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Cannabis-Related Impairment and Social Anxiety: The Role of Use to Manage Negative and Positive Affect in Social Situations

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Abstract

Background and Objectives: Individuals with elevated social anxiety are thought to be at high risk for developing cannabis-related problems because they use cannabis to cope with anxiety-provoking social situations. Social anxiety is unique among the anxiety conditions in that it is characterized by both elevated negative affect (NA) and lower positive affect (PA). Yet it is unclear whether persons with elevated social anxiety use cannabis to decrease their NA or to increase their PA.

Methods: Thus, the current study examined the role of PA and NA (including cannabis use to increase PA and to decrease NA in social situations) on cannabis use frequency and related problems among current (past three-month) cannabis users ($N = 278$).

Results: Social anxiety was significantly correlated with NA, PA, cannabis use to decrease NA, and use to increase PA. Serial mediation analyses tested the paths between social anxiety, affect, use to manage affect, typical cannabis use frequency, and cannabis use-related problems. Contrary to prediction, social anxiety was not indirectly related to use frequency or related problems via NA or PA generally. Rather, social anxiety was indirectly related to cannabis problems via the serial effect of use to cope with NA and typical use frequency and via the serial effect of use to increase PA and typical use frequency.

Conclusions/Importance: Social anxiety may be associated with using cannabis to decrease NA and increase PA specifically in social situations, which increases cannabis use frequency and thus, problem risk.

Keywords

social anxiety; affect; cannabis use; cannabis problems; cannabis use motives

Introduction

Cannabis is the most commonly used illicit drug in the United States (Substance Abuse and Mental Health Services Administration, 2014). One-fifth of individuals who endorsed past-year cannabis use, without lifetime cannabis use disorder, reported currently experiencing an

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anxiety disorder, more than twice the rates of anxiety disorders among non-users (Teesson et al., 2012). Accumulating data indicate that social anxiety may be robustly and perhaps uniquely associated with cannabis-related problems and may serve as a risk factor for such problems (Buckner, Heimberg, Ecker, & Vinci, 2013). Approximately one-third of individuals with cannabis dependence also had a lifetime social anxiety disorder (SAD) diagnosis, which is more than double that of any other anxiety disorder (Agosti, Nunes, & Levin, 2002). Further, SAD but no other anxiety disorders or depression, remained significantly, prospectively related to cannabis dependence after accounting for comorbid disorders (Buckner, Heimberg, Schneier, et al., 2012; Buckner et al., 2008). Even subclinical levels of social anxiety are robustly related to cannabis-use related problems and cannabis dependence (e.g., Buckner, Bonn-Miller, Zvolensky, & Schmidt, 2007; Buckner, Ecker, & Dean, 2016; Buckner, Heimberg, Matthews, & Silgado, 2012; Buckner & Schmidt, 2008; Buckner, Schmidt, Bobadilla, & Taylor, 2006). Thus, elucidation of factors associated with vulnerability to cannabis-related problems among persons with elevated social anxiety could have important implications for the treatment and prevention of cannabis-related problems for this high-risk group.

Social anxiety is somewhat unique among the anxiety conditions in that it is characterized by both high negative affect (NA) and low positive affect (PA; T. A. Brown, Chorpita, & Barlow, 1998; Kashdan & Collins, 2010). It has therefore been proposed that persons with SAD may be vulnerable to using substances to not only decrease high NA but to increase low PA as well (Buckner, Heimberg, et al., 2013). There is a robust relationship between social anxiety and using cannabis to cope with NA (Buckner et al., 2007) and cannabis use to cope with NA mediates the relationship between social anxiety and cannabis-related problems (Buckner et al., 2007). No work has tested the role of low PA in the relations between social anxiety and cannabis-related problems.

