Published in final edited form as:

Addict Behav. 2017 July ; 70: 49–53. doi:10.1016/j.addbeh.2017.02.014.

Anxiety and Cannabis-Related Problem Severity among Dually Diagnosed Outpatients: The Impact of False Safety Behaviors

Julia D. Buckner^{a,*}, Michael J. Zvolensky^{b,c}, Anthony H. Ecker^{d,e}, Emily R. Jeffries^a, Austin W. Lemke^a, Kimberlye E. Dean^a, Michael S. Businelle^f, and Matthew W. Gallagher^b

^aDepartment of Psychology, Louisiana State University, 236 Audubon Hall, Baton Rouge, LA 70803, USA

^bDepartment of Psychology, University of Houston, Houston, TX, USA

^cDepartment of Behavioral Sciences, University of Texas MD Anderson Cancer Center, Houston, TX, USA

^dVA South Central Mental Illness Research, Education, and Clinical Center, Houston, TX, USA

^eMenninger Department of Psychiatry and Behavioral Sciences, Baylor College of Medicine, Houston, TX, USA

^fDepartment of Family and Preventive Medicine, University of Oklahoma Health Sciences Center, Oklahoma City, OK, USA

Abstract

Cannabis use disorder (CUD) co-occurs with anxiety disorders at high rates. Little is known about the mechanisms linking CUD and anxiety disorders. One theoretically-driven perspective is that individuals with anxiety disorders may be more apt to use FSBs (i.e., behaviors that may be effective in decreasing anxiety in the short-term, but can maintain and even exacerbate anxiety in the long-term), which can perpetuate cannabis use despite cannabis-related problems. The present study tested whether FSB use explained the relation of anxiety symptom severity with cannabis quantity and related problems among 77 adults with CUD and comorbid anxiety disorders seeking outpatient CUD treatment. Results indicated that FSB frequency was significantly related to anxiety symptom severity and cannabis problem severity, but not cannabis quantity. Anxiety symptom severity was indirectly (via FSB frequency) related to cannabis problem severity, but not to cannabis quantity. These novel findings suggest that more frequent use of FSBs may play an important role in cannabis problem severity among individuals with CUD and anxiety disorders.

*Corresponding author.

Publisher's Disclaimer: This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Contributors

Drs. Buckner and Zvolensky designed the study and wrote the protocol. Dr. Buckner conducted the statistical analyses. All authors contributed to writing the manuscript and approved the final manuscript.

Conflict of Interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of this paper.

Keywords

cannabis; marijuana; cannabis-related problems; false safety behaviors; anxiety; dual diagnosis

1. Introduction

Cannabis remains the most widely used illicit substance and rates of use have increased over the past decade (Substance Abuse and Mental Health Services Administration [SAMHSA], 2014). Approximately 25% of persons who use cannabis are daily users (SAMHSA, 2014). Over 20% of past-year users meet criteria for a current cannabis use disorder (CUD) and CUD is the most prevalent substance use disorder (SAMHSA, 2014).

Anxiety is highly related to CUD – 43.5–50% of people with CUD have an anxiety disorder, a rate nearly six times that of those without CUD (Stinson, Ruan, Pickering, & Grant, 2006). Anxiety disorders tend to onset before cannabis dependence among dually diagnosed individuals (Agosti, Nunes, & Levin, 2002) and prospective work supports that anxiety may increase CUD vulnerability – relative to adolescents without social anxiety disorder (SAD), those with SAD were nearly five times more likely to develop cannabis dependence as young adults after controlling for depression and other relevant disorders (Buckner et al., 2008). In fact, generalized anxiety and social anxiety are both prospectively related to greater risk of cannabis-related problems (Marmorstein, White, Loeber, & Stouthamer-Loeber, 2010). Anxiety may maintain cannabis use and related problems. Greater anxiety at treatment termination predicts greater post-treatment cannabis use and use-related problems (e.g., Buckner & Carroll, 2010). Further, cannabis dependence may increase risk for developing some types of anxiety (e.g., Zvolensky et al., 2006).

