19.590 ^a
Gender identity (nonbinary) → cannabis-related consequences	2.73	-4.357, 10.623
Age 21+ → hours spent high from cannabis	4.79	0.681, 9.804 ^a
Age 21+ → cannabis-related consequences	-0.44	-2.428, 1.660

Notes: Unstandardized estimates (*b*) and 95% confidence intervals (CI) are reported. Dummy coded variables representing state and gender were included as covariates when predicting coping and boredom motives, hours spent high, and cannabis-related consequences. Dichotomized age (at least 21 years old versus under 21) was included as an additional covariate when predicting hours spent high and cannabis-related consequences. Model estimates for covariates are not shown here.

^a95% confidence interval (CI) does not contain zero, representing a significant effect.

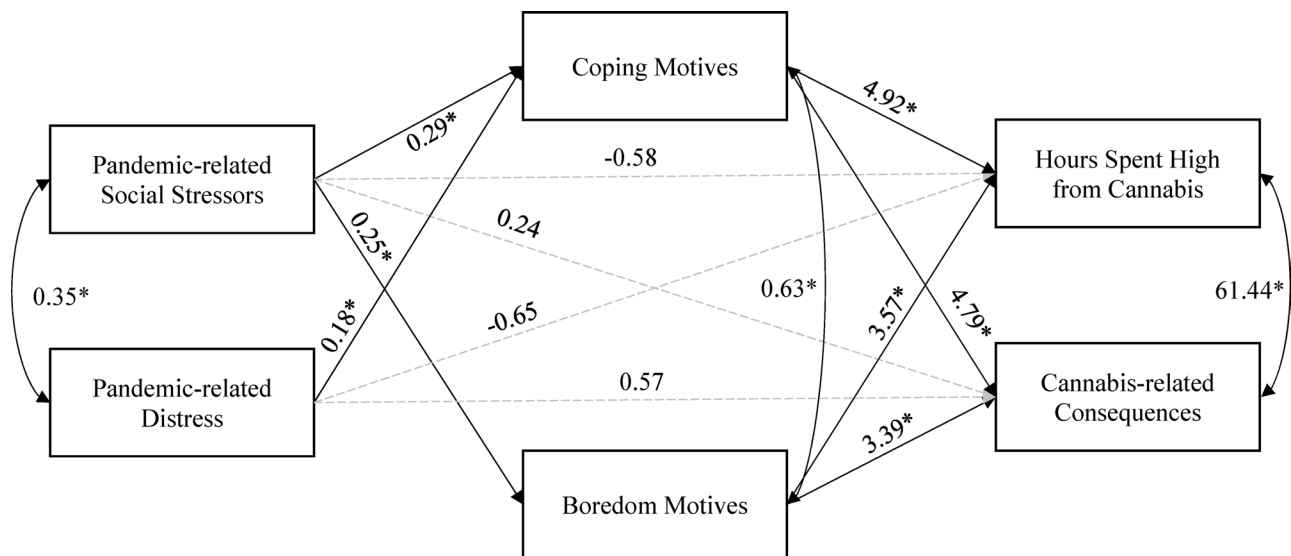


Figure 1. Path model. Notes: Unstandardized coefficients are reported for each path. Although not shown here, dummy-coded variables representing state and gender identity were included as covariates when predicting coping and boredom motives, hours spent high, and cannabis-related consequences; dichotomized age (at least 21 years old versus under 21) was included as an additional covariate when predicting hours spent high and cannabis-related consequences. An indirect effect of pandemic-related social stressors on hours spent high was present via coping ($b=1.41$, 95% CI [0.785, 2.274]) and boredom motives ($b=0.88$, 95% CI [0.410, 1.518]), as well as on cannabis-related consequences via coping ($b=1.37$, 95% CI [0.886, 2.027]) and boredom motives ($b=0.83$, 95% CI [0.467, 1.275]). An indirect effect of pandemic-related distress on hours spent high was present via coping motives ($b=0.87$, 95% CI [0.206, 1.906]), as well as on cannabis-related consequences via coping motives ($b=0.85$, 95% CI [0.173, 1.680]). * 95% confidence interval (CI) does not contain zero, representing a significant effect.