If it is the case that persons with elevated social anxiety use to increase PA, such use is problematic given that PA is inversely correlated with substance use, and individuals with higher NA and lower PA use substances more frequently (Wills, Sandy, Shinar, & Yaeger, 1999). There is indirect evidence to support the theory that these individuals may use cannabis to increase PA. To illustrate, in a non-clinical convenience sample, those with elevated trait social anxiety experienced fewer and less intense positive emotions both when alone and in social situations (Kashdan & Collins, 2010). Given that most cannabis use occurs in social settings while others are using (e.g., Buckner, Crosby, Silgado, Wonderlich, & Schmidt, 2012; Buckner et al., 2015; Buckner, Zvolensky, & Ecker, 2013; Reilly, Didcott, Swift, & Hall, 1998), individuals with greater social anxiety may use cannabis to increase PA in social situations specifically to enjoy these situations, as greater PA is related to less avoidance of social situations among individuals with elevated social anxiety (Trew & Alden, 2012). Further, both coping motives (using cannabis to regulate negative emotions) and enhancement motives (using cannabis to experience more positive emotions) were the most commonly endorsed motives in response to a social stressor laboratory task, indicating that individuals may use cannabis in social situations to both decrease NA and increase PA (Buckner, Zvolensky, Ecker, & Jeffries, 2016). Yet no known studies have directly tested whether persons with elevated social anxiety use cannabis to increase PA specifically in social situations and whether doing so accounts for greater cannabis use or related problems.

The *Marijuana Use to Cope with Social Anxiety Scale* (MCSAS; Buckner, Heimberg, Matthews, et al., 2012) was designed to specifically assess cannabis use to cope in 24 social situations found in prior research to be anxiety-provoking among those with elevated social anxiety (Liebowitz, 1987). Compared to individuals with lower social anxiety, individuals with greater social anxiety were significantly more likely to use cannabis to cope in social situations (Buckner, Heimberg, Matthews, et al., 2012). Further, using cannabis to cope in social situations was significantly related to more cannabis use-related problems, above and beyond other variables related to cannabis use-related problems, such as frequency of use and general coping motives (Buckner & Zvolensky, 2014).

Although an important step, the MCSAS did not assess whether participants use cannabis in social situations as an attempt to decrease NA or increase PA. Thus, the current study set out to elucidate the role of cannabis use to manage PA and NA in social situations using a modified version of the MCSAS. First, we tested whether social anxiety was related to using cannabis in social situations to increase PA as well as to decrease NA. Second, we tested serial relations among affect and use to determine whether social anxiety is related to more NA (or less PA), which is in turn related to greater cannabis use to decrease NA (or increase PA), leading to greater cannabis use and related problems (see Figure 1). Social anxiety tends to be unrelated to cannabis use frequency (e.g., Buckner et al., 2007; Buckner, Ecker, & Cohen, 2010; Buckner & Schmidt, 2008; Ecker & Buckner, 2014); thus, we did not expect social anxiety to be directly related to use frequency. These hypotheses were tested among college students given that cannabis is the most commonly used illicit drug among college students (Johnston, O'Malley, Bachman, Schulenberg, & Miech, 2016), rates of cannabis use and related problems tend to peak during this age (Stinson, Ruan, Pickering, & Grant, 2006), and social anxiety often increases during the transition to college (Spokas & Heimberg, 2009).

Method

Participants and Procedures

Participants were recruited through the psychology participant pool at a large state university in the southern United States (where cannabis is legal for medical but not recreational purposes at the state level) for a study on college substance use (e.g., Buckner & Terlecki, 2016; Buckner, Walukevich, & Lewis, 2019). The university's Institutional Review Board approved the study and all participants provided informed consent before data collection. The consent form explained that participants' names would not be linked to their responses, assuring confidentiality of responses. Further, the consent form detailed that a certificate of confidentiality was obtained from the National Institute on Drug Abuse to further protect confidentiality. Participants completed computerized self-report measures using a secure, online data collection website ([surveymonkey.com](https://www.surveymonkey.com)). All participants received referrals to university-affiliated psychological outpatient clinics and research credit for completion of the survey.