Individuals with CUD may be vulnerable to using false safety behaviors (FSB; i.e., behaviors that help one avoid or alleviate anxiety and related affect), such as avoidance and cannabis use, to help manage anxiety and related conditions. FSBs are utilized across anxiety conditions because they often temporarily alleviate anxiety (e.g., avoiding a situation that engenders fear; Schmidt et al., 2012). Yet, repeated use of FSB maintains pathological anxiety (Hope, Durrheim, d’Espaignet, & Dalton, 2006; Salkovskis, Clark, & Hackmann, 1991). Although not all cannabis use may occur to manage anxiety (e.g., anxiety is also related to conformity-motivated cannabis use; Buckner, Bonn-Miller, Zvolensky, & Schmidt, 2007; Comeau, Stewart, & Loba, 2001), chronically using cannabis to reduce anxiety (i.e., using cannabis as a FSB) may facilitate learning that anxiety should be avoided because it is harmful. Further, some strains of cannabis (especially those with higher levels of THC) can increase anxiety (see Crippa et al., 2009), resulting in a positive feedback loop between anxiety and cannabis use.

Although no studies have tested the relation of FSB in the anxiety-cannabis link, indirect evidence highlights that FSBs may play an important role. Relaxation/tension-reduction and coping with negative affect are among the most common reasons for cannabis use (Buckner et al., 2015; Reilly, Didcott, Swift, & Hall, 1998) and coping-motivated use partially accounts for cannabis-related problems among anxious users (e.g., Buckner et al., 2007; Buckner, Heimberg, Matthews, & Silgado, 2012). Individuals with more cannabis-related

problems engage in FSBs such as avoidance (e.g., social avoidance; Buckner, Heimberg, & Schmidt, 2011) and avoiding social situations if cannabis is unavailable (Buckner & Zvolensky, 2014). Importantly, avoidance behaviors mediate the relation between social anxiety and cannabis problems (Buckner et al., 2011) and coping motivated cannabis use (Buckner, Zvolensky, Farris, & Hogan, 2014).

The current study sought to evaluate the role of FSB on anxiety-cannabis relation among adult treatment-seeking patients with CUD and anxiety disorders. First, we tested whether more severe anxiety would be related to more frequent FSB use. Second, we tested whether FSB would be related to cannabis quantity and related problems. Third, we tested whether FSB frequency would explain the relation of anxiety severity with cannabis quantity and related problems.

2. Method

2.1 Participants and Procedures

Participants ($n=77$) were adult treatment-seeking cannabis users ($M_{age}=24.0$, $SD=8.0$; 41.6% female) recruited from the community (via flyers, newspaper and online advertisements) to participate in a trial of two psychosocial interventions for CUD ([clinicaltrials.gov](https://clinicaltrials.gov/ct2/show/study/NCT01875796) #NCT01875796). Because one of the interventions targeted comorbid CUD and anxiety disorders, inclusion criteria included having used cannabis in the past week to manage anxiety, cannabis as drug of choice to manage anxiety, and being interested in treatment to manage anxiety and cannabis in addition to 18–65 years of age, endorsing motivation to quit smoking cannabis, and willing to complete treatment and assessment appointments. Exclusion criteria included currently receiving psychological or substance use treatment, being mandated for treatment, and currently being pregnant or interested in becoming pregnant during the study timeframe. The current study is based on secondary analyses of pre-treatment data.

