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Article in *Addictive Behaviors* · July 2018

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Author manuscript

Addict Behav. Author manuscript; available in PMC 2019 July 01.

Published in final edited form as:

Addict Behav. 2018 July ; 82: 166–173. doi:10.1016/j.addbeh.2018.03.008.

Anxiety sensitivity components in relation to alcohol and cannabis use, motives, and problems in treatment-seeking cigarette smokers

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Abstract

Anxiety sensitivity (AS)—fear of anxiety symptoms and their potential negative consequences—has been implicated in the development of substance use problems and motivation to use substances for coping with distress, though the AS components (physical, cognitive, and social concerns) have not been studied extensively in relation to alcohol- and cannabis-related variables. In a cross-sectional design, self-report measures of AS and alcohol and cannabis use, motives, and problems were administered to 364 treatment-seeking cigarette smokers with a history of alcohol and cannabis use. In both adjusted and unadjusted analyses, linear regression models indicated that AS cognitive concerns are related to cannabis-use conformity motives, alcohol-use coping motives, and alcohol problems; AS physical and cognitive concerns are related to greater cannabis problems specifically in males; and AS social concerns are associated with greater social, coping, enhancement, and conformity drinking motives. AS cognitive and physical concerns were also related to greater alcohol and cannabis problems, respectively, in subsamples limited to 214 current alcohol users and 170 current cannabis users. Together with prior work, current findings suggest that it may be beneficial to focus more on addressing AS cognitive concerns in individuals

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AUTHOR DISCLOSURE

Contributors

Casey R. Guillot conducted literature searches, designed the current study, analyzed the data, and contributed to writing the first draft of the manuscript. Heidemarie Blumenthal also contributed to writing the first draft of the manuscript. Michael J. Zvolensky and Norman B. Schmidt wrote the protocol for the larger study and contributed to revising the first draft of the manuscript. All authors have contributed to and approved of the final manuscript.

Conflict of Interest

All authors declare that they have no conflicts of interest.

with tobacco-alcohol problem comorbidity, whereas it may be beneficial to focus on addressing both AS physical and cognitive concerns in males with tobacco-cannabis problem comorbidity. In addition, cigarette smokers high in AS social concerns may benefit from relaxation training to lessen their social anxiety as well as behavioral activation to enhance their positive affect.

Keywords

anxiety sensitivity; alcohol problems; cannabis problems; substance use motives

1. Introduction

Anxiety sensitivity (AS) is a personality factor characterized by the fear of anxiety symptoms and their potential negative consequences.^[1,2] Both theory and data suggest that this trait tendency to fear experiences related to anxiety amplifies the unpleasantness of such experiences and thereby leads to greater psychological distress (e.g., acutely induced fear, anxiety, and general negative affect).^[1–5] AS also has been implicated in the development of several forms of psychopathology, as evidenced by a multitude of concurrent and prospective associations with panic, generalized anxiety, social anxiety, posttraumatic stress disorder, depression, and suicidal ideation.^[3,6–12] Given these findings, in conjunction with studies showing that emotional disorders prospectively predict the onset and development of substance use disorders,^[13–16] AS also may influence substance use.

In fact, a growing literature does indicate that AS is related to motivation to use substances to cope with distress and the development of substance use problems. Individuals high in AS often report the expectation that substance use will reduce negative affect as well as report using substances specifically for that purpose, including tobacco,^[17–19] alcohol,^[20–26] and cannabis.^[25,27–29] Identifying malleable risk factors associated with coping-related substance use motives and expectancies is important given consistent findings linking coping-oriented substance use and the development of substance use problems.^[30–33] In addition, AS has been associated with the problematic use of a variety of substances, again including tobacco,^[18,19,34] alcohol,^[23,29,35–37] and cannabis.^[28,29,38,39]

The two most commonly used measures of AS in adults, the Anxiety Sensitivity Index (ASI)^[2] and the ASI-3,^[40] consistently display three lower-order factors of general AS:^[7,40–42] *physical concerns* (fear that somatic symptoms of anxiety may be harmful), *cognitive concerns* (fear that cognitive symptoms of anxiety may indicate psychological problems), and *social concerns* (fear that publicly observable symptoms of anxiety may be noticed and have negative consequences). However, research examining potential AS associations with alcohol- and cannabis-related variables has mainly focused on general AS, and as Norton^[43] previously noted, only examining potential associations of general AS with substance-related variables may fail to inform about associations more attributable to certain AS components.