Of the 1,013 students who completed the survey, 280 endorsed past three-month cannabis use. Of those, two were excluded due to questionable validity of responses (described below). The racial/ethnic composition of the final sample of 278 (79.9% female) was 12.6%

non-Hispanic African American, 0.4% Hispanic African American, 2.5% Asian American, 75.5% Non-Hispanic Caucasian, 2.1% Hispanic Caucasian, 1.1% Native American, 4.7% multiracial, and 1.1% “other”. The mean age was 20.2 ($SD = 2.0$) and the mean age of first cannabis use was 17.1 ($SD = 2.0$). Regarding past three-month cannabis use, 6.8% ($n = 19$) endorsed using less than once per month, 57.2% ($n = 159$) endorsed using one to three times a month, 25.2% ($n = 70$) endorsed using one to six times a week, and 10.8% ($n = 30$) endorsed using daily or more. A majority (66.2%) endorsed experiencing at least one cannabis use-related problem in the past three months ($M = 2.32$, $SD = 2.55$). The most frequent use-related problems included: procrastination (38.5%), lower energy level (35.3%), lower productivity (33.1%), and memory loss (23.0%).

Measures

The *Marijuana Use to Cope with Social Anxiety Scale-Revised* (MCSAS-R) was modified from the MCSAS, a self-report measure developed to assess cannabis use to cope with social situations as well as avoidance of social situations in the absence of cannabis (Buckner, Heimberg, Matthews, et al., 2012). The MCSAS includes 24 social situations (e.g., going to a party, meeting strangers) from the *Liebowitz Social Anxiety Scale* (LSAS; Liebowitz, 1987). The original MCSAS scales demonstrated adequate internal consistency and evidence of convergent and divergent validity (Buckner, Heimberg, Matthews, et al., 2012). In the current study, the MCSAS was modified to assess cannabis use to decrease NA in each of the 24 situations (MCSAS-NA) by asking participants how frequently they “Use marijuana to feel less nervous or depressed” in each social situation. Participants were also asked to rate the degree to which they use marijuana to increase PA in each social situation (i.e., “Use marijuana to feel good or have more fun”; MCSAS-PA). The LSAS avoidance scale ratings were used: 0 (*Never*) to 3 (*Usually (68–100%)*). Higher scores indicate more frequent cannabis use to manage affect. Internal consistencies were excellent for MCSAS-NA ($\alpha = .95$) and MCSAS-PA ($\alpha = .94$).

The *Marijuana Use Form* (MUF; Buckner et al., 2007) assessed cannabis use frequency in the past three months on a scale ranging from 0 (*less than once a month, including never*) to 10 (*21 or more times each week*). The MUF has shown convergent validity with ecological momentary assessments of cannabis use (Buckner, Crosby, Wonderlich, & Schmidt, 2012).

The *Marijuana Problems Scale* (MPS; Stephens, Roffman, & Curtin, 2000) assessed 19 cannabis-related problems (e.g., procrastination, lower productivity, memory loss) experienced in the past 90 days on a scale ranging from 0 (*no problem*) to 2 (*serious problem*). Items scored either 1 or 2 were counted to create a sum of the number of cannabis-related problems, with higher scores indicating greater problems experienced. The measure has achieved good internal consistency in prior work using this scoring strategy (Ecker & Buckner, 2014; Lozano, Stephens, & Roffman, 2006). Internal consistency was adequate in the current sample ($\alpha = .77$).

The *Social Interaction Anxiety Scale* (SIAS; Mattick & Clarke, 1998) was used to assess social anxiety, which contains 20 items assessing social anxiety from 0 (*not at all characteristic or true of me*) to 4 (*extremely characteristic or true of me*). Total SIAS scores 34 or greater are considered indicative of clinically-elevated levels of social anxiety

(Heimberg, Mueller, Holt, Hope, & Liebowitz, 1992). This measure has demonstrated good internal consistency in both community and undergraduate samples and is specific for social anxiety relative to other forms of anxiety (i.e., trait anxiety; E. J. Brown et al., 1997). Internal consistency was good ($\alpha = .89$) in the current sample.