The racial/ethnic composition of the current sample was non-Hispanic White (63.6%), Hispanic White (13.0%), non-Hispanic African American (19.5%), Asian/Asian American (1.3%), and other (2.6%). Participants were well educated with 65.3% indicating that they completed at least part of college and 14.7% indicating they had a bachelor's degree. Regarding relationships, 78.7% reported marital status as single, 8.0% as cohabitating, 5.3% as divorced, 4.0% as "other", 2.7% as married, and 1.3% as separated. Age of first cannabis use was on average 16.2 years old ($SD=3.2$). The majority (96.1%) used at least four times in the past month, with 59.7% endorsing using at least 24 days in the past month ($M=21.5$, $SD=8.9$). The majority (83.3%) reported at least one serious previous cannabis quit attempt ($M=3.7$, $SD=13.5$). Only 9.8% endorsed a history of treatment for drug use whereas 41.0% endorsed a history of anxiety treatment. Primary DSM-5 diagnoses were: CUD (45.5%), SAD (32.5%), generalized anxiety disorder (13.0%), panic disorder (3.9%), other specified anxiety disorder (2.6%), and other (2.6%; e.g., agoraphobia).

Participants provided written informed consent prior to participation and study protocol was approved by the university's Institutional Review Board. Participants underwent a clinical interview and completed a computerized battery of self-report questionnaires.

2.2 Measures

The clinician-administered *Timeline Follow Back* (TLFB; Sobell & Sobell, 1992) assessed cannabis use quantity in the past 90 days. Participants were asked to record the number of cannabis joints they smoked every day. Number of joints was summed. The TLFB is a reliable and valid self-report measure of cannabis use (O'Farrell, Fals-Stewart, & Murphy, 2003; Robinson, Sobell, Sobell, & Leo, 2014).

The *Marijuana Problems Scale* (MPS; Stephens, Roffman, & Curtin, 2000) assessed the severity of 19 cannabis-related problems experienced in the past 90 days from 0 (*no problem*) to 2 (*serious problem*). Items were summed. The measure achieved good internal consistency in prior work (Lozano, Stephens, & Roffman, 2006) and currently ($\alpha=.86$).

The *Social Interaction Anxiety Scale* (SIAS; Mattick & Clarke, 1998) is a 20-item self-report scale of trait social anxiety from 0 (*not at all*) to 4 (*extremely*). The SIAS has shown adequate internal consistency among cannabis users (Ecker & Buckner, 2014) and specificity for social anxiety relative to other forms of anxiety (E. J. Brown et al., 1997). Internal consistency was excellent ($\alpha=.93$).

The 16-item self-report *Penn State Worry Questionnaire* (PSWQ; Meyer, Miller, Metzger, & Borkovec, 1990) assessed trait worry from 1 (*not at all*) to 5 (*very*). Items were summed. The PSWQ can differentiate generalized anxiety from other forms of anxiety (Fresco, Mennin, Heimberg, & Turk, 2003) and demonstrated excellent internal consistency among cannabis users (Buckner, Joiner, Schmidt, & Zvolensky, 2012). Internal consistency was good ($\alpha=.83$).

The *Panic Attack Questionnaire-Short Form* (PAQ-SF; Norton, Dorward, & Cox, 1986) assessed severity of panic attack symptoms via 16 items (e.g., "Fear of losing control") rated from 0 (*not at all noticed*) to 8 (*very strongly felt*). Items were summed. The PAQ-SF demonstrated excellent internal consistency in prior work (Bernstein, Cardenas, Coy, & Zvolensky, 2011) and currently ($\alpha=.93$).

The *Safety Aid Scale* (SAS; Korte & Schmidt, 2014) assessed use of 79 non-cannabis-related FSBs (e.g., "avoiding parties or other social situations", "speaking very little during social encounters", "Avoiding driving during 'rush hour' or when there will be a lot of traffic on the road") while feeling nervous/anxious from 0 (*never or rarely*) to 4 (*almost always*). Items were summed. The SAS demonstrated excellent internal consistency in prior work (Korte & Schmidt, 2014) and currently ($\alpha=.95$).

