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Marijuana Use Motives and Social Anxiety among Marijuana Using Young Adults

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Abstract

Given the high rates of co-occurring marijuana use and social anxiety, the present investigation examined the relations among marijuana use motives, marijuana use and problems, and social anxiety in 159 (54.7% female) young adults (M_{age} = 18.74, *SD* = 1.20). As expected, after covarying for a number of variables related to both marijuana use and social anxiety (e.g. gender, alcohol use problems, anxiety sensitivity), social anxiety predicted greater numbers of marijuana use problems. Interestingly, social anxiety was not related to marijuana use frequency. Also consistent with prediction, social anxiety was a significant predictor of coping and conformity motives for marijuana use above and beyond relevant variables. Finally, coping motives for marijuana use mediated the relation between social anxiety and marijuana use problems. These data provide novel evidence for the unique effects of coping-motivated marijuana use in the link between marijuana-related impairment and social anxiety.

Keywords

Marijuana; Social Anxiety; Social Phobia; Motives; Coping; Affect Regulation

1. Introduction

Marijuana is the most commonly used illicit drug in the United States (U.S.) and internationally (Project MATCH Research Group, 2004). The use of marijuana is particularly common among young adults, with increasing prevalence rates being reported through the 1990's (Johnson, O'Malley, & Bachman, 2001). Marijuana use in college students is especially high with 60 −73% of college students reporting lifetime use of the substance (Bell, Wechsler, & Johnston, 1997;McMillan & Conner, 2002) and approximately one-third of college students endorsing current use (Kilmer et al., 2006). These high rates of marijuana use among young adults are cause for concern given that marijuana is associated with a variety of problems in social, health, and occupational/educational realms (Reilly, Didcott, Swift, & Hall, 1998).

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Research has begun to identify factors related to marijuana use among young adults. Negative emotional states in general, and anxiety in particular, appear to convey risk for use (Patton et al., 2002). According to tension-reduction models, individuals use substances to decrease negative affect states like anxiety (Conger, 1956). Consistent with this model, marijuana users report increased use during times of affective distress (Kaplan, Martin, Johnson, & Robbins, 1986) and relief from tension is the most common reason given for their marijuana use (Hathaway, 2003;Reilly et al., 1998). The expectation that using marijuana will reduce negative affect is associated with marijuana use among undergraduates (Schafer & Brown, 1991). In regard to anxiety more specifically, marijuana users appear to use marijuana because they believe that the drug helps to manage anxiety (Hathaway, 2003;Ogborne, Smart, Weber, & Birchmore-Timney, 2000;Zvolensky, Bernstein, Marshall, & Feldner, 2006).

Social anxiety is one form of anxiety that is associated with particularly high rates of problematic marijuana use. Social anxiety refers to a type of anxiety experienced in or in anticipation of social and/or performance situations for fear of negative evaluation. Recent studies have suggested that marijuana dependence is associated with high rates of social anxiety (Buckner et al., in press). For example, the National Comorbidity Study (NCS) indicated that individuals with social anxiety are *seven times* more likely to experience marijuana-related impairment relative to the general population (Agosti, Nunes, & Levin, 2002). The NCS data also indicate that there may be some specificity between marijuana use problems and social anxiety, as the rate of marijuana dependence was more than twice that of any other anxiety disorder. In a longitudinal investigation, after controlling for relevant Axis I psychopathology, adolescent SAD (but not other anxiety or depressive disorders) was linked to greater rates of marijuana dependence at age 30 (Buckner et al., in press). These data further support the contention that SAD increases risk for marijuana use disorders. Consistent with studies focused on clinical conditions, other reports indicate that daily marijuana users report significantly higher levels of social anxiety symptoms than individuals who use marijuana less regularly (Oyefeso, 1991) and that college students with greater social anxiety symptomatology demonstrate greater numbers of marijuana use problems (Buckner, Mallott, Schmidt, & Taylor, 2006;Buckner, Schmidt, Bobadilla, & Taylor, 2006).

Although there is a link between social anxiety and marijuana use *problems* in clinical (Agosti et al., 2002;Buckner et al., in press;Lynskey et al., 2002) and college samples (Buckner, Mallott et al., 2006;Buckner, Schmidt, Bobadilla et al., 2006) it remains unclear whether social anxiety is related to a greater *frequency* of marijuana use. We know of only one study that has examined the relation between frequency of marijuana use and social anxiety (Oyefeso, 1991). This report examined social anxiety among male undergraduate marijuana users and found daily marijuana users demonstrated higher levels of social anxiety relative to individuals who used marijuana less frequently. Although this study is limited by the exclusion of female marijuana users, this finding suggests that at least some socially anxious marijuana users may use marijuana more frequently than non-socially anxious marijuana users.

The question arises as to why social anxiety, in particular, is associated with such high rates of marijuana-related impairment. Uncovering pathways through which marijuana-related impairment may emerge among socially anxious individuals is a critical step for research in this area. Motivational models of substance use posit that substance use motivated by different needs represents distinct behaviors as a function of the ability of the substance to fulfill the particular need (Cooper, Frone, Russell, & Mudar, 1995). Thus, different motives are associated with unique patterns of use, use consequences, etc.