Indeed, some studies have shown that AS components are differentially associated with alcohol-related variables (with each study having included all three AS facets unless otherwise noted). One study found that only AS social concerns were related to alcohol

consumption in female undergraduates.^[44] In a sample of male and female undergraduates, another study (which did not include AS social concerns) found that only AS cognitive concerns were related to alcohol problems and expecting alcohol to reduce tension.^[22] Similarly, another study of male and female undergraduates reported an association between AS cognitive concerns and retrospectively reported drinking in response to negative situations.^[45] One study found that AS physical and cognitive concerns prospectively predicted the development of alcohol use disorder in young adults,^[36] whereas another study of young adult cannabis smokers found that only AS cognitive concerns were related to greater alcohol volume (i.e., the product of typical drinking frequency and amount).^[39] In treatment-seeking smokers in particular, a study of trauma-exposed individuals found that AS social concerns were related to hazardous alcohol use.^[46] Altogether, not many studies have investigated the components of AS in relation to problematic alcohol use, though some prior work suggests links between AS components and particular alcohol use indices. Specifically, physical concerns have been related to alcohol use disorder; social concerns have been related to heavier alcohol use; and cognitive concerns have been associated with greater alcohol volume, drinking problems, and negative reinforcement-related drinking. However, no prior work known to the authors to date has examined the components of AS in relation to motives for alcohol consumption.

To the authors' knowledge, only two studies have investigated potential associations between AS facets and cannabis-related variables: One study of cannabis smokers found that AS cognitive concerns were related to cannabis withdrawal severity but not cannabis use frequency,^[39] and another study of cannabis users found that AS cognitive concerns were related to cannabis problems but not cannabis use frequency.^[38] Thus, similar to the alcohol literature, the few studies that have examined AS facets in relation to cannabis-related variables linked AS cognitive concerns to cannabis problems but not cannabis use frequency, yet no such AS component studies have been conducted in relation to cannabis use motives. Examining such understudied associations between AS facets and non-nicotine substance-related variables in treatment-seeking cigarette smokers could benefit individualized treatments for dependent cigarette smokers who have different fears about anxiety symptoms accompanied by problematic patterns of alcohol and/or cannabis use.

The purpose of the present study was to explore AS components in relation to alcohol and cannabis use, motives, and problems in 364 treatment-seeking cigarette smokers with a history of alcohol and cannabis use. Guided by the literature, the following was hypothesized: (1) AS cognitive concerns will be related to greater alcohol volume, coping-oriented alcohol use motives, and alcohol and cannabis problems; (2) AS social concerns will be related to greater hazardous drinking and alcohol consumption; and (3) AS physical concerns will be related to greater alcohol problems. In regard to other alcohol and cannabis use motives, it was further hypothesized that some of the AS components will be related to conformity motives for alcohol and cannabis use, given that several studies have reported associations between general AS and alcohol- and cannabis-use conformity motives.
[20,25–28]

2. Methods

2.1. Participants

Participants were 364 treatment-seeking cigarette smokers (193 males and 171 females; age: $M = 35.8$, $SD = 13.4$) who also reported lifetime alcohol and cannabis use, of whom 84.9% were White, 9.9% were Black, and 5.2% were of another ethnicity (e.g., Asian or mixed) or did not specify ethnicity. Participants generally were well educated, with 74.5% indicating the completion of some university. The current report is based on secondary analyses of baseline (pre-treatment) data for a subset of the full sample from a larger, tobacco cessation study. Eligible participants were at least 18 years old, reported smoking an average of 8 or more cigarettes per day for at least one year, and reported motivation to quit smoking of 5 or higher on a 10-point scale.^[19,35] Exclusion criteria included current use of smoking cessation products or treatment, suicidality requiring intervention, and history of psychotic-spectrum disorders. On average, participants reported initiating regular cigarette smoking at 17.4 ($SD = 3.7$) years old, being a regular cigarette smoker for 17.5 ($SD = 13.2$) years, and smoking 16.1 ($SD = 9.9$) cigarettes per week. Participants' mean score on the Fagerström Test for Cigarette Dependence was 5.1 ($SD = 2.3$), indicative of moderate cigarette dependence.^[47,48]

2.2. Measures

2.2.1. Anxiety Sensitivity Index-3 (ASI-3)—The ASI-3^[40] assesses fear of anxiety symptoms and their potential negative consequences. The ASI-3 includes an 18-item Total Scale (which measures general AS) and three 6-item subscales: Physical Concerns, Cognitive Concerns, and Social Concerns. Responses are rated on a 5-point Likert scale ranging from 0 (*very little*) to 4 (*very much*). The ASI-3 has been validated for use in treatment-seeking cigarette smokers.^[41]