To describe the sample, the *Anxiety and Related Disorders Interview Schedule for DSM-5* (ADIS; T. A. Brown & Barlow, 2014) assessed DSM-5 anxiety disorders. The *Structured Clinical Interview for DSM-IV Disorders* (SCID; First, Spitzer, Gibbon, & Williams, 2007), with additional questions for DSM-5 criteria, assessed DSM-5 CUD. Interviews were conducted by trained clinical psychology graduate students under the supervision of the first author (a licensed clinical psychologist). These interviews have demonstrated good interrater reliability (T. A. Brown, Di Nardo, Lehman, & Campbell, 2001; Ventura, Liberman, Green, Shaner, & Mintz, 1998). Percent agreement between two raters for primary CUD diagnosis

in our laboratory is above 90% (Buckner, Zvolensky, Ecker, & Jeffries, 2016). Participants also completed a self-report measure of demographic variables.

2.3 Data analytic strategy

Some variables (Table 1) were not normally distributed (skew > 3; kurtosis > 10; Kline, 2005), which is often the case with substance use variables (e.g., Keough, O'Connor, Sherry, & Stewart, 2015); thus hypotheses were tested using maximum likelihood bootstrapping (10,000 samples were drawn), which is robust against violations of assumptions of normality (Erceg-Hurn & Mirosevich, 2008), using the structural equation modeling program AMOS 22 (Figure 1). Any days with missing data on the TLFB were conservatively coded 0. The anxiety variable was treated as a latent variable comprised of severity of social anxiety, worry, and panic attack symptoms. Effects of anxiety severity on FSB frequency and from FSB frequency to cannabis outcomes represent unique associations after controlling for shared variance. Model fit were calculated via χ^2 , Comparative Fit Index (CFI), and Standardized Root Mean Square Residual (SRMR). A non-significant χ^2 , a CFI of .95 or higher, and an SRMR of .08 or lower indicate good model fit (Hu & Bentler, 1999). Covariance was estimated among cannabis outcomes.

3. Results

Anxiety measures were significantly correlated with cannabis problems but not quantity (Table 1). Gender was the only demographic variable associated with variables of interest¹.

The hypothesized model (Figure 1) was a good fit to the data, $\chi^2(2)=3.18$, $p=.923$, CFI=1.00, SRMR=.04. Anxiety was significantly related to FSB. FSB was significantly related to cannabis problems but quantity. Anxiety was indirectly (via FSB) related to cannabis problems, $\beta=.332$, $SE=.159$, 95% CI: .091, .768, $p=.014$, but not to quantity, $\beta=.003$, $SE=.131$, 95% CI: -.219, .294, $p=.966$.

Given limitations of conducting analyses using cross-sectional data, we tested whether cannabis problems mediated the association between anxiety and FSB, including cannabis quantity as a covariate (Kenny, 2014). This model was not a good fit, $\chi^2=35.69$, $p<.001$, CFI=.29, SRMR=.14.

4. Discussion

Findings add to a growing body of work on anxiety and cannabis-related problems (Agosti et al., 2002; Stinson et al., 2006) by identifying a potential mechanism through which anxiety influences cannabis-related problems. Specifically, FSBs were significantly related to both anxiety and cannabis problem severity. Importantly, anxiety severity was indirectly related to cannabis problems through FSB frequency.

FSB may contribute to cannabis-related problems due to tendency to engage in maladaptive attempts to regulate negative affect. Using cannabis to cope with negative affect mediates the

¹Inclusion of gender as a covariate in the model resulted in poor model fit, $\chi^2(12)=25.39$, $p=.013$, CFI=1.00, SRMR=.12.

anxiety-cannabis-related problem relationship (Buckner et al., 2007) and engagement in some FSBs (e.g., avoidance) is robustly related to cannabis problems (Buckner et al., 2011; Buckner & Zvolensky, 2014). Findings are consistent with work finding anxious cannabis users tend to use specific types of safety behaviors (e.g., avoidance) (Buckner, Heimberg, et al., 2012). The current data extend these findings by determining that maladaptive attempts to regulate negative affect, whether they involve cannabis use or not, may contribute to cannabis-related problems among anxious users. Notably, FSB was not related to cannabis use quantity, highlighting that those who use more FSB are not necessarily using more cannabis but that they continue to use despite experiencing cannabis-related problems, a hallmark feature of CUD (American Psychiatric Association, 2013).