Two motives, in particular, may be related to social anxiety. First, socially anxious individuals may be vulnerable to using marijuana for coping motives (i.e., to regulate negative affective states). Although we know of no studies directly testing this hypothesis, anxious individuals

appear to be at risk for coping-motivated marijuana use. For instance, the perceived ability to cope with stress has been found to moderate the relation between marijuana use problems and social anxiety among college undergraduates (Buckner, Schmidt, Bobadilla et al., 2006). Further, other anxiety conditions have been linked to coping motives for marijuana use (Bonn-Miller, Zvolensky, & Bernstein, 2007;Comeau, Stewart, & Loba, 2001). Second, socially anxious individuals may be particularly vulnerable to conformity motives (i.e., using marijuana to avoid social censure). In fact, socially anxious undergraduates with the greatest numbers of substance-using friends have been found to demonstrate greater rates of marijuana use problems (Buckner, Mallott et al., 2006). However, given the cross-sectional nature of those data, it is unclear whether this finding reflects coping or conformity motives. Socially anxious individuals may use marijuana to cope with negative affect and then seek out marijuana-using friends to avoid negative evaluation by peers that do not use marijuana. Alternatively, socially anxious individuals may engage in conformity–motivated marijuana use, using marijuana to avoid negative evaluation by marijuana-using peers.

To the extent social anxiety is related to problematic marijuana use, it is possible that coping motives could mediate this association. Using marijuana to cope with negative affectivity may limit, or forestall altogether, more adaptive mood management strategies among active marijuana users. If socially anxious young adults use marijuana to cope with distressing emotional symptoms, they may learn to rely on the drug to: (1) gain "entry" into social situations in which marijuana is present, (2) manage anxiety reactions in anticipation of and/or during social situations, and/or (3) avoid social interactions by using marijuana rather than attending social situations (e.g., class, work, social functions). In so far as this behavior pattern is effective in minimizing negative affect, over time these individuals will presumably be at greater risk for marijuana use problems. However, given mixed data regarding whether conformity motives are related to marijuana use behaviors (Bonn-Miller et al., 2007;Simons, Correia, Carey, & Borsari, 1998), it is unlikely that conformity motives would play a mediational role in the relation between social anxiety and marijuana use frequency or problems.

The present investigation was designed to test four interrelated research aims focused on explicating the associations between social anxiety and marijuana factors among young adults. First, we investigated whether social anxiety would be related to marijuana use frequency and problems above and beyond variables that are associated with social anxiety and/or marijuana-related variables. We examined whether social anxiety was related to frequency of marijuana use above and beyond the effects of gender, anxiety sensitivity (AS; the extent to which an individual believes symptoms of anxiety have harmful consequences) (Reiss & McNally, 1985), obsessive-compulsive (OC) symptoms, alcohol use quantity, and alcohol and marijuana use problems as prior works suggests these constructs are related to both social anxiety and marijuana use (e.g., Agosti et al., 2002;Bonn-Miller et al., 2007;Buckner, Schmidt, & Eggleston, 2006;Crum & Anthony, 1993). We also investigated whether social anxiety would be related to marijuana use problems after controlling for gender, AS, OC symptoms, alcohol use quantity, alcohol use problems, and frequency of marijuana use. Consistent with prior work (Buckner, Mallott et al., 2006;Buckner, Schmidt, Bobadilla et al., 2006;Oyefeso, 1991), it was hypothesized that social anxiety would be related to greater frequency of marijuana use as well as greater number of marijuana use problems. Second, given past data suggesting that social anxiety is linked to marijuana-related impairment in women, but not in men (Buckner, Mallott et al., 2006), we examined the moderational effects of gender on the association between social anxiety and marijuana use problems. Third, we tested whether social anxiety was associated with particular marijuana use motives. In line with past research in this area (Buckner, Mallott et al., 2006;Buckner, Schmidt, Bobadilla et al., 2006), it was hypothesized that social anxiety would be related to coping and conformity motives, but not other motives, after controlling for variables related to both social anxiety and marijuana use (e.g., gender, alcohol use behaviors, marijuana use behaviors). Finally, we examined whether marijuana motives mediated the

relation between social anxiety and marijuana use behaviors. In light of past mediational findings in other populations (Simons, Gaher, Correia, Hansen, & Christopher, 2005) and indirect evidence of mediation with other anxiety conditions (Bonn-Miller et al., 2007;Comeau et al., 2001), we hypothesized that coping motives would mediate any association between social anxiety and marijuana use behaviors.

2. Method

2.1. Participants

The present sample consisted of 159 (54.7% female) undergraduates recruited through introductory psychology course sections who received research credit for their participation. Only individuals reporting lifetime marijuana use were eligible for the study. Participants were at least 18 years of age (range = 18−26) with a mean age of 18.74 (*SD* = 1.20). The racial and ethnic composition of the sample was as follows: 5.0% African American or Black, 3.1% Asian, 79.9% Caucasian or White, 8.8% Hispanic/Latino, and 2.5% mixed race/ethnicity. Participants provided written informed consent and completed a battery of self-report measures in a group setting. No participant refused participation.