Table 3. Indirect and total effects.

Indirect effects	<i>b</i>	95% CI
Pandemic-related social stressors → coping motives → hours spent high from cannabis	1.41	0.785, 2.274 ^a
Pandemic-related social stressors → coping motives → cannabis-related consequences	1.37	0.886, 2.027 ^a
Pandemic-related social stressors → boredom motives → hours spent high from cannabis	0.88	0.410, 1.518 ^a
Pandemic-related social stressors → boredom motives → cannabis-related consequences	0.83	0.467, 1.275 ^a
Pandemic-related distress → coping motives → hours spent high from cannabis	0.87	0.206, 1.906 ^a
Pandemic-related distress → coping motives → cannabis-related consequences	0.85	0.173, 1.680 ^a
Total effects		
Pandemic-related social stressors → hours spent high from cannabis	1.71	-0.191, 3.872
Pandemic-related social stressors → cannabis-related consequences	2.45	1.357, 3.526 ^a
Pandemic-related distress → hours spent high from cannabis	0.23	-3.422, 3.636
Pandemic-related distress → cannabis-related consequences	1.42	-0.358, 3.381

^a95% confidence interval (CI) does not contain zero, representing a significant effect.

consequences. Cisgender men and nonbinary individuals reported more hours high compared to cisgender women. Furthermore, cisgender men reported greater cannabis-related consequences compared to cisgender women. Being at least 21 years of age was associated with more hours high but not cannabis-related consequences.

Indirect effects

Finally, indirect effects were examined to test our primary hypotheses (Table 3). As expected, greater coping and boredom motives each significantly contributed to associations between greater pandemic-related social stressors and greater cannabis use and consequences after accounting for all other model variables. Similarly, greater coping motives contributed to associations between greater pandemic-related distress and greater cannabis use and consequences. Considering all direct and indirect effects, there was one total effect present, such that pandemic-related social stressors were associated with more cannabis-related consequences.

Discussion

Given the heightened rates of college student cannabis use during the COVID-19 pandemic,¹² the aim of this study was to examine mechanisms associated with students' cannabis use and consequences during the pandemic. Among cannabis-using

college students, we considered stress-related predictors of use and consequences, including social stressors (eg, isolation, loneliness) and pandemic-related distress (eg, concerns about danger or contamination). In partial support of hypotheses, correlations revealed that pandemic-related social stressors and distress were not directly related to the hours spent high from cannabis but were directly related to greater cannabis use consequences. Thus, it may be that pandemic-related stressors led to using a greater amount of cannabis in a similar time span, or that any cannabis use in the context of stressors was more likely to lead to consequences (eg, increased anxiety, low motivation, unable to do work). Findings also point to the particular importance of social stressors. Relative to distress, social stressors evidenced a stronger bivariate association with cannabis-related consequences, and in the path model controlling for covariates, this link was the only total effect that held. These findings build on prior research to highlight the continued effects of COVID-19-related social stressors on cannabis-related outcomes into the first year of the pandemic, well past the initial social distancing restrictions. To further understand mechanisms linking stressors to consequences of cannabis use, we turn next to motivations for cannabis use.

Consistent with the self-medication model,⁴¹ we expected that greater pandemic-related distress would be associated with more coping motives, and in turn, more hours spent high and cannabis use consequences. Indeed, we found support for this hypothesis, adding to a larger literature supporting the self-medication model with regard to both alcohol (despite some inconsistent findings) and cannabis use.⁴²⁻⁴⁴ This finding extends prior work to highlight college students' use of cannabis to cope with general distress associated with fear of contracting COVID-19.