2.2.2. Alcohol Use Disorders Identification Test (AUDIT)—The AUDIT^[49] is a well-validated measure of hazardous and harmful alcohol use. The first 3 items pertain to alcohol use frequency, typical drinking amount, and frequency of binge drinking (Alcohol Consumption subscale), and the remaining 7 items pertain to alcohol-related difficulties and symptoms of alcohol dependence (Alcohol Problems subscale). Each item is scored 0–4, except for the last two items, which are scored 0, 2, or 4, with higher AUDIT total scores representing more hazardous drinking. Also, Item #1 was used to assess at-least-monthly alcohol use (item score of 2 or higher, which indicates drinking 2–4 times per month), and the product of Item #1 and #2 scores was used to index alcohol volume.^[50]

2.2.3. Drinking Motives Questionnaire—Revised (DMQ-R)—The DMQ-R^[51] is a 20-item measure of reasons for drinking alcohol. Each item is rated on a Likert scale ranging from 1 (*almost never/never*) to 5 (*almost always/always*). The DMQ-R has four drinking-motives subscales: Social, Coping, Enhancement, and Conformity. The four-factor structure of the DMQ-R has been consistently replicated in a diversity of samples, with past work demonstrating strong convergent and divergent validity.^[52]

2.2.4. Marijuana Smoking History Questionnaire (MSHQ)—The MSHQ^[53] assesses cannabis use history and patterns of use. In the current study, Item #2 (i.e., “Please rate your marijuana use in the past 30 days”) was used, which is a 9-point scale (rated 0–8) that is anchored by 0 = *no use*, 4 = *once a week*, and 8 = *more than once a day*. This item was used to determine the percentage of participants who endorsed past 30-day cannabis use (item score of 1 or higher, which indicates cannabis use in the past 30 days) as well as past 30-day cannabis use rating (0–8), which served as an index of cannabis use frequency.

2.2.5. Marijuana Problems Scale (MPS)—The MPS^[54] is a 19-item measure of problems attributed to cannabis use. Each item concerns a problem that may have occurred in the past 90 days and is rated on a 3-point scale (0 = *no problem*, 1 = *minor problem*, and 2 = *serious problem*), with higher MPS total scores representing greater cannabis problems.

2.2.6. Marijuana Motives Measure (MMM)—The MMM^[55] is a 25-item self-report measure of reasons for using cannabis. Each item is rated on a Likert scale ranging from 1 (*almost never/never*) to 5 (*almost always/always*). The MMM has five cannabis-motives subscales: Social, Coping, Enhancement, Conformity, and Expansion. The five-factor structure of the MMM has been consistently replicated in several different samples, and specific subscales have been associated with cannabis use frequency and problems.^[56]

2.2.7. Covariates—An author-constructed demographic questionnaire asked about sex, ethnicity, age, and education level, and an author-constructed medical history form was used to assess hypertension status.^[19,35] The 8-item Big Five Inventory (BFI) Neuroticism scale^[57] was used to assess the trait tendency to experience negative affect. Cronbach’s α for the BFI Neuroticism scale was .83 in the current study.

2.3. Procedure

Cigarette smokers were recruited with flyers, newspaper ads, and radio announcements offering participation in a randomized controlled clinical trial investigating the efficacy of standard smoking cessation treatment versus integrated treatment for smoking and anxiety.^[12] Participants were recruited from the communities centered on the University of Vermont and Florida State University and were paid \$142.50 for their full participation and received 6 weeks of free nicotine replacement patches. Participants completed informed consent and a computerized battery of self-report measures. The Institutional Review Board approved the protocol at each study site.

2.4. Data Analysis

Alpha (two-tailed) was set at .01 in order to correct for multiple testing without being overly conservative and unduly inflating the Type II error rate with a Bonferroni correction.^[58–60] Six planned covariates were selected as factors that may affect substance-related variables: sex,^[61,62] ethnicity (0 = Non-White; 1 = White),^[62] age,^[61,62] education level (0 = No University; 1 = Attended University),^[61,62] hypertension status,^[63] and neuroticism^[64]. For preliminary analyses, descriptive statistics and Cronbach’s alphas for AS and substance-related measures were obtained. For primary analyses, linear and multinomial logistic regression models were used that adjusted for covariates in which each AS variable served

as the predictor of each criterion (substance-related) variable in the overall sample and in gender-specific subsamples. For supplemental analyses, linear regression models were used that controlled for covariates in which each chosen AS variable served as the predictor of alcohol and cannabis problems in subsamples limited to cigarette smokers who recently used alcohol and cannabis, respectively. Regression results are reported as standardized regression coefficients (β s) or odds ratios (ORs).