Findings have important clinical implications. Given that reductions in anxiety are related to better CUD treatment outcomes (Buckner & Carroll, 2010), clinicians may consider assessing FSBs among CUD patients and teaching patients more adaptive ways to anxiety (rather than rely on FSBs). Pilot data support that teaching patients to identify and eliminate FSBs, while simultaneously teaching patients skills to manage cannabis use (e.g., manage cravings) decreases cannabis use and related problems (Buckner, Ecker, et al., 2016).

There are a number of limitations. First, the study cross-sectional. Although we evaluated an alternative model, longitudinal is necessary. Second, future work could benefit from multi-method approaches. Third, participants were recruited for a CUD treatment trial and future work should examine the current model among non-treatment seekers to generalize to samples in which cannabis quantity is more normally distributed. Fourth, future work may assess composition of THC and CBD of cannabis used to determine whether FSB is related to use of strains with greater anxiety alleviating properties.

Acknowledgments

We thank Ashley A. Richter for her assistance with data collection.

Role of Funding Source

Funding for this study was provided from the National Institute of Drug Abuse (1R34DA031937-01A1). Funding was awarded to Dr. Julia Buckner. NIDA had no further role in study design; in the collection, analysis and interpretation of data; in the writing of the manuscript; or in the decision to submit the manuscript for publication. All authors have agreed to authorship order and contributed to the final version of the manuscript.

References

- Agosti V, Nunes E, Levin F. Rates of psychiatric comorbidity among U.S. residents with lifetime cannabis dependence. *American Journal of Drug and Alcohol Abuse*. 2002; 28:643–652. DOI: 10.1081/ADA-120015873 [PubMed: 12492261]
- American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders*. 5th. Arlington, VA: American Psychiatric Association; 2013.
- Bernstein A, Cardenas SJ, Coy PEC, Zvolensky MJ. Test of a factor mixture-based taxonic-dimensional model of anxiety sensitivity and panic attack vulnerability among university and clinical samples in Mexico City. *Journal of Psychopathology and Behavioral Assessment*. 2011; 33:491–500. DOI: 10.1007/s10862-011-9235-8
- Brown EJ, Turovsky J, Heimberg RG, Juster HR, Brown TA, Barlow DH. Validation of the Social Interaction Anxiety Scale and the Social Phobia Scale across anxiety disorders. *Psychological Assessment*. 1997; 9:21–27. DOI: 10.1037/1040-3590.9.1.21

