

General Anxiety Disorder Symptoms, Tension Reduction, and Marijuana Use Among Young Adult Females

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Abstract

Background: The current study tested the hypothesis that tension reduction expectancies mediate the relationship between anxiety symptoms and marijuana use.

Methods: Interview data for 332 young adult females from Southern New England were collected from 2004 to 2009.

Results: In structural equation modeling, anxiety symptoms had a significant direct effect ($b_{yx} = 0.227$, 95% confidence interval [CI] 0.086-0.369, $p < 0.05$) on tension reduction expectancies and a significant indirect effect ($b_{yx} = 0.026$, 95% CI 0.010-0.046, $p < 0.05$) on marijuana use.

Conclusions: The effect of anxiety symptoms on marijuana use was fully mediated by tension reduction expectancies. Implications for tension reduction as a possible component of treatment interventions are discussed.

Introduction

Young adults and marijuana use

MARIJUANA IS THE MOST WIDELY USED illicit substance in the United States. In 2007, approximately 6% of Americans over the age of 12 reported using marijuana at least once in the past month.¹ Regular marijuana use is associated with respiratory illnesses, such as bronchitis, emphysema, and lung infections,²⁻⁴ as well as neurocognitive deficits.^{2,5} The use of marijuana has also been linked with psychosocial problems, including occupational absenteeism, work-related accidents,⁶⁻⁷ poor educational achievement,^{2,8,9} and increased likelihood of mental health conditions, including anxiety, depression, and suicidal behavior.^{2,10,11} Given these associations and the high prevalence of use, marijuana use represents a significant public health problem.

Young adults between the ages of 18 and 25 have the highest rate of marijuana use, with approximately 16.4% of adults in this age group reporting marijuana use at least once in the past month.¹ Therefore, marijuana users of this age group have been the focus of research and clinical efforts aimed at understanding, reducing, and treating substance use.

Historically, studies focusing on young adult marijuana users have struggled to recruit women.¹² Knowledge about

marijuana use in this group is important because it is highly prevalent in women between the ages of 18 and 25 and may pose unique risks. In 2006, approximately 12.5% of women between the ages of 18 and 25 reported marijuana use in the past year.¹³ Furthermore, rates of marijuana-related disorders (cannabis abuse and dependence) among female marijuana users between the ages of 18 and 29 have increased from 25% in the early 1990s to 32% in 2002.¹⁴ In addition to the potential negative consequences of marijuana use noted, it has also been linked to increased sexual activity, inconsistent condom use, and greater levels of sexual activity while under the influence of substances.^{15,16} These types of sexually risky behaviors increase a woman's risk for unplanned pregnancies and the contraction of sexually transmitted diseases (STD). Taken together, the risks associated with marijuana use represent a significant threat to the health and well-being of women in the early stages of adulthood.

Marijuana use, anxiety, and coping expectancies

General anxiety disorder (GAD) is one of the most highly prevalent mental health conditions and is characterized by excessive and uncontrollable worry that causes impairment or significant distress.¹⁷ Women are disproportionately affected

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by GAD, with a prevalence rate that is two times greater than that of men.^{18,19} The co-occurrence of anxiety disorders and marijuana use has been well documented,^{20–23} and symptoms of GAD have been associated with greater levels of marijuana use.²⁴ In general, substance abusers frequently characterize their use as a means for coping with psychiatric symptoms.^{25–27} Among marijuana users, coping motives have been found to be associated with a variety of anxiety-related constructs: agoraphobic cognitions, anxiety arousal,²⁷ affective liability,²⁸ negative affect,²⁹ and worry.²⁴ Little is known however, about the relationship between coping motives and GAD, the most common anxiety disorder among women.

Beyond an individual's motives for use, investigators have focused on marijuana effect expectancies, that is, an individual's expectations about the effects of substance use.³⁰ The distinction between effect expectancies and motives for use is often negligible among users. Nevertheless, expectancies are thought to more fully capture an individual's perception of the likelihood of marijuana use fulfilling intended motives.³¹ One of the most commonly reported expectancies of marijuana use is tension reduction and relaxation (TRR).³² Similar to coping motives, individuals endorsing TRR expectancies rely on marijuana use to reduce tension (or increase relaxation), an expectation that suggests the presence of anxiety symptoms.

Buckner and Schmidt³³ examined the mediating role of various marijuana effect expectancies on social anxiety symptoms and marijuana-related problems and use. Although TRR expectancies were initially identified as a significant predictor of marijuana problems in this study, Buckner and Schmidt did not find TRR to be a significant mediator of social anxiety and marijuana use (vs. nonuse) in logistic meditational analyses. Rather, cognitive and behavioral impairment expectancies were found to significantly mediate the relationship between social anxiety symptoms and marijuana use. The mediating role of TRR expectancies on the relationship between a continuous measure of marijuana use and broader anxiety symptoms among users remains unclear.

There are reasons to believe that young women may exhibit a unique profile of marijuana use with respect to TRR expectancies and anxiety symptoms because of the dramatic gender differences in GAD prevalence, with women having two times the prevalence rate of men.^{18,19} In the current study, we hypothesize that TRR expectancies will significantly mediate the relationship between GAD symptoms and marijuana use in young adult women.

Materials and Methods

Participants

The current study used the baseline data from a randomized clinical trial of a brief, motivationally focused marijuana intervention for sexually active young adult women. The study sample was recruited from the community using advertisements aimed at women who have smoked marijuana at least three times in the past 3 months. Other inclusion criteria for this study were (1) aged 18–24, (2) live within 20 miles of Providence, RI, and planning to remain in the geographic area for the next 6 months, (3) speak English, (4) have had heterosexual intercourse on at least one occasions in the past 90 days, (5) not pregnant, and (6) do not meet criteria for sub-

stance dependence (other than marijuana, alcohol, or nicotine) within the past year.