3. Results

3.1. Preliminary Analyses

Descriptive statistics and Cronbach's alphas for AS and substance-related measures are shown in Table 1.

3.2. Primary Analyses

Skewness for the criterion variables in the overall sample was 2 or greater (indicating significant skew^[65]) only for alcohol and cannabis problems and conformity motives, with most participants reporting that they have no alcohol or cannabis problems and no motivation to use alcohol or cannabis in order to conform. Individual regression models between AS and substance measures in the overall sample are shown in Table 2. Individual regression models between AS and substance measures in the male and female subsamples are shown in Table 3 and Table 4.

After controlling for covariates, alcohol-related regression models in the overall sample indicated that general AS was significantly related to more hazardous drinking, and general AS and AS cognitive concerns were significantly related to greater alcohol problems. For drinking motives, general AS and all three AS facets were significantly related to greater conformity motives; general AS and AS social concerns were significantly related to greater social and enhancement motives; and general AS and AS cognitive and social concerns were significantly related to greater coping motives.

In regard to cannabis in the overall sample, AS physical concerns were significantly related to greater cannabis problems, whereas general AS was marginally related to cannabis problems ($p = .012$). For cannabis use motives, general AS and all three AS facets were significantly related to greater social, coping, and expansion motives; AS physical concerns were significantly related to greater enhancement motives; and AS cognitive concerns were significantly related to greater conformity motives.

Rerunning regression models without covariates in the overall sample only reduced the following associations to non-significant trends: general AS with drinking enhancement motives ($p = .044$), AS physical concerns with cannabis problems ($p = .027$), and AS physical concerns with cannabis enhancement motives ($p = .028$).

Gender-specific regression models revealed that the following significant associations were unique to each gender: in males, AS social concerns with drinking social motives, general AS and AS cognitive and social concerns with drinking coping motives, AS social concerns with drinking social motives, AS social concerns with drinking conformity motives, general

AS and AS physical and cognitive concerns with cannabis problems, AS social concerns with cannabis social motives, and general AS and AS cognitive and social concerns with cannabis conformity motives; but in females, general AS with hazardous drinking AS cognitive concerns with drinking social motives, AS physical concerns with cannabis coping motives, and AS social concerns with cannabis expansion motives.

Because the association between AS physical concerns and cannabis problems was reduced to a non-significant trend in the overall sample when covariates were not included, regression models relating general AS and AS physical and cognitive concerns to cannabis problems in males were rerun without covariates. In unadjusted analyses, general AS ($\beta = .25, p = .002$) and AS physical ($\beta = .23, p = .007$) and cognitive concerns ($\beta = .27, p = .001$) all remained significantly related to cannabis problems in males.

3.3. Supplemental Analyses

Given the relations between general AS and alcohol and cannabis problems and the respective associations of AS cognitive and physical concerns with alcohol and cannabis problems in the overall sample, a series of supplemental analyses (adjusted for covariates) were run in which general AS and AS cognitive and physical concerns served as predictors of alcohol and cannabis problems in subsamples limited to cigarette smokers who were current users of each substance (i.e., smokers who used alcohol at least monthly for alcohol-problem analyses and smokers who reported past 30-day cannabis use for cannabis-problem analyses). In the two user-specific subsamples, skewness dropped below 2 for both alcohol and cannabis problems, indicating a lack of significant skew.^[65] In regard to smokers who were current alcohol users ($n = 214$), AS cognitive concerns were significantly related to alcohol problems ($\beta = .24, p = .005$), and general AS was marginally related to alcohol problems ($\beta = .21, p = .015$). As for smokers who were current cannabis users ($n = 170$), both general AS ($\beta = .23, p = .010$) and AS physical concerns ($\beta = .22, p = .006$) were significantly related to cannabis problems. Thus, the effect sizes of AS associations with alcohol and cannabis problems were slightly larger when subsamples were limited to current substance users; however, only AS cognitive and physical concerns were significantly related to alcohol and cannabis problems, respectively, regardless if relations were tested in the full sample of cigarette smokers reporting lifetime alcohol and cannabis use or in subsamples of cigarette smokers reporting current alcohol or cannabis use.