The *Positive and Negative Affect Scale* (PANAS; Watson, Clark, & Tellegen, 1988) is a self-report measure consisting of positive and negative affect subscales each comprised of 10 emotions. Participants rated the extent to which they generally experience each emotion from 1 (*very slightly or not at all*) to 5 (*extremely*) and higher scores represented higher levels of NA/PA. In the present study, internal consistency was good for both the NA subscale (PANAS-NA; $\alpha = .87$) and the PA subscale (PANAS-PA; $\alpha = .88$).

The *Infrequency Scale* (IS; Chapman & Chapman, 1983) was used to identify random responders who provided random or grossly invalid responses. Four questions from the IS were included. Per prior online studies (e.g., Cohen, Iglesias, & Minor, 2009), individuals who endorsed three or more items were excluded ($n = 2$).

Data analytic strategy

As is often the case with substance-related variables (e.g., Buckner & Terlecki, 2016; Keough, Battista, O'Connor, Sherry, & Stewart, 2016; Keough, O'Connor, Sherry, & Stewart, 2015), inspection of the data (Table 1) revealed that some variables were not normally distributed (skew > 3.0; kurtosis > 10; Kline, 2005). Thus, hypotheses were tested using bootstrapping, which is robust against violations of assumptions of normality (Erceg-Hurn & Miroseovich, 2008). Specifically, serial multiple mediation models were conducted to examine the influence of affect (NA, PA) and using cannabis to cope with affect (decrease NA, increase PA) as mediators of the relation between anxiety severity and outcomes. Separate models were conducted for NA- and PA-related paths. These path models are presented in Figure 1. Although mediational models are ideally tested using prospective data, cross-sectional tests of mediation are appropriate tests of theoretically-driven relations among study variables (Hayes, 2013, 2018). These analyses were conducted using PROCESS, a conditional process modeling program that utilizes an ordinary least squares-based path analytical framework to test for both direct and indirect effects (Hayes, 2013, 2018). First, we examined the total effect model, which represents the proportion of variance in cannabis use-related problems that is explained by variance in social anxiety. Next, we examined the full model with the mediators, which represents the proportion of variance in cannabis use-related problems that is explained by variance in social anxiety, accounting for the mediators. Finally, we examined the seven individual indirect pathways in the model (relation of social anxiety on cannabis problems via the proposed indirect pathways outlined in Figure 1; see Table 2, Indirect Effects). All specific and conditional indirect effects were subjected to follow-up bootstrap analyses with 10,000 resamples from which a 95% confidence interval (CI) was estimated (Hayes, 2009; Preacher & Hayes, 2004, 2008). Pairwise comparisons were conducted for all specific indirect effects to test for differences between specific indirect effects. For two specific indirect effects with opposite signs, the contrast is the difference between absolute values of the indirect effects. A significant

contrast indicates that that one specific indirect effect is larger than the other effect (Hayes, 2013, 2018).

Results

Social anxiety was significantly correlated with NA, PA, cannabis use to decrease NA, use to increase PA, and cannabis problems (Table 1). Use to decrease NA and to increase PA were significantly correlated with cannabis use frequency and problems. Use to decrease NA was positively correlated with NA while use to increase PA was not associated with PA.