2.2. Measures

Marijuana Use Form (MUF).—The MUF is a self-report instrument that assesses marijuana use. Participants reported whether they have ever used marijuana, the date of last marijuana use, and usual frequency of marijuana use (lifetime and past month). Lifetime frequency was assessed using a 0−6 rating scale (0=never, 3=once or twice per month, 6=once or more every day). Past-month frequency was assessed using a 0−9 rating scale (0 = once per month or less, 5 = 5−6 times per month, 9 = at least 21 times per week). This questionnaire is similar to other self-report measures that have been used to successfully assess marijuana use behaviors (Bonn-Miller, Zvolensky, Leen-Feldner, Feldner, & Yartz, 2005;Zvolensky, Bonn-Miller et al., 2006). By subtracting date of last use from date of study completion, we were also able to identify which participants used marijuana in the past three months in addition to those who used marijuana in the past month.

Marijuana Problems Scale (MPS).—The MPS is a 19-item list of negative social, occupational, physical, and personal consequences associated with marijuana use in the past 90 days (Stephens, Roffman, & Curtin, 2000). Examples of problems assessed include: (1) problems between you and your partner, (2) to miss days at work or miss classes, (3) financial difficulties, (4) to have lower productivity, and (5) to feel bad about your use. Participants rate marijuana use problems on a 0−2 scale (0=no problem, 1=minor problem, 2=serious problem). This measure has demonstrated good reliability (Stephens et al., 2004). In the present sample, scores ranged from 0.00 to 17.00 (*M* = 2.95, *SD* = 3.94).

Marijuana Motives Measure (MMM).—The MMM is a 25-item measure assessing the following marijuana use motives: enhancement (e.g., to get high), coping (e.g., to forget my worries), social (e.g., to enjoy a party), conformity (e.g., to fit in with a group I like), and expansion (e.g., to expand my awareness). Participants indicate on a 5-point Likert-type scale (1 = *"almost never / never"* to 5 = *"almost always / always"*) the degree to which they have smoked marijuana for particular reasons (e.g. to be sociable). MMM subscales have demonstrated excellent internal consistency (Chabrol, Ducongé, Casas, Roura, & Carey, 2005).

Liebowitz Social Anxiety Scale – self-report version (LSAS-SR).—The LSAS, a widely used instrument for the assessment of social anxiety (Liebowitz, 1987). The LSAS-SR has demonstrated test-retest reliability, internal consistency, and convergent and discriminant

validity (Baker, Heinrichs, Kim, & Hofmann, 2002). A score of 60 or above has been found to be indicative of clinically meaningful social anxiety (Heimberg, Mueller, Holt, Hope, & Liebowitz, 1992). In the present sample, scores ranged from 0.00 to 99.00 (M = 33.83, SD = 25.00) with 40 (15.1%) students with scores in the clinical range.

***Short Michigan Alcohol Screening Test* (SMAST).—**The SMAST is a 13- item self-report questionnaire designed to screen for lifetime alcohol use problems (Selzer, Vinokur, & van Rooijen, 1975). The SMAST has been used in a variety of settings with diverse populations, including college samples (Fischer & Wampler, 1994;Hussong, 2003). In the present sample, scores ranged from 0.00 to 10.00 (M = 1.55, SD = 1.69).

Alcohol Consumption Form.—This questionnaire was used to measure alcohol consumption. Participants reported the average number of drinks consumed each day of the week during an average week in the past month. This information was then used to derive average quantity of alcohol consumption (i.e., average number of drinks consumed per drinking occasion). This questionnaire is highly similar to other self-report measures that have been shown to provide reliable information on drinking behaviors and to correlate with peer observations of alcohol use (Del Boca & Noll, 2000;Stacy, Widaman, Hays, & DiMatteo, 1985). In the present sample, the average quantity rating was 5.26 (SD = 2.27) drinks per drinking occasion.

***Anxiety Sensitivity Index* (ASI).—**The ASI is a 16-item measure that uses a 5-point Likert-type scale (0 = *"very little"* to 4 = *"very much"*) to assess the degree to which participants are concerned about possible negative consequences of anxiety symptoms (e.g. *"It scares me when I feel shaky"*) (Reiss, Peterson, Gursky, & McNally, 1986). In the present investigation, the total ASI score was used, as it represents the global-order AS factor and therefore takes into consideration different types of fears, including fears of anxiety-related somatic, cognitive, and social cues. In the present sample, scores ranged from 0.00 to 57.00 (M = 19.72, SD = 10.40).

Obsessive-Compulsive Inventory-Revised (OCIR).—The OCIR is an 18-item self-report measure of common OCD symptoms (Foa et al., 2002). Respondents rate the degree to which they have been bothered by each symptom using a scale from 0 (not at all) to 4 (very much). The OCIR has been found to demonstrate good test-retest reliability, good internal consistency, and to differentiate between patients with and without OCD with a clinical cut score of 21 (Foa et al., 2002). In the present sample, scores ranged from 0.00 to 62.00 (M = 13.59, SD = 12.16) with 47 (17.7%) students with scores in the clinical range.

3. Results

3.1. Marijuana Use Patterns

In the present sample, 58.4% (n = 93) endorsed using marijuana in the past three months, 52.2% (n = 83) endorsed using marijuana in the past month, and 13.8% (n = 22) indicated daily marijuana use. Only 15.1% (n = 24) endorsed lifetime marijuana of less than four occasions, with the majority (59.1%; n = 94) indicating monthly use or greater. In regards to lifetime marijuana use, participants who reported using marijuana in the past three months demonstrated an average MUF score of 3.23 (SD = 1.41), indicating an average lifetime usage in the 1−2 times per month range. In regards to past-month marijuana use, we found an average MUF score of 2.34 (SD = 2.64), suggesting an average past-month usage in the once per week range. Among participants reporting past-month marijuana use, the average MUF score was 7.38 (SD = 1.42), indicating an average past-month usage in the 9−13 times per week range.