4. Discussion

In accord with hypotheses, AS cognitive concerns were related to greater alcohol problems, coping-oriented motives for alcohol use, and conformity motives for alcohol and cannabis use. Though no prior work known to the authors to date has examined AS components in relation to alcohol and cannabis use motives, the association between AS cognitive concerns and coping-oriented drinking motives is consistent with prior work that associated AS cognitive concerns with negative reinforcement-related drinking,^[22,45] and the association between AS cognitive concerns and conformity motives for both alcohol and cannabis use is consistent with prior work that associated general AS with alcohol- and cannabis-use conformity motives.^[20,25–28] The association between AS cognitive concerns and greater

alcohol problems is also consistent with two prior studies. [22,36] However, the lack of an association between AS cognitive concerns and greater alcohol volume is inconsistent with one prior study.[39]

Furthermore, the association of AS physical concerns with cannabis problems (in adjusted and male-specific analyses) is inconsistent with two prior studies of cannabis users that related AS cognitive concerns to cannabis problems,[38,39] though AS cognitive concerns were related to cannabis problems specifically in males in the current study. Sample differences may partially account for this divergence. First, with sample sizes of 49 and 84, the two prior studies of cannabis users[38,39] may have lacked sufficient power to detect an association between AS physical concerns and cannabis problems, in comparison to the current study which utilized an overall sample and subsamples that were 170 cannabis users. Second, compared to regular cannabis users, treatment-seeking cigarette smokers may tend to use cannabis to help manage aversive anxiety-related physical sensations.[38] Given that this is the first study to examine AS facets in relation to cannabis variables in treatment-seeking smokers, it is difficult to assess the likelihood of these potential explanations. Notably, AS physical concerns were also related to cannabis-use enhancement motives (in adjusted analyses), which additionally suggests that cigarette smokers high in AS physical concerns may use cannabis because they enjoy the sensations associated with cannabis use.

Contrary to hypotheses, AS social concerns were not related to greater hazardous alcohol drinking or greater alcohol consumption. These findings contrast with previous studies of female undergraduate students[44] and trauma-exposed cigarette smokers[46]. However, it is possible that findings from the first prior study,[44] which utilized a small sample size ($N=30$), are unreliable, and it is also possible that findings from the second prior study[46] are population-specific (i.e., trauma-exposed cigarette smokers). Interestingly, AS social concerns were related to all four drinking motives in the overall sample and in males. Given this information, one may have expected a significant relationship between AS social concerns and alcohol consumption. Perhaps AS social concerns is tied to alcohol consumption, but there are moderators of this relationship, such as exposure to trauma[46] or stress,[66] particularly social stress.[67,68] Also of interest, AS social concerns were the only AS component associated with social and enhancement drinking motives. Similarly, two prior studies of cigarette smokers reported that the only aspect of AS associated with positive reinforcement-related smoking outcome expectancies was AS social concerns,[18,19] with some items from the expectancy measure[69] specifically referencing smoking-related social interaction and others being specific to sensory satisfaction, akin to social and enhancement drinking motives in the current study. Hence, AS social concerns may be uniquely associated with motivation to smoke and drink for pleasure and to increase positive affect in social situations, which may be related to characteristically low positive affect in individuals with social anxiety.[70,71]

Concordant with hypotheses, none of the AS components were related to cannabis use frequency, which is consistent with prior research.[38,39] Also, in accord with general expectations, AS and its components were related to drinking conformity motives and to expansion, social, and coping motives for cannabis use in the overall sample. These findings are consistent with previous studies that associated general AS with greater drinking

conformity motives^[20,21,23,25,26] and with greater expansion,^[28] social,^[27,28] and coping motives for cannabis use.^[25,27–29]

4.1. Limitations

This study has some limitations. Due to its cross-sectional design, it cannot examine changes in variables over time or determine causality. Also, the current study only used self-report measures, which may be influenced by common-method bias or inaccurate reporting. Another limitation is that the current sample is largely White; therefore, current findings may not generalize to smokers belonging to an ethnic minority group (e.g., African Americans) and should be interpreted with caution until replicated in additional samples (e.g., in other more ethnically heterogeneous or exclusively non-White samples) given that this was the first study to examine AS components in relation to alcohol and cannabis use motives.