Cannabis use to manage NA

The total effect model of social anxiety predicting cannabis problems was significant, $R^2 = 0.018$, $F(1, 276) = 5.13$, $p = .024$. The full model with the NA-related mediators (i.e., NA and using cannabis to decrease NA) was also significant, $R^2 = 0.148$, $F(4, 273) = 11.85$, $p < .0001$. The direct effect of social anxiety on cannabis problems (controlling for the mediators) was no longer significant (Table 2). See Figure 2 for sequential pathways from social anxiety to cannabis problems via NA, use to decrease NA, and cannabis use frequency. Regarding the test of the indirect effects (Table 2), contrary to prediction, social anxiety was not related to more cannabis problems via the sequential effects of NA, use to decrease NA in social situations, and frequency. Rather, greater social anxiety was predictive of more cannabis problems indirectly via use to decrease NA in social situations and the sequential effects of use to decrease NA in social situations and more frequent cannabis use. In fact, results from the pairwise comparisons between indirect effects indicated that the indirect effect of the social anxiety $\rightarrow$ use to decrease NA in social situations $\rightarrow$ cannabis use frequency $\rightarrow$ cannabis problems pathway, $b = 0.007$, $SE = 0.004$, 95% CI: [0.002, 0.016], and the social anxiety $\rightarrow$ use to decrease NA in social situations $\rightarrow$ cannabis problems pathway, $b = 0.011$, $SE = 0.006$, 95% CI: [0.007, 0.022], were both larger than the indirect effect of proposed pathway (social anxiety $\rightarrow$ NA $\rightarrow$ use to decrease NA in social situations $\rightarrow$ cannabis use frequency $\rightarrow$ cannabis problems).

Cannabis use to manage PA

The full model with the PA-related mediators (i.e., PA and using cannabis to increase PA) was also significant, $R^2 = 0.166$, $F(4, 273) = 13.58$, $p < .0001$. The direct effect of social anxiety on cannabis problems (controlling for the mediators) was no longer significant (Table 3). See Figure 3 for sequential pathways from social anxiety to cannabis problems via PA, use to increase PA, and cannabis use frequency. Regarding the test of the indirect effects (Table 3), contrary to prediction, social anxiety was not related to more cannabis problems via the sequential effects of PA, use to increase PA in social situations, and frequency. Rather, greater social anxiety was predictive of more cannabis problems indirectly via use to increase PA in social situations and the sequential effects of use to increase PA in social situations and more frequent cannabis use. In fact, results from the pairwise comparisons between indirect effects indicated that the indirect effect of the pathway social anxiety $\rightarrow$ use to increase PA in social situations $\rightarrow$ cannabis problems, $b = 0.011$, $SE = 0.005$, 95% CI: [0.002, 0.022], and the pathway social anxiety $\rightarrow$ use to increase PA in social situations $\rightarrow$ cannabis use frequency $\rightarrow$ cannabis problems, $b = 0.007$, $SE = 0.003$, 95% CI: [0.002,

0.014], were larger than the indirect effect of the proposed pathway (social anxiety → PA → use to increase PA in social situations → cannabis use frequency → cannabis problems).

Discussion

This is the first known test of the role of low PA in the relationship between social anxiety and cannabis outcomes. As predicted, social anxiety was related to more cannabis use to increase PA in social situations and using cannabis to increase PA was related to more frequent cannabis use and more cannabis-related problems. In contrast to our hypotheses, social anxiety was not indirectly related to use frequency or related problems via PA generally, which highlights the specificity of PA in social contexts. However, sequential mediation analyses supported alternative models: social anxiety was indirectly related to cannabis-related problems through using to increase PA in social situations and frequency of use. In other words, it may be that individuals with elevated social anxiety do not use cannabis to increase PA generally; rather they do so to increase PA specifically in social situations. Further, our results indicate that socially anxious individuals who use cannabis to increase PA in social situations also use cannabis more frequently, which in turn is related to more cannabis-related problems. These findings highlight cannabis use to increase PA in social situations is related to more frequent cannabis use and more cannabis-related problems, which extends prior work indicating that cannabis use to cope with NA in social situations was a robust predictor of cannabis-related problems, above and beyond use frequency and coping motives generally (Buckner, Heimberg, et al., 2012).