- Brown, TA., Barlow, DH. Anxiety and Related Disorders Interview Schedule for DSM-5—Lifetime version. New York, NY: Oxford University Press; 2014.
- Brown TA, Di Nardo PA, Lehman CL, Campbell LA. Reliability of DSM-IV anxiety and mood disorders: Implications for the classification of emotional disorders. *Journal of Abnormal Psychology*. 2001; 110:49–58. DOI: 10.1037/0021-843X.110.1.49 [PubMed: 11261399]
- Buckner JD, Bonn-Miller MO, Zvolensky MJ, Schmidt NB. Marijuana use motives and social anxiety among marijuana-using young adults. *Addictive Behaviors*. 2007; 32:2238–2252. DOI: 10.1016/j.addbeh.2007.04.004 [PubMed: 17478056]
- Buckner JD, Carroll KM. Effect of anxiety on treatment presentation and outcome: Results from the Marijuana Treatment Project. *Psychiatry Research*. 2010; 178:493–500. DOI: 10.1016/j.psychres.2009.10.010 [PubMed: 20537406]
- Buckner JD, Ecker AH, Beighley JS, Zvolensky MJ, Schmidt NB, Shah SM, Carroll KM. Integrated cognitive behavioral therapy for comorbid cannabis use and anxiety disorders. *Clinical Case Studies*. 2016; 15:68–83. DOI: 10.1177/1534650115590857
- Buckner JD, Heimberg RG, Matthews RA, Silgado J. Marijuana-related problems and social anxiety: The role of marijuana behaviors in social situations. *Psychology of Addictive Behaviors*. 2012; 26:151–156. DOI: 10.1037/a0025822 [PubMed: 22004129]
- Buckner JD, Heimberg RG, Schmidt NB. Social anxiety and marijuana-related problems: The role of social avoidance. *Addictive Behaviors*. 2011; 36:129–132. DOI: 10.1016/j.addbeh.2010.08.015 [PubMed: 20832947]
- Buckner JD, Joiner TE Jr, Schmidt NB, Zvolensky MJ. Daily marijuana use and suicidality: The unique impact of social anxiety. *Addictive Behaviors*. 2012; 37:387–392. DOI: 10.1016/j.addbeh.2011.11.019 [PubMed: 22154236]
- Buckner JD, Schmidt NB, Lang AR, Small JW, Schlauch RC, Lewinsohn PM. Specificity of social anxiety disorder as a risk factor for alcohol and cannabis dependence. *Journal of Psychiatric Research*. 2008; 42:230–239. DOI: 10.1016/j.jpsychires.2007.01.002 [PubMed: 17320907]
- Buckner JD, Zvolensky MJ. Cannabis and related impairment: The unique roles of cannabis use to cope with social anxiety and social avoidance. *The American Journal on Addictions*. 2014; 23:598–603. DOI: 10.1111/j.1521-0391.2014.12150.x [PubMed: 25196146]
- Buckner JD, Zvolensky MJ, Crosby RD, Wonderlich SA, Ecker AH, Richter AA. Antecedents and consequences of cannabis use among racially diverse cannabis users: an analysis from ecological momentary assessment. *Drug and Alcohol Dependence*. 2015; 147:20–25. DOI: 10.1016/j.drugalcdep.2014.12.022 [PubMed: 25578250]
- Buckner JD, Zvolensky MJ, Ecker AH, Jeffries ER. Cannabis craving in response to laboratory-induced social stress among racially diverse cannabis users: The impact of social anxiety disorder. *Journal of Psychopharmacology*. 2016; 30:363–369. DOI: 10.1177/0269881116629115 [PubMed: 26839322]
- Buckner JD, Zvolensky MJ, Farris SG, Hogan J. Social anxiety and coping motives for cannabis use: The impact of experiential avoidance. *Psychology of Addictive Behaviors*. 2014; 28:568–574. DOI: 10.1037/a0034545 [PubMed: 24274436]
- Comeau N, Stewart SH, Loba P. The relations of trait anxiety, anxiety sensitivity and sensation seeking to adolescents' motivations for alcohol, cigarette and marijuana use. *Addictive Behaviors*. 2001; 26:803–825. DOI: 10.1016/S0306-4603(01)00238-6 [PubMed: 11768546]
- Crippa JA, Zuardi AW, Martin-Santos R, Bhattacharyya S, Atakan Z, McGuire P, Fusar-Poli P. Cannabis and anxiety: a critical review of the evidence. *Human Psychopharmacology-Clinical and Experimental*. 2009; 24:515–523. DOI: 10.1002/hup.1048 [PubMed: 19693792]
- Ecker AH, Buckner JD. Cannabis use behaviors and social anxiety: The roles of perceived descriptive and injunctive peer norms. *Journal of Studies on Alcohol and Drugs*. 2014; 75
- Erceg-Hurn DM, Mirosevich VM. Modern robust statistical methods: An easy way to maximize the accuracy and power of your research. *American Psychologist*. 2008; 63:591–601. DOI: 10.1037/0003-066X.63.7.591 [PubMed: 18855490]
- First, MB., Spitzer, RL., Gibbon, M., Williams, JBW. Structured Clinical Interview for DSM-IV-TR Axis I Disorders, Research Version, Patient Edition With Psychotic Screen (SCID-I/P W/PSY SCREEN). New York: Biometrics Research, New York State Psychiatric Institute; 2007.