3.2. Zero-Order Correlations among Anxiety, Substance Use Behaviors, and Marijuana Use Motives

Table 1 depicts the zero-order associations between predictor and criterion variables. Zero-order correlations were conducted to examine the associations between measures of anxiety (social anxiety, AS, and OC symptoms), gender, and substance use behaviors (frequency and problems). As expected, social anxiety was significantly correlated with AS, OC symptoms, female gender, and alcohol use problems. Also as predicted, social anxiety was significantly correlated with marijuana use problems, but contrary to expectation was unrelated to frequency of marijuana use[2]. Further, OC symptoms were significantly associated with both marijuana and alcohol use problems, although AS was unrelated to marijuana use behaviors.

Next, we examined the relations between marijuana motives, marijuana use problems, and social anxiety, and found marijuana use problems to be associated with all marijuana motives except conformity motives. We also found that all marijuana motives were associated with past-month marijuana frequency. As predicted, social anxiety was significantly correlated only with coping and conformity motives.

3.3. Gender Analyses

The moderational effects of gender on the association between social anxiety and marijuana use problems were evaluated. This model was not significant, F (1, 111) = .97, $p > .05$. Further, social anxiety was significantly related to marijuana use problems in both women ($r = .27$, $p < .05$) and men ($r = .35$, $p < .05$), further suggesting that both young men and young women are vulnerable to marijuana use problems. In light of previous work finding social anxiety was related to marijuana use frequency in men (Oyefeso, 1991), we examined the correlations between social anxiety and marijuana use frequency by gender. Social anxiety was not related to marijuana use frequency among women ($r = .00$, $p > .05$) or men ($r = .08$, $p > .05$).

3.4. Relations between Social Anxiety and Marijuana Use Variables Above and Beyond Relevant Variables.

To investigate whether social anxiety was linked to marijuana use problems above and beyond relevant covariates, a hierarchical linear regression was conducted. In this model, marijuana use problems served as the dependent variable. Given their relations to social anxiety and marijuana use behaviors, gender, alcohol use problems, quantity of alcohol consumption, frequency of marijuana use, OC symptoms, and AS were included as covariates. Predictor variables were divided into two steps in the hierarchy: (a) AS, OC symptoms, gender, alcohol use problems, alcohol quantity, and frequency of marijuana use were entered at step 1, and (b) social anxiety was entered at step 2. Social anxiety remained a significant predictor of marijuana use problems after controlling for AS, OC symptoms, gender, alcohol use problems, alcohol quantity, and frequency of marijuana use (see Table 2).

A hierarchical linear regression was next conducted to examine the utility of social anxiety in the prediction of coping and conformity motives above and beyond relevant covariates. In the first model, coping motives served as the dependent variable. In the second model, conformity motives served as the dependent variable. Using the same covariates noted above, predictor variables were divided into three steps in the hierarchy: (a) AS, OC symptoms, gender, alcohol use problems, alcohol quantity, and frequency of marijuana use were entered at step 1, (b) other marijuana use motives were entered at step 2, and (c) social anxiety was entered at step 3. Social anxiety remained a significant predictor of coping motives (but not conformity motives) after controlling for the effects of other marijuana motives, AS, gender, alcohol use problems, alcohol quantity, and frequency of marijuana use (see Table 2).

3.5. Mediation Analyses

The mediational role of coping motives in regard to the relation between social anxiety and marijuana use problems was examined (Kenny, Kashy, & Bolger, 1998) (Table 3). The first requirement of this strategy rests with an association between the predictor variable (social anxiety) and criterion (marijuana -related problems). Given that frequency of marijuana use was unrelated to social anxiety (see Table 1), marijuana use problems served as the only criterion variable examined.

The second and third requirements for testing mediation with this strategy require establishing a relation between the predictor variable and the proposed mediating variable (i.e., marijuana use motive), and the proposed mediating variable and the criterion, respectively. Given that coping motives were the only motives significantly linked to social anxiety and marijuana use problems, only coping motives were examined as a possible mediator. In order to satisfy requirement three, the proposed mediator must be associated with the criterion after controlling for the effects of the predictor. After controlling for social anxiety, coping motives were significantly associated with marijuana use problems (see Table 3).

The final requirement involves evaluating the relation between the predictor and the criterion when the variance accounted for by the proposed mediator has been removed. Traditionally, when this equation yields a non-significant effect for the predictor, the controlling variable is said to mediate the relation. In these analyses, coping motives mediated the relation with marijuana use problems (Table 3).

Due to limitations of conducting mediational analyses using cross-sectional data, one method of increasing confidence in the observed effects is to conduct additional analyses after reversing the proposed mediator with the criterion variable (Sheets & Braver, 1999). In this case, we evaluated whether marijuana use problems mediated the association between social anxiety and coping motives. Regression analyses were not consistent with mediation in this direction as social anxiety remained a significant predictor of coping motives, F (1, 111) = 4.57, $p < .05$. In other words, this model failed to account for the data thereby increasing confidence in the original model's mediational effects.