Consistent with prior work finding social anxiety to be related to cannabis use to manage NA (e.g., Buckner et al., 2007), sequential mediation analyses indicated that social anxiety was indirectly related to cannabis problems via cannabis use to decrease NA in social situations and more frequent cannabis use. In contrast to our hypotheses, social anxiety was not indirectly related to use or use related problems via NA generally. In both PA and NA models, our initial hypothesized models including general PA and NA were not supported, however, we found support for alternative models when general PA and NA were not included in the models. These findings highlight the importance of use context and its role in the relations between social anxiety and cannabis-related problems, which indicates that individuals with greater social anxiety do not necessarily use cannabis to manage affect generally; rather our results suggest they use it to manage affect specifically in social situations. This may be especially problematic since a majority of cannabis use occurs in social situations (e.g., Buckner, Crosby, Silgado, et al., 2012; Buckner et al., 2015; Buckner, Zvolensky, et al., 2013; Reilly et al., 1998).

In both PA and NA models, it is noteworthy that the size of the indirect effects of use to manage affect and use frequency were small. This small effect may reflect the non-clinically anxious nature of the sample, given that the size of the effect of social anxiety on substance use problems is greater at clinically elevated levels of social anxiety than normative levels of social anxiety (Buckner & Heimberg, 2010; Buckner, Heimberg, Matthews, & Silgado, 2012). However, identifying specific use vulnerability factors such as cannabis use to manage PA and to manage NA in social situations may be clinically significant (Abelson,

1985), given that even subclinical levels of social anxiety are robustly related to cannabis-use related problems (e.g., Buckner, Bonn-Miller, Zvolensky, & Schmidt, 2007; Buckner, Ecker, & Dean, 2016; Buckner, Heimberg, et al., 2012; Buckner & Schmidt, 2008; Buckner, Schmidt, Bobadilla, & Taylor, 2006).

Consistent with prior work, (e.g., Buckner et al., 2007; Buckner et al., 2010; Buckner & Schmidt, 2008; Ecker & Buckner, 2014), social anxiety was not related to cannabis use frequency generally. However, it was related to more use to increase PA and to decrease NA in social situations. This finding adds to a growing body of work indicating that social anxiety is related to more use in specific cannabis use situations, such as to cope in social situations (Buckner, Heimberg, et al., 2012) and when alone (Buckner et al., 2016). More use in these high-risk situations is related to more cannabis-related impairment (Buckner et al., 2016; Buckner, Heimberg, et al., 2012). When considered in light of the current findings, an important next step will be to determine whether cannabis is used in specific, high-risk cannabis use situations to increase PA, decrease NA, or for other emotion regulation goals. Such information could inform efforts to refine treatment and prevention protocols aimed at decreasing cannabis use in such high-risk situations.

Findings have important treatment implications. To illustrate, current cognitive behavioral protocols (e.g., Steinberg et al., 2005) include identification of triggers for high-risk use. Clinicians may consider encouraging patients with SAD to identify social situations in which they want to increase PA as well as those in which they want to decrease NA as high-risk situations. These patients may benefit from learning skills to help them more adaptively increase PA and decrease NA in social situations to reduce their reliance on cannabis and reduce associated cannabis-related problems. Cannabis users with social anxiety may also benefit from psychoeducation on the effects of cannabis on affect. For example, although cannabis has been shown to decrease NA following use (Buckner et al., 2015; Cuttler, Spradlin, & McLaughlin, 2018), some evidence suggests that cannabis use does not impact subsequent PA (Buckner et al., 2015).