4.2. Conclusions

Current findings in treatment-seeking cigarette smokers suggest that: (1) AS cognitive concerns are related to greater alcohol problems; (2) AS physical and cognitive concerns are related to greater cannabis problems in males; and (3) AS social concerns are associated with greater social and enhancement drinking motives. These findings may have important implications for treating high-AS cigarette smokers with comorbid alcohol or cannabis problems. Together with prior work indicating that AS cognitive and physical concerns are associated with tobacco dependence severity in treatment-seeking smokers,^[19] current findings suggest that it may be beneficial to focus more on addressing AS cognitive concerns in individuals with tobacco-alcohol problem comorbidity, whereas it may be beneficial to focus on addressing both AS physical and cognitive concerns in males with tobacco-cannabis problem comorbidity. Also, together with prior research evidencing that AS social concerns are the only AS component associated with positive reinforcement-related cigarette smoking,^[19] current findings may have additional implications for assisting high-AS cigarette smokers who want to quit smoking and curb their drinking habits: Individuals high in AS social concerns, who may smoke and drink for pleasure and to increase positive affect in social situations, may additionally benefit from relaxation training aimed at lessening social anxiety^[72] and behavioral activation aimed at enhancing positive affect.^[73]

Acknowledgments

Role of Funding Sources

This study was supported by funding from National Institute of Mental Health Grant R01-MH076629. The NIMH had no role in designing the study, collecting, analyzing, and interpreting the data, writing the manuscript, or deciding to submit the paper for publication.

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HIGHLIGHTS

- We studied anxiety sensitivity (AS) facet-substance relations in cigarette smokers.
- AS cognitive concerns were related to alcohol problems in the overall sample.
- AS cognitive and physical concerns were related to cannabis problems in males.
- AS social concerns were related to greater social and enhancement drinking motives.
- Current findings may guide treatment for tobacco-alcohol/cannabis comorbidity.

Table 1

Descriptive Statistics and Cronbach's Alphas for Anxiety Sensitivity and Substance-Related Measures

	<i>M (SD) or %</i>	Cronbach's α
ASI-3 Total Scale	15.1 (12.0)	.93
ASI-3 Physical Concerns	4.6 (4.5)	.86
ASI-3 Cognitive Concerns	3.3 (4.3)	.91
ASI-3 Social Concerns	7.3 (5.1)	.82
AUDIT	6.6 (6.1)	.83
Factor 1: Alcohol Consumption	4.1 (3.1)	.79
Factor 2: Alcohol Problems	2.5 (4.0)	.81
Alcohol Volume	2.2 (3.1)	
At-Least-Monthly Alcohol Use	58.8	
DMQ-R Social	13.1 (6.0)	.93
DMQ-R Coping	8.7 (4.7)	.91
DMQ-R Enhancement	12.0 (5.8)	.90
DMQ-R Conformity	6.4 (2.9)	.87
MSHQ Past 30-Day Cannabis Use Rating	2.3 (3.0)	
MSHQ Past 30-Day Cannabis Use	46.7	
MPS Cannabis Problems	2.4 (4.0)	.89
MMM Social	11.0 (6.0)	.91
MMM Coping	9.2 (5.3)	.90
MMM Enhancement	13.8 (6.9)	.92
MMM Conformity	7.0 (3.8)	.88
MMM Expansion	9.3 (5.9)	.95

Note. $N = 364$; ASI-3 = Anxiety Sensitivity Index-3; AUDIT = Alcohol Use Disorders Identification Test; DMQ-R = Drinking Motives Questionnaire Revised; MSHQ = Marijuana Smoking History Questionnaire; MPS = Marijuana Problems Scale; MMM = Marijuana Motives Measure.

Individual Regression Models between Anxiety Sensitivity (AS) and Substance Measures in the Overall Sample Expressed as β (*SE*) or OR (95% CI)