- Fresco DM, Mennin DS, Heimberg RG, Turk CL. Using the Penn State Worry Questionnaire to identify individuals with generalized anxiety disorder: a receiver operating characteristic analysis. [Article]. *Journal of Behavior Therapy and Experimental Psychiatry*. 2003; 34:283–291. DOI: 10.1016/j.jbtep.2003.09.001 [PubMed: 14972674]
- Hope K, Durrheim DN, d'Espaignet ET, Dalton C. Syndromic Surveillance: is it a useful tool for local outbreak detection? *Journal Of Epidemiology And Community Health*. 2006; 60:374–375. DOI: 10.1136/jech.2005.035337 [PubMed: 16680907]
- Hu L-T, Bentler PM. Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling*. 1999; 6:1–55. DOI: 10.1080/10705519909540118
- Kenny, DA. Mediation. 2014 Apr 9. 2014 Retrieved July 15, 2014, from <http://davidakenny.net/cm/mediate.htm>
- Keough MT, O'Connor RM, Sherry SB, Stewart SH. Context counts: Solitary drinking explains the association between depressive symptoms and alcohol-related problems in undergraduates. *Addictive Behaviors*. 2015; 42:216–221. DOI: 10.1016/j.addbeh.2014.11.031 [PubMed: 25486616]
- Kline, RB. Principles and practice of structural equation modeling. 2nd. New York: Guilford Press; 2005.
- Korte, K., Schmidt, NB. Development and initial validation of the Safety Aid Scale. Paper presented at the Association of Behavioral and Cognitive Therapies; Philadelphia, PA. 2014.
- Lozano BE, Stephens RS, Roffman RA. Abstinence and moderate use goals in the treatment of marijuana dependence. *Addiction*. 2006; 101:1589–1597. DOI: 10.1111/j.1360-0443.2006.01609.x [PubMed: 17034438]
- Marmorstein NR, White HR, Loeber R, Stouthamer-Loeber M. Anxiety as a predictor of age at first use of substances and progression to substance use problems among boys. *Journal of Abnormal Child Psychology*. 2010; 38:211–224. DOI: 10.1007/s10802-009-9360-y [PubMed: 19821024]
- Mattick RP, Clarke JC. Development and validation of measures of social phobia scrutiny fear and social interaction anxiety. *Behaviour Research and Therapy*. 1998; 36:455–470. DOI: 10.1016/S0005-7967(97)10031-6 [PubMed: 9670605]
- Meyer TJ, Miller ML, Metzger RL, Borkovec TD. Development and validation of the Penn State Worry Questionnaire. *Behaviour Research and Therapy*. 1990; 28:487–496. [PubMed: 2076086]
- Norton GR, Dorward J, Cox BJ. Factors associated with panic attacks in nonclinical subjects. *Behavior Therapy*. 1986; 17:239–252. DOI: 10.1016/S0005-7894(86)80054-5
- O'Farrell TJ, Fals-Stewart W, Murphy M. Concurrent validity of a brief self-report drug use frequency measure. *Addictive Behaviors*. 2003; 28:327–337. DOI: 10.1016/S0306-4603(01)00226-X [PubMed: 12573682]
- Reilly D, Didcott P, Swift W, Hall W. Long-term cannabis use: Characteristics of users in an Australian rural area. *Addiction*. 1998; 93:837–846. DOI: 10.1080/09652149835350 [PubMed: 9744119]
- Robinson SM, Sobell LC, Sobell MB, Leo GI. Reliability of the Timeline Followback for cocaine, cannabis, and cigarette use. *Psychology of Addictive Behaviors*. 2014; 28:154–162. DOI: 10.1037/a0030992 [PubMed: 23276315]
- Salkovskis PM, Clark DM, Hackmann A. Treatment of panic attacks using cognitive therapy without exposure or breathing retraining. *Behaviour Research and Therapy*. 1991; 29:161–166. DOI: 10.1016/0005-7967(91)90044-4 [PubMed: 2021378]
- Schmidt NB, Buckner JD, Pusser A, Woolaway-Bickel K, Preston JL, Norr A. Randomized controlled trial of False Safety Behavior Elimination Therapy: A unified cognitive behavioral treatment for anxiety psychopathology. *Behavior Therapy*. 2012; 43:518–532. DOI: 10.1016/j.beth.2012.02.004 [PubMed: 22697441]
- Sobell, LC., Sobell, MB. Timeline follow-back: A technique for assessing self-reported alcohol consumption. In: Litten, RZ., Allen, JP., editors. *Measuring alcohol consumption: Psychosocial and biochemical methods*. Totowa, NJ US: Humana Press; 1992. p. 41-72.
- Stephens RS, Roffman RA, Curtin L. Comparison of extended versus brief treatments for marijuana use. *Journal of Consulting and Clinical Psychology*. 2000; 68:898–908. DOI: 10.1037/0022-006X.68.5.898 [PubMed: 11068976]