Results should be interpreted in light of limitations that can inform future work in this area. First, the sample was comprised of predominantly White, female undergraduates and was conducted in a state where cannabis remains legal for medical but not recreational purposes. Yet even in states where cannabis is legal for recreational purposes, many universities have policies that prohibit cannabis use, possession, and distribution on campus and engaging in such activity may result in disciplinary action for the student, such as dismissal from the university (Regents of the University of California; Sims, 2018; Vice Provost for Student Affairs, 2018). Additional work is necessary to test whether results generalize to more diverse samples of cannabis users, including cannabis users in states in which cannabis is legal for recreational purposes. Second, the study was cross-sectional in nature, permitting an important first step in testing the putative relations among study variables (Hayes, 2013, 2018); however, no causal conclusions can be reached. Thus, prospective and experimental work will be an important next step. Third, the use of a non-clinical convenience sample provides important information about the nature of the relations among study variables given that the majority of cannabis users do not seek treatment for their cannabis use (e.g., Buckner et al., 2010; Stinson et al., 2006); however, future work testing whether results

generalize to treatment-seeking samples or those with clinically-elevated levels of social anxiety will be an important next step. Fourth, data were collected using retrospective self-report and future work utilizing multi-method (e.g., ecological momentary assessment of reasons for use during in vivo cannabis use; biological verification of cannabis use) and/or multi-informant (e.g., collateral reports of cannabis use) approaches are necessary.

Despite these limitations, findings from the current study provide novel support suggesting that social anxiety is related to using cannabis to decrease NA and increase PA in social situations specifically, rather than to manage NA and PA more generally. Further, findings suggest that cannabis users with social anxiety may use cannabis to decrease NA and increase PA in social situations, which in turn increases use frequency, and thus, problem risk. These novel findings could inform treatment efforts geared toward personalization of treatment for high-risk users, such as those with elevated social anxiety.

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Figure 1.

Conceptual model depicting the sequential pathways from social anxiety to cannabis problems via NA/PA, use to decrease NA/increase PA, and cannabis use frequency.

Figure 2.

Model depicting the sequential pathways from social anxiety to cannabis problems via NA, use to decrease NA, and cannabis use frequency. * $p < .05$, ** $p < .01$, *** $p < .001$. NA - negative affect

Figure 3. Model depicting the sequential pathways from social anxiety to cannabis problems via PA, use to increase PA, and cannabis use frequency * $p < .05$, ** $p < .01$, *** $p < .001$. PA= positive affect

Table 1

Descriptive data and correlations between study variables

	1	2	3	4	5	6	7
1. Social anxiety	-						
2. Negative affect (NA)	.40 ***	-					
3. Positive affect (PA)	-.24 ***	-.01	-				
4. Using to decrease NA	.36 ***	.24 ***	-.05	-			
5. Using to increase PA	.21 ***	.09	-.01	.84 ***	-		
6. Number of cannabis related problems	.14 **	.07	-.12 *	.29 ***	.33 ***	-	
7. Cannabis use frequency	.09	-.02	.03	.41 ***	.53 ***	.34 ***	-
<i>M</i>	18.63	19.12	29.05	3.20	5.96	2.32	2.94
<i>SD</i>	10.48	6.31	7.11	7.23	8.83	2.55	2.60
<i>Min</i>	0	10	10	0	0	0	0
<i>Max</i>	64	50	50	72	72	10	19
<i>Range</i>	0–64	10–47	10–45	0–45	0–53	0–10	0–12
<i>Skewness</i>	1.16	1.06	–0.34	3.15	2.47	1.33	1.35
<i>Kurtosis</i>	1.76	1.70	0.29	10.62	6.80	1.68	1.04