Table 2

Measure	ASI-3:			
	Total Scale	Physical Concerns	Cognitive Concerns	Social Concerns
<i>Alcohol Use and Problems</i>				
AUDIT	.18 (.06)*	.13 (.06)	.15 (.06)	.15 (.06)
Factor 1: Alcohol Consumption	.11 (.06)	.09 (.05)	.05 (.06)	.12 (.06)
Factor 2: Alcohol Problems	.19 (.06)*	.13 (.06)	.19 (.06)*	.13 (.06)
Alcohol Volume	1.4 (0.3–5.4)	1.0 (0.3–3.6)	3.1 (0.7–13.5)	0.6 (0.1–2.9)
<i>Alcohol Use Motives</i>				
DMQ-R Social	.23 (.06)**	.11 (.05)	.14 (.06)	.28 (.06)**
DMQ-R Coping	.22 (.06)**	.14 (.06)	.23 (.06)**	.16 (.06)*
DMQ-R Enhancement	.17 (.06)*	.10 (.05)	.10 (.06)	.20 (.06)**
DMQ-R Conformity	.28 (.06)**	.16 (.06)*	.29 (.06)**	.21 (.06)**
<i>Cannabis Use and Problems</i>				
MSHQ Past 30-Day Cannabis Use Rating	1.2 (0.8–1.9)	1.5 (1.0–2.2)	1.0 (0.6–1.4)	1.1 (0.7–1.7)
MPS Cannabis Problems	.16 (.06)	.17 (.06)*	.09 (.06)	.11 (.06)
<i>Cannabis Use Motives</i>				
MMM Social	.26 (.06)**	.23 (.06)**	.17 (.06)*	.22 (.06)*
MMM Coping	.23 (.06)**	.21 (.06)**	.18 (.06)*	.16 (.06)*
MMM Enhancement	.14 (.06)	.15 (.06)*	.07 (.06)	.10 (.06)
MMM Conformity	.16 (.06)	.07 (.06)	.18 (.06)*	.14 (.06)
MMM Expansion	.32 (.06)**	.25 (.06)**	.31 (.06)**	.22 (.06)**

Note. *N* = 364; ASI-3 = Anxiety Sensitivity Index-3; AUDIT = Alcohol Use Disorders Identification Test; DMO-R = Drinking Motives Questionnaire Revised; MSHQ = Marijuana Smoking History Questionnaire; MPS = Marijuana Problems Scale; MMM = Marijuana Motives Measure. Alcohol Volume was calculated by multiplying AUDIT item #1 (alcohol use frequency) by AUDIT item #2 (typical drinking amount), with a minimum Alcohol Volume of 0 (if item #2 score = 0, indicating 1–2 drinks per occasion) and a maximum Alcohol Volume of 16 (if each item score was 4). MSHQ Past 30-Day Cannabis Use Rating was a minimum of 0 (indicating no past 30-day use) and a maximum of 8 (indicating more than once daily use). For Alcohol Volume and Past 30-Day Cannabis Use Rating, 0 was the reference category, and the maximum was the comparison category. Individual regression models involved testing each AS variable as a predictor of each substance-related measure adjusted for sex, ethnicity, age, education level, hypertension status, and neuroticism.

* *p* < .01.

p < .001 (significant associations in bold print)
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Individual Regression Models between Anxiety Sensitivity (AS) and Substance Measures in the Male Subsample Expressed as β (*SE*) or OR (95% CI)

Table 3

Measure	ASI-3:			
	Total Scale	Physical Concerns	Cognitive Concerns	Social Concerns
<i>Alcohol Use and Problems</i>				
AUDIT	.12 (.09)	.09 (.08)	.08 (.09)	.13 (.08)
Factor 1: Alcohol Consumption	.02 (.09)	-.01 (.09)	-.07 (.09)	.09 (.08)
Factor 2: Alcohol Problems	.17 (.09)	.14 (.09)	.17 (.09)	.12 (.08)
Alcohol Volume	NA	NA	NA	NA
<i>Alcohol Use Motives</i>				
DMQ-R Social	.23 (.08) *	.12 (.08)	.05 (.09)	.34 (.07) **
DMQ-R Coping	.26 (.09) *	.16 (.09)	.26 (.09) *	.22 (.08) *
DMQ-R Enhancement	.17 (.09)	.11 (.09)	.07 (.09)	.22 (.08) *
DMQ-R Conformity	.32 (.09) **	.19 (.09)	.36 (.09) **	.25 (.08) *
<i>Cannabis Use and Problems</i>				
MSHQ Past 30-Day Cannabis Use Rating	1.0 (0.5–1.9)	1.3 (0.7–2.6)	1.0 (0.5–1.8)	0.8 (0.5–1.5)
MPS Cannabis Problems	.25 (.09) *	.27 (.09) *	.25 (.09) *	.14 (.09)
<i>Cannabis Use Motives</i>				
MMM Social	.29 (.09) *	.24 (.09) *	.13 (.09)	.30 (.08) **
MMM Coping	.21 (.08)	.15 (.08)	.20 (.08)	.16 (.08)
MMM Enhancement	.14 (.09)	.12 (.09)	.09 (.09)	.12 (.08)
MMM Conformity	.27 (.09) *	.13 (.09)	.30 (.09) **	.23 (.08) *
MMM Expansion	.27 (.09) *	.25 (.09) *	.26 (.09) *	.16 (.09)