Although the pandemic impacted many domains of college students' lives, establishing close social relationships is an important part of development for college-aged individuals.^{45,46} Thus, after controlling for pandemic-related distress, we focused on the social impacts of the pandemic. As hypothesized, experiencing more social stressors was associated with greater coping and boredom motives to use cannabis, and in turn, more hours spent high and cannabis use consequences. Findings are consistent with past research highlighting isolation as a risk factor for cannabis use during the pandemic.⁴⁷ In past qualitative research, cannabis users also stated their reasons for increased cannabis use during the pandemic included increased free time and boredom, in addition to coping with distress.⁴⁸ Few quantitative studies have examined boredom-related motives for substance use in the context of the pandemic,⁴⁹ and current findings extend this work to highlight that boredom can be a key motivator for cannabis use. Findings also suggest the importance of social connectedness in mitigating time spent high and related consequences, consistent with the stress-buffering effects of social support on mental health.⁵⁰

A strength of this study was the inclusion of college students from three states with different laws regarding cannabis use. Although state was examined as a covariate, we found no significant associations between state and cannabis use motives, hours spent high, or consequences when controlling for pandemic-related social stressors and distress.

This lack of an association is consistent with past studies that have failed to find evidence for postlegalization increases in cannabis use among young adults.²⁷ However, research on this topic is mixed,⁵¹ as others have found an association between legalization of recreational cannabis and increased use.^{1,28,52} One possibility is that laws regulating cannabis use might be most related to whether or not individuals use cannabis,⁵¹ but not necessarily the hours spent high or consequences amongst individuals who do use cannabis. On the other hand, it is also possible that differences by legalization status exist for cannabis use time or consequences, but a larger, more representative sample is needed to detect the effects of legalization status on behavior.

Importantly, hypothesized indirect effects were also supported when controlling for demographic covariates. Consistent with prior work,³⁸ men reported more hours spent high and consequences than women. Additionally, nonbinary individuals reported more hours spent high than women. However, this finding was based on a small subsample of nonbinary individuals and should be interpreted with caution. Furthermore, individuals over age 21 reported spending more hours high. Older college students may have greater access to cannabis in states where cannabis is legal, or may have more established use patterns that involve spending more time high.

Strengths and limitations

Findings should be interpreted in light of methodological limitations. Most notably, data are cross-sectional and causal inferences cannot be made. Although the hypothesized model is consistent with a larger theoretical and empirical literature on substance use motives and self-medication, alternative models could also be possible. For example, using cannabis may impact one's social relationships and in turn, distress. Relatedly, we focused on specific stressors and motives that we anticipated would drive use during the pandemic, but other unexamined constructs may also be important. Other motives for cannabis use could be considered in future studies, as could other aspects of students' stressful experiences during the pandemic, such as academic challenges and potentially long-lasting physiological effects of contracting COVID-19. Although not examined due to sample size limitations, pandemic-related experiences may have also changed meaningfully across the two semesters during which data were collected for this study, which could have implications for cannabis use and consequences. Furthermore, our assessment of cannabis use reflected the time individuals spent under the influence of cannabis, but did not capture dose, manner, or context of consumption, which could each affect risk for cannabis-related consequences. In addition, students enrolled in psychology or human development classes were invited to participate and self-selected into the study. Accordingly, findings may not represent all college students' experiences, potentially limiting generalizability. Finally, we did not examine substances other than cannabis use, or how their concurrent use might exacerbate outcomes. These are important areas of future inquiry.

Research and practice implications

Current findings may inform interventions intended to prevent or reduce hours spent high and cannabis use consequences among college students. Given that students used cannabis to cope with distress, there may be benefits to promoting alternative strategies to regulate emotion, tolerate distress, and cope with experiences of distress and loneliness. Findings also highlight the importance of social connections in mitigating negative outcomes of stress. Thus, interventions promoting social support during periods of distress may have important implications for preventing increases in hours spent high and associated consequences. During future periods when students experience heightened stress and isolation, interventions targeting both coping strategies and social connectedness – especially to peers with low or no cannabis use – may help to mitigate cannabis use and consequences.⁵³

Conflict of interest disclosure

The authors have no conflicts of interest to report. The authors confirm that the research presented in this article met the ethical guidelines, including adherence to the legal requirements, of the United States and received approval from the Institutional Review Boards of the University of Nebraska-Lincoln, Georgia State University, Washington State University, and the University of Washington.

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