4. Discussion

There is increased recognition that social anxiety is related to marijuana use problems. The present investigation contributes several unique insights into this relationship. Consistent with prediction, social anxiety was incrementally related to marijuana use problems among young adults. These data, in conjunction with past research (Buckner, Mallott et al., 2006;Buckner, Schmidt, Bobadilla et al., 2006;Buckner et al., in press), suggest social anxiety is indeed concurrently related to marijuana use problems and that this effect is not attributable to other factors related to social anxiety and marijuana use problems (e.g., frequency of marijuana use, AS, gender, drinking behaviors). The observed result should prompt more scientific and clinically focused attention on the high rates of co-occurrence of marijuana use problems and social anxiety. For instance, marijuana use prevention efforts may be developed to target socially anxious young adults and clinicians treating socially anxious patients should carefully screen for marijuana use and use-related impairment.

4.1. Social Anxiety and Coping Motives

Also consistent with prediction, social anxiety was uniquely associated with coping motives for marijuana use. This novel finding is consonant with cognitive-affective motivational models of drug use (Cooper, 1994). These data build upon past anxiety-marijuana research on coping processes (Bonn-Miller et al., 2007;Buckner, Schmidt, Bobadilla et al., 2006;Comeau

et al., 2001) and suggest that social anxiety is related to coping-based motives for marijuana use above and beyond the variance due to other theoretically-relevant factors as well as other motives for marijuana use. Indeed, this is a potentially clinically important finding because it highlights a possible explanatory mechanism.

Finally, as expected, we found evidence for a mediational model wherein coping motives serve to explain, at least in part, the relation between social anxiety and marijuana use problems (Buckner, Schmidt, Bobadilla et al., 2006). Although the cross-sectional nature of the research design does not allow us to disentangle whether coping motives occur after social anxiety (often an implicit feature of mediational models; Baron & Kenny, 1986), the present findings provide data consistent with a coping-derived mediational model. We attempted to strengthen confidence in this observation by evaluating an alterative model where marijuana use problems mediated the relation between social anxiety and coping; no support was evident for such an account.

4.2. Social Anxiety Not Linked to Increased Frequency of Marijuana Use

Contrary to past work (Oyefeso, 1991), our data suggest that social anxiety is unrelated to frequency of marijuana use. There are several factors that could contribute to these discrepant findings. First, methodological differences could account for the dissimilar results as each study used different measures of social anxiety and cannabis use (e.g., Oyefeso used past-year marijuana use to measure frequency whereas the present study examined past- month use). Second, the current study included female undergraduates whereas Oyefeso only examined male undergraduates, although social anxiety was unrelated to marijuana use frequency in men as well as women in the present study. Alternatively, it may be the case that marijuana use problems are a better measure of marijuana-related impairment among socially anxious individuals than marijuana use frequency. This is consistent with the findings in the alcohol-social anxiety literature suggesting that alcohol use problems are more consistently related to social anxiety than measures of quantity/frequency of alcohol use (Buckner, Schmidt, & Eggleston, 2006;Morris, Stewart, & Ham, 2005).

What could account for greater number of substance use problems but not greater frequency of substance use among socially anxious individuals? It may be that socially anxious individuals use substances such as marijuana and alcohol to cope with anxious responding. In the case of marijuana specifically, socially anxious marijuana users may not necessarily use marijuana more frequently than non-socially anxious marijuana users. Rather, the coping-mediational model suggests that something about the manner in which socially anxious young adults use marijuana increases their risk for marijuana-related impairment. It may be that socially anxious marijuana users only use marijuana to manage anxiety and to avoid social censure. By limiting the circumstances in which they use marijuana to those involving social anxiety/censure, socially anxious marijuana users may not be vulnerable to using marijuana more frequently than non-socially anxious marijuana users.

4.3. Social Anxiety Linked to Marijuana Use Problems

Despite not using marijuana more frequently, it appears that something about the way in which socially anxious individuals use marijuana increases their risk for marijuana use problems. Given that socially anxious individuals fear negative evaluation, their use of marijuana in social situations may promote the fear that they will behave in a socially inappropriate manner while under marijuana's influence. This fear may engender greater anxiety when faced with subsequent social situations. Greater anxiety may promote marijuana use to attenuate anxious responding and could result in marijuana-related impairment through several avenues. For instance, socially anxious individuals may use marijuana to attenuate anticipatory anxiety reactions prior to social situations. Once under the influence of marijuana, they may avoid

attending the social situation for fear of being negatively evaluated for being under the influence (e.g., fear of behaving inappropriately while intoxicated, fear of being judged for using an illicit substance). Avoiding social situations while intoxicated could then result in marijuana use problems such as decreased work or school productivity if the social situation in question is work or school. Avoidance may also result in arguments with family or friends regarding use if the socially anxious individual uses marijuana instead of engaging in activities with friends or family, etc.

Alternatively, if the individual views marijuana as an effective method to cope with negative affect (i.e., social anxiety) during social situations, he or she may not strive to learn more effective coping strategies. Rather the individual may use marijuana to manage social anxiety, resulting in impairment in social situations (e.g., work or school functioning, arguments with others, driving under the influence to or from social situations). This second pathway is consistent with existing models of anxiety and marijuana use that posit that marijuana dependent individuals may be particularly vulnerable to relying on marijuana to regulate negative affect (Mitchell, Zvolensky, Marshall, Bonn-Miller, & Vujanovic, in press;Zvolensky et al., 2006).