Note. $N = 193$; ASI-3 = Anxiety Sensitivity Index-3; AUDIT = Alcohol Use Disorders Identification Test; DMQ-R = Drinking Motives Questionnaire Revised; MSHQ = Marijuana Smoking History Questionnaire; MPS = Marijuana Problems Scale; MMM = Marijuana Motives Measure. Alcohol Volume was calculated by multiplying AUDIT Item #1 (alcohol use frequency) by AUDIT Item #2 (typical drinking amount), with a minimum Alcohol Volume of 0 (if Item #2 score = 0, indicating 1–2 drinks per occasion) and a maximum Alcohol Volume of 16 (if each item score was 4). MSHQ Past 30-Day Cannabis Use Rating was a minimum of 0 (indicating no past 30-day use) and a maximum of 8 (indicating more than once daily use). For Alcohol Volume and Past 30-Day Cannabis Use Rating, 0 was the reference category and the maximum was the comparison category. Individual regression models involved testing each AS variable as a predictor of each substance-related measure adjusted for ethnicity, age, education level, hypertension status, and neuroticism.

* $p < .01$,

** $p < .001$ (significant associations in bold print);

NA = not able to be computed due to only one male reporting maximum alcohol volume

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Individual Regression Models between Anxiety Sensitivity (AS) and Substance Measures in the Female Subsample Expressed as β (SE) or OR (95% CI)

Table 4

Measure	ASI-3:			
	Total Scale	Physical Concerns	Cognitive Concerns	Social Concerns
<i>Alcohol Use and Problems</i>				
AUDIT	.23 (.09)*	.16 (.08)	.20 (.08)	.17 (.09)
Factor 1: Alcohol Consumption	.20 (.08)	.16 (.07)	.14 (.08)	.16 (.08)
Factor 2: Alcohol Problems	.20 (.09)	.12 (.08)	.20 (.09)	.14 (.09)
Alcohol Volume	NA	NA	NA	NA
<i>Alcohol Use Motives</i>				
DMQ-R Social	.23 (.08)*	.11 (.07)	.23 (.08)*	.21 (.08)
DMQ-R Coping	.17 (.09)	.13 (.08)	.19 (.09)	.08 (.09)
DMQ-R Enhancement	.17 (.08)	.09 (.07)	.12 (.08)	.18 (.08)
DMQ-R Conformity	.23 (.09)*	.15 (.07)	.23 (.08)*	.16 (.09)
<i>Cannabis Use and Problems</i>				
MSHQ Past 30-Day Cannabis Use Rating	1.6 (0.8–3.0)	1.7 (0.9–2.9)	0.9 (0.5–1.7)	1.8 (0.9–3.7)
MPS Cannabis Problems	.06 (.09)	.10 (.07)	-.04 (.08)	.07 (.09)
<i>Cannabis Use Motives</i>				
MMM Social	.25 (.09)*	.22 (.07)*	.21 (.08)	.13 (.09)
MMM Coping	.25 (.10)	.25 (.08)*	.15 (.09)	.15 (.10)
MMM Enhancement	.14 (.09)	.17 (.07)	.06 (.08)	.08 (.09)
MMM Conformity	.06 (.10)	.04 (.08)	.07 (.09)	.03 (.10)
MMM Expansion	.37 (.08)**	.24 (.07)**	.35 (.07)**	.27 (.08)**

Note. $N = 171$; ASI-3 = Anxiety Sensitivity Index-3; AUDIT = Alcohol Use Disorders Identification Test; DMQ-R = Drinking Motives Questionnaire Revised; MSHQ = Marijuana Smoking History Questionnaire; MPS = Marijuana Problems Scale; MMM = Marijuana Motives Measure. Alcohol Volume was calculated by multiplying AUDIT Item #1 (alcohol use frequency) by AUDIT Item #2 (typical drinking amount), with a minimum Alcohol Volume of 0 (if Item #2 score = 0, indicating 1–2 drinks per occasion) and a maximum Alcohol Volume of 16 (if each item score was 4). MSHQ Past 30-Day Cannabis Use Rating was a minimum of 0 (indicating no past 30-day use) and a maximum of 8 (indicating more than once daily use). For Alcohol Volume and Past 30-Day Cannabis Use Rating, 0 was the reference category and the maximum was the comparison category. Individual regression models involved testing each AS variable as a predictor of each substance-related measure adjusted for ethnicity, age, education level, hypertension status, and neuroticism.

* $p < .01$,

** $p < .001$ (significant associations in bold print);

NA = not able to be computed due to only one female reporting maximum alcohol volume

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