*
 $p < .05$,**
 $p < .01$,***
 $p < .001$

Table 2

Bootstrapping analyses testing direct and indirect effects of NA-related variables

	t	b	SE	95% C.I.	p
Direct Effects					
DV: NA					
Social anxiety	7.3055	0.2423	0.0332	[0.1770, 0.3076]	<.0001
DV: Use to decrease NA					
NA	1.8186	0.1273	0.0700	[-0.0105, 0.2651]	.070
Social anxiety	5.1817	0.2183	0.0421	[0.1354, 0.3012]	<.0001
DV: Cannabis use frequency					
NA	-1.9614	-0.0486	0.0248	[-0.0974, 0.0002]	.051
Use to decrease NA	7.4731	0.1586	0.0212	[0.1168, 0.2004]	<.0001
Social anxiety	-0.3249	-0.0050	0.0155	[-0.0356, 0.0255]	.746
DV: Cannabis problems					
NA	0.2672	0.0067	0.0250	[-0.0425, 0.0558]	.790
Use to decrease NA	2.4548	0.0572	0.0233	[0.0113, 0.1031]	.015
Cannabis use frequency	4.4170	0.2670	0.0604	[0.1480, 0.3860]	<.0001
Social anxiety	0.7015	0.0109	0.0155	[-0.0197, 0.0415]	.484
Indirect Effects					
SA → NA → problems	-	0.0016	0.0051	[-0.0078, 0.0124]	-
SA → MCSAS-NA → problems	-	0.0125	0.0052	[0.0028, 0.0232]	-
SA → frequency → problems	-	-0.0013	0.0046	[-0.0105, 0.0080]	-
SA → NA → MCSAS-NA → problems	-	0.0018	0.0014	[-0.0003, 0.0052]	-
SA → NA → frequency → problems	-	-0.0031	0.0023	[-0.0084, 0.0005]	-
SA → MCSAS-NA → frequency → problems	-	0.0092	0.0038	[0.0033, 0.0178]	-
SA → NA → MCSAS-NA → frequency → problems	-	0.0013	0.0010	[-0.0003, 0.0038]	-

Note. SA = social anxiety, NA = negative affect, MCSAS-NA = cannabis use to decrease negative affect

Table 3

Bootstrapping analyses testing direct and indirect effects of PA-related variables

	t	b	SE	95% C.I.	p
Direct Effects					
DV: PA					
SA	-4.1666	-0.1652	0.0396	[-0.2432, -0.0871]	<.0001
DV: Use to decrease PA					
PA	0.6883	0.0518	0.0753	[-0.0964, 0.2001]	.492
Social anxiety	3.6957	0.1890	0.0511	[0.0883, 0.2896]	<.001
DV: Cannabis use frequency					
PA	0.5893	0.0113	0.0192	[-0.0265, 0.0492]	.556
Use to increase PA	10.2837	0.1583	0.0154	[0.1280, 0.1886]	<.0001
Social anxiety	-0.2984	-0.0040	0.0134	[-0.0303, 0.0223]	.766
DV: Cannabis problems					
PA	-1.9659	-0.0402	0.0204	[-0.0804, 0.0001]	.050
Use to increase PA	2.9655	0.0570	0.0192	[0.0192, 0.0949]	.003
Cannabis use frequency	3.6010	0.2309	0.0641	[0.1047, 0.3571]	<.001
Social anxiety	0.7514	0.0107	0.0142	[-0.0173, 0.0386]	.453
Indirect Effects					
SA → PA → problems	-	0.0066	0.0041	[-0.0004, 0.0157]	-
SA → MCSAS-PA → problems	-	0.0108	0.0050	[0.0027, 0.0218]	-
SA → frequency → problems	-	-0.0009	0.0035	[-0.0080, 0.0062]	-
SA → PA → MCSAS-PA → problems	-	-0.0005	0.0007	[-0.0021, 0.0008]	-
SA → PA → frequency → problems	-	-0.0004	0.0008	[-0.0023, 0.0011]	-
SA → MCSAS-PA → frequency → problems	-	0.0069	0.0031	[0.0020, 0.0140]	-
SA → PA → MCSAS-PA → frequency → problems	-	-0.0003	0.0005	[-0.0014, 0.0006]	-

Note. SA = social anxiety, PA = positive affect, MCSAS-PA = cannabis use to increase positive affect in social situations.