4.4. Social Anxiety and Conformity Motives

As predicted, social anxiety was related to conformity motives above and beyond relevant variables. These data indicate that at least some socially anxious individuals appear to use marijuana for fear of negative evaluation by marijuana-using peers. Given accumulating evidence suggesting links between social anxiety, marijuana use problems, and peer use variables (Buckner, Mallott et al., 2006), future work should explore whether conformity-motivated marijuana use serves as the means by which socially anxious individuals *initiate* marijuana use. Because peer influence is one of the strongest predictors of marijuana use (Ginsberg & Greenley, 1978;Maxwell, 2002), it may be the case that socially anxious individuals initiate marijuana use as a means to avoid censure from and foster relationships with marijuana-using peers. They may then begin to view marijuana as an effective coping strategy to manage anxiety and begin engaging in coping-motivated marijuana use.

4.5. Limitations and Future Directions

The present study has a number of limitations that deserve comment and suggest further work in this area. First, due to the cross-sectional nature of these analyses, causal inferences cannot be made. Both longitudinal and experimental work are needed to examine our contention that social anxiety serves as a risk factor for the development of high-risk motives which in turn lead to increases in marijuana use problems as it may very well be the case that social anxiety serves as a consequence of prolonged marijuana-related impairment. Second, self-report measures are vulnerable to memory bias. Further, the MPS asks participants to rate how much of a problem each item is for them versus the frequency with which each problem occurs. Future work could therefore benefit by including a multi-method approach with larger sample sizes that would allow for subjective as well as objective ratings of the primary predictor and dependent variables under study. Third, the present study examined a non-referred group of young adults rather than a treatment-seeking sample. On one hand, these data are thereby generalizable to young adult college students, a group particularly vulnerable to marijuana-related impairment. On the other hand, future study is needed to examine whether the observed relations generalize to more severe socially anxious populations. Fourth, the present study consisted of individuals who have used marijuana. Future work is necessary to examine those socially anxious individuals who do not use marijuana to elucidate factors that protect these individuals from using marijuana in maladaptive ways. Fifth, given the nature of the MMM, it is currently unknown whether socially anxious individuals use marijuana to cope with negative affect generally or whether they use marijuana to cope with negative affect specifically

concerning social situations and fear of negative evaluation. It would be important for future work to identify the situations in which socially anxious individuals are vulnerable to using marijuana for coping reasons.

The present study serves as an important step toward the delineation of mechanisms that may contribute to the high rates of co-occurrence between marijuana-related impairment and social anxiety. Our data indicate coping motives play an important role in the co-occurrence of these two problems. Future work is necessary, however, to fully determine why some socially anxious individuals begin to use marijuana to regulate emotions while others do not. Such work will have important implications for the prevention and treatment of this high-risk population.

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Table 1

Zero-order relations among anxiety variables, gender, substance use behaviors, and marijuana use motives

[[|]]	[[1|]]	[[2|]]	[[3|]]	[[4|]]	[[5|]]	[[6|]]	[[7|]]	[[8|]]	[[9|]]	[[10|]]	[[11|]]	[[12|]]	[[13|]]
[[1. Social anxiety|]]	[[-|]]	[[|]]	[[|]]	[[|]]	[[|]]	[[|]]	[[|]]	[[|]]	[[|]]	[[|]]	[[|]]	[[|]]	[[|]]
[[2. Anxiety sensitivity|]]	[[.46**|]]	[[-|]]	[[|]]	[[|]]	[[|]]	[[|]]	[[|]]	[[|]]	[[|]]	[[|]]	[[|]]	[[|]]	[[|]]
[[3. OC symptoms|]]	[[.29**|]]	[[.20*|]]	[[-|]]	[[|]]	[[|]]	[[|]]	[[|]]	[[|]]	[[|]]	[[|]]	[[|]]	[[|]]	[[|]]
[[4. Gender|]]	[[.26**|]]	[[.21**|]]	[[.02|]]	[[-|]]	[[|]]	[[|]]	[[|]]	[[|]]	[[|]]	[[|]]	[[|]]	[[|]]	[[|]]
5. Marijuana use problems	[[.25**|]]	[[.06|]]	[[.28**|]]	[[−.11|]]	[[-|]]	[[|]]	[[|]]	[[|]]	[[|]]	[[|]]	[[|]]	[[|]]	[[|]]
6. Past-month marijuana frequency	[[.03|]]	[[−.09|]]	[[.01|]]	[[−.23**|]]	[[.44**|]]	[[-|]]	[[|]]	[[|]]	[[|]]	[[|]]	[[|]]	[[|]]	[[|]]
7. Past-month alcohol quantity	[[.01|]]	[[−.01|]]	[[−.01|]]	[[−.13|]]	[[.01|]]	[[.18*|]]	[[-|]]	[[|]]	[[|]]	[[|]]	[[|]]	[[|]]	[[|]]
8. Alcohol use problems	[[.17|]]	[[.05|]]	[[.21*|]]	[[−.03|]]	[[.29**|]]	[[.23**|]]	[[.18*|]]	[[-|]]	[[|]]	[[|]]	[[|]]	[[|]]	[[|]]
[[9. Social motives|]]	[[.08|]]	[[.01|]]	[[.06|]]	[[−.15|]]	[[.24**|]]	[[.33**|]]	[[.13|]]	[[.07|]]	[[-|]]	[[|]]	[[|]]	[[|]]	[[|]]
[[10. Coping motives|]]	[[.25**|]]	[[.08|]]	[[.13|]]	[[−.09|]]	[[.36**|]]	[[.42**|]]	[[.08|]]	[[.12|]]	[[.60**|]]	[[-|]]	[[|]]	[[|]]	[[|]]
[[11. Enhancement motives|]]	[[.02|]]	[[−.01|]]	[[−.08|]]	[[.19*|]]	[[.39**|]]	[[.52**|]]	[[.29**|]]	[[.14|]]	[[.70**|]]	[[.61**|]]	[[-|]]	[[|]]	[[|]]
[[12. Conformity motives|]]	[[.19*|]]	[[.16*|]]	[[.07|]]	[[−.01|]]	[[−.02|]]	[[−.18*|]]	[[.02|]]	[[−.04|]]	[[.19*|]]	[[.13|]]	[[−.03|]]	[[-|]]	[[|]]
[[13. Expansion motives|]]	[[.16|]]	[[.20*|]]	[[.15|]]	[[−.17*|]]	[[.40**|]]	[[.45**|]]	[[.10|]]	[[.08|]]	[[.54**|]]	[[.59**|]]	[[.57**|]]	[[.06|]]	[[-|]]