- Stinson FS, Ruan WJ, Pickering R, Grant BF. Cannabis use disorders in the USA: Prevalence, correlates and co-morbidity. *Psychological Medicine*. 2006; 36:1447–1460. DOI: 10.1017/S0033291706008361 [PubMed: 16854249]
- Substance Abuse and Mental Health Services Administration. Results from the 2013 National Survey on Drug Use and Health: Summary of National Findings: NSDUH Series H-48, HHS Publication No. (SMA) 14-4863. Rockville, MD: Substance Abuse and Mental Health Services Administration; 2014.
- Ventura J, Liberman RP, Green MF, Shaner A, Mintz J. Training and quality assurance with Structured Clinical Interview for DSM-IV (SCID-I/P). *Psychiatry Research*. 1998; 79:163–173. [PubMed: 9705054]
- Zvolensky MJ, Bernstein A, Sachs-Ericsson N, Schmidt NB, Buckner JD, Bonn-Miller MO. Lifetime associations between cannabis, use, abuse, and dependence and panic attacks in a representative sample. *Journal of Psychiatric Research*. 2006; 40:477–486. DOI: 10.1016/j.jpsychires.2005.09.005 [PubMed: 16271364]

Highlights

- False safety behavior use was significantly related to anxiety symptom severity.
- False safety behavior was significantly related to cannabis problem severity.
- False safety behavior utilization was unrelated to frequency of cannabis use.
- Anxiety was indirectly related to cannabis problems via false safety behavior use.

Figure 1.

Structural equation model for FSB use mediating the relation of anxiety to cannabis outcomes. Standardized path estimates are presented. The path between cannabis outcomes is unstandardized covariance. * $p < .05$, ** $p < .01$, *** $p < .001$.

Table 1

Descriptives and Bivariate Correlations among Demographics and Study Variables.

	1	2	3	4	5	6	7	8	9	10
1. Age										
2. Sex	-.08									
3. Race	-.11	-.18								
4. Education	.42**	-.17	.03							
5. Social anxiety	-.03	.09	.20	-.01						
6. Worry	-.16	.25*	-.10	.08	.17					
7. Panic attack severity	-.14	.46**	-.05	-.11	.01	.28*				
8. FSB frequency	.06	.26*	-.07	-.03	.35**	.53**	.36**			
9. Cannabis quantity	-.01	.20	-.11	.07	-.08	.01	.00	.00		
10. Cannabis problems	-.05	-.02	.07	-.08	.18	.18	.09	.34**	-.02	
<i>M(SD)</i>	23.8 (8.1)				36.5 (16.0)	47.1 (11.1)	32.3 (26.6)	99.5 (42.5)	65.4 (70.3)	12.3 (7.0)
Range	18–56				2–63	16–66	0–106	10–279	3–461	2–27
Skewness	2.58				–0.20	–0.36	0.64	1.07	3.38	0.45
Kurtosis	6.89				–0.87	–0.62	–0.34	3.28	15.04	–0.78

Note. Significant skew and kurtosis statistics (skew > 3, kurtosis > 10) are presented in bold.