Note. Social anxiety was measures using the Liebowitz Social Anxiety Scale (LSAS), anxiety sensitivity was measured using the Anxiety Sensitivity Index (ASI), OC symptoms were measured using the Obsessive-Compulsive Inventory-Revised (OCIR), marijuana use problems were measured using the Marijuana Problems Scale (MPS), alcohol use problems were measured using the Short Michigan Alcohol Screening Test (SMAST), and marijuana motives were measured with the Marijuana Motives Measure (MMM). OC = Obsessive-Compulsive. * p< 0.05, ** p< 0.01.

Table 2

Relations between social anxiety and marijuana use factors after controlling for relevant variables

[[|]]	ΔR^2	*Finc*	*df*	*t*	[[β|]]	sr^2	*p*
Dependent Variable: Marijuana Use Problems							
[[1|]]	[[.272|]]	[[6.49|]]	[[6, 104|]]	[[|]]	[[|]]	[[|]]	[[<.001|]]
[[Gender|]]	[[|]]	[[|]]	[[|]]	[[−1.11|]]	[[−.71|]]	[[.01|]]	[[Ns|]]
[[Alcohol problems|]]	[[|]]	[[|]]	[[|]]	[[3.03|]]	[[.53|]]	[[.06|]]	[[.00|]]
[[Alcohol quantity|]]	[[|]]	[[|]]	[[|]]	[[−2.01|]]	[[−.26|]]	[[.03|]]	[[<.05|]]
[[Marijuana frequency|]]	[[|]]	[[|]]	[[|]]	[[2.97|]]	[[.38|]]	[[.06|]]	[[.00|]]
[[Anxiety sensitivity|]]	[[|]]	[[|]]	[[|]]	[[1.03|]]	[[.03|]]	[[.01|]]	[[Ns|]]
[[OC symptoms|]]	[[|]]	[[|]]	[[|]]	[[2.07|]]	[[.05|]]	[[.03|]]	[[<.05|]]
[[2|]]	[[.028|]]	[[4.05|]]	[[1, 103|]]	[[|]]	[[|]]	[[|]]	[[<.05|]]
[[Social Anxiety|]]	[[|]]	[[|]]	[[|]]	[[2.01|]]	[[.03|]]	[[.03|]]	[[<.05|]]
Dependent Variable: Coping Motives							
[[1|]]	[[.198|]]	[[4.20|]]	[[6, 102|]]	[[|]]	[[|]]	[[|]]	[[<.001|]]
[[Gender|]]	[[|]]	[[|]]	[[|]]	[[.57|]]	[[.43|]]	[[0.00|]]	[[Ns|]]
[[Alcohol problems|]]	[[|]]	[[|]]	[[|]]	[[−.33|]]	[[−.07|]]	[[0.00|]]	[[ns|]]
[[Alcohol quantity|]]	[[|]]	[[|]]	[[|]]	[[.26|]]	[[.04|]]	[[0.00|]]	[[ns|]]
[[Marijuana frequency|]]	[[|]]	[[|]]	[[|]]	[[4.68|]]	[[.70|]]	[[0.17|]]	[[.00|]]
[[Anxiety sensitivity|]]	[[|]]	[[|]]	[[|]]	[[.58|]]	[[.02|]]	[[0.00|]]	[[ns|]]
[[OC symptoms|]]	[[|]]	[[|]]	[[|]]	[[1.26|]]	[[.04|]]	[[0.01|]]	[[ns|]]
[[2|]]	[[.351|]]	[[19.11|]]	[[4, 98|]]	[[|]]	[[|]]	[[|]]	[[<.001|]]
[[Social motives|]]	[[|]]	[[|]]	[[|]]	[[2.40|]]	[[.27|]]	[[0.03|]]	[[<.05|]]
[[Enhancement motives|]]	[[|]]	[[|]]	[[|]]	[[2.12|]]	[[.18|]]	[[0.02|]]	[[<.05|]]
[[Conformity motives|]]	[[|]]	[[|]]	[[|]]	[[1.42|]]	[[.16|]]	[[0.01|]]	[[ns|]]
[[Expansion motives|]]	[[|]]	[[|]]	[[|]]	[[2.61|]]	[[.31|]]	[[0.03|]]	[[.01|]]
[[3|]]	[[.033|]]	[[7.56|]]	[[1, 97|]]	[[|]]	[[|]]	[[|]]	[[<.01|]]
[[Social anxiety|]]	[[|]]	[[|]]	[[|]]	[[2.75|]]	[[.04|]]	[[.03|]]	[[<.01|]]
Dependent Variable: Conformity Motives							
[[1|]]	[[.044|]]	[[.77|]]	[[6, 102|]]	[[|]]	[[|]]	[[|]]	[[ns|]]
[[Gender|]]	[[|]]	[[|]]	[[|]]	[[−.52|]]	[[−.29|]]	[[0.00|]]	[[ns|]]
[[Alcohol problems|]]	[[|]]	[[|]]	[[|]]	[[−.57|]]	[[−.09|]]	[[0.00|]]	[[ns|]]
[[Alcohol quantity|]]	[[|]]	[[|]]	[[|]]	[[−.09|]]	[[−.01|]]	[[0.00|]]	[[ns|]]
[[Marijuana frequency|]]	[[|]]	[[|]]	[[|]]	[[−.97|]]	[[−.11|]]	[[0.01|]]	[[ns|]]
[[Anxiety sensitivity|]]	[[|]]	[[|]]	[[|]]	[[1.13|]]	[[.03|]]	[[0.01|]]	[[ns|]]
[[OC symptoms|]]	[[|]]	[[|]]	[[|]]	[[1.07|]]	[[.02|]]	[[0.01|]]	[[ns|]]
[[2|]]	[[.124|]]	[[3.64|]]	[[4, 98|]]	[[|]]	[[|]]	[[|]]	[[<.01|]]
[[Social motives|]]	[[|]]	[[|]]	[[|]]	[[2.54|]]	[[.25|]]	[[0.05|]]	[[<.05|]]
[[Enhancement|]]	[[|]]	[[|]]	[[|]]	[[|]]	[[|]]	[[|]]	[[|]]
[[motives|]]	[[|]]	[[|]]	[[|]]	[[−2.04|]]	[[−.16|]]	[[0.04|]]	[[<.05|]]
[[Coping motives|]]	[[|]]	[[|]]	[[|]]	[[1.42|]]	[[.13|]]	[[0.02|]]	[[ns|]]
[[Expansion motives|]]	[[|]]	[[|]]	[[|]]	[[.23|]]	[[.03|]]	[[0.00|]]	[[ns|]]
[[3|]]	[[.033|]]	[[4.01|]]	[[1, 97|]]	[[|]]	[[|]]	[[|]]	[[<.05|]]
[[Social anxiety|]]	[[|]]	[[|]]	[[|]]	[[2.00|]]	[[.02|]]	[[0.03|]]	[[<.05|]]

Note. Social anxiety was measures using the Liebowitz Social Anxiety Scale (LSAS), anxiety sensitivity was measured using the Anxiety Sensitivity Index (ASI), OC symptoms were measured using the Obsessive-Compulsive Inventory-Revised (OCIR), marijuana use problems were measured using the Marijuana Problems Scale (MPS), alcohol use problems were measured using the Short Michigan Alcohol Screening Test (SMAST), and marijuana motives were measured with the Marijuana Motives Measure (MMM). OC = Obsessive-Compulsive.

β = standardized beta weight; sr^2 = squared semi-partial correlation

Table 3

Regression Analyses Testing for Mediation: (1) Effect of Social Anxiety on Marijuana use problems, (2) Effect of Social Anxiety on Coping Motives (Mediator), (3) Effect of Coping Motives on Marijuana use problems After Controlling for Social Anxiety, and (4) Effect of Social Anxiety on Marijuana use problems after Controlling for Coping Motives

[[Dependent Variable|]]	[[Independent Variable(s)|]]	[[β|]]	*F*
[[Marijuana use problems|]]	[[1. Social Anxiety|]]	[[.25|]]	[[7.30**|]]
[[Coping Motives|]]	[[2. Social Anxiety|]]	[[.18|]]	[[9.64**|]]
[[Marijuana -Related Problems|]]	[[3. Coping Motives|]]	[[.26|]]	[[8.34**|]]
[[|]]	[[Social Anxiety|]]	[[.25|]]	[[7.73**|]]
[[Marijuana -Related Problems|]]	[[4. Social Anxiety|]]	[[.07|]]	[[1.63|]]
[[|]]	[[Coping Motives|]]	[[.44|]]	[[50.90***|]]

Note. Social anxiety was measured using the Liebowitz Social Anxiety Scale (LSAS), marijuana use problems were measured using the Marijuana Problems Scale (MPS), and marijuana motives were measured with the Marijuana Motives Measure (MMM).

β = standardized beta weight provided for multiple regression. Social anxiety was separately regressed on each dependent variable in steps (1) and (2). Social anxiety and mediator were simultaneously regressed on the dependent variable in step (4).

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