A total of 1728 women were screened, and 1183 were excluded for not meeting study eligibility criteria. Of the remaining 545 eligible women, an additional 178 women refused or were unable to enroll. In total, 367 women provided informed consent approved by the institutional review board of Butler Hospital. Of those providing consent, 35 were determined to be ineligible for the study during the baseline assessment. A total of 332 women completed the baseline assessment and were compensated \$30 for the assessment interview.

Measures

Substance use. Past 90-day marijuana, alcohol, and other substance use was assessed using the timeline follow-back (TLFB).³⁴ The TLFB is a calendar-based questionnaire that prompts participants to recall the frequency of substance use in the past 90 days. The TLFB has been shown to have strong test-retest reliability for marijuana use at 30-, 90-, and 365-day intervals (0.89, 0.90, and 0.92, respectively). Moreover, the TLFB has been shown to have good concurrent validity (coefficients ranging from 0.44 to 0.51) with the Addiction Severity Index, a commonly used self-report measure of substance use. The TLFB has also been shown to have strong discriminant validity ($r=0.06–0.17$) with scales of nonsubstance use domains.³⁵ Additional questions included the number of times participants smoked marijuana per day and if participants were tobacco smokers. Total marijuana used (the variable used in subsequent models) was computed by multiplying the number of use days by the average number of times used per day. Past 90-day marijuana and alcohol abuse and dependence symptoms were assessed using the Structured Clinical Interview for DSM-IV (SCID-I).³⁶ The item content of the SCID-I corresponds to DSM criteria for alcohol and substance abuse/dependence. The SCID-I has been shown to have strong concurrent, discriminant, and predictive validity among substance users.³⁷

Anxiety symptoms. GAD symptoms in the past 90 days were assessed using the Psychiatric Diagnostic Screening Questionnaire (PDSQ).³⁸ The PDSQ is a brief self-report scale designed to screen for the most common DSM-IV axis I disorders. In the current study, we used the GAD subscale of the PDSQ, which consists of 10 GAD symptoms based on DSM criteria. The number of endorsed symptoms of the GAD subscale are summed to form a GAD subscale score. Zimmerman and Mattia³⁸ provide clinical cutoffs (GAD cutoff ≥ 7 , which corresponds to a 90% diagnostic sensitivity level). The GAD subscale of the PDSQ has been shown to have good internal consistency ($\alpha=0.89$) and test-retest reliability (reliability coefficient = 0.79). The GAD subscale of the PDSQ has also been shown to have adequate convergent validity (0.67) with clinician diagnosis and other scales of GAD. Furthermore, a discriminant validity correlational coefficient of 0.35 has been reported for the PDSQ GAD subscale and other domains of psychiatric diagnosis.³⁸

Relaxation and tension reduction expectancies

Positive marijuana expectancies, including TRR, were measured using the 48-item Marijuana Effect Expectancies

Questionnaire (MEEQ).³⁹ The MEEQ includes three positive marijuana expectancies subscales: Social & Sexual Facilitation, Perceptual and Cognitive Enhancement, and TRR. The MEEQ TRR subscale (mediator in our analyses) includes 8 items rated on a 5-point Likert scale (1, disagree strongly, to 5, agree strongly). Sample items include: I get a sense of relaxation from using marijuana and Marijuana makes me feel carefree and I do not care about my problems as much. Items are summed, with a possible score range of 8–40. The internal consistency of the MEEQ subscales ranges from moderate to high (0.66–0.82). The MEEQ has been shown to have adequate test-retest reliability over a 2-year period, with values ranging from 0.21 to 0.56 (all *p* values <0.05). A significant and positive correlation ($r = 0.39, p < 0.001$) between the MEEQ TRR subscale and a similar subscale (Tension Reduction subscale of the AEQ-A [Alcohol Expectancy Questionnaire-Adolescent Form]) has also been reported, indicating adequate convergent validity.³⁹

Analyses

Descriptive statistics were tabulated in order to summarize the background characteristics of participants. Product-moment correlations were calculated to summarize bivariate associations among variables included in subsequent models. Two structural equation models (SEM) were estimated to test the hypothesis that TRR mediate the effect of anxiety symptom count on quantity of marijuana use. The first is a fully recursive model including the direct effect of GAD symptoms on total marijuana use and the indirect effect of GAD symptoms on total marijuana use as mediated by TRR. All direct and indirect effects for other model covariates were also estimated. This just identified model is illustrated in Figure 1 and provides perfect statistical fit with the observed data. The second model is the full mediation model in which the direct effect of GAD on total marijuana use is constrained to equal 0. In Figure 1, the dashed line from GAD to total marijuana use indicates that this effect is not estimated in the full mediation model. The Satorra-Bentler scaled chi-square test is used to test the fit of the full mediation model.

Additionally, we report the Bayesian Information Criterion (BIC) as an additional indicator of relative model fit. If the observed data are consistent with the meditational hypothesis, we would expect to find statistical significance for the total effect of GAD on total marijuana use and the specific indirect effect of GAD on total marijuana use via TRR. The effect would be considered partially mediated if such conditions hold and the full-mediation model fails to fit the observed data. We report coefficients for the best fitting model. Auxiliary analyses were conducted to determine if mediation was specific to TRR expectancies or if the effect of GAD symptoms on total marijuana use was mediated by other positive marijuana expectancies, such as social and sexual facilitation or perceptual and cognitive enhancement. Models were estimated using MPlus 5.1.⁴⁰ Preliminary exploratory analysis indicated that total marijuana use and average alcohol consumption exhibited marked skewness and kurtosis. After evaluating alternative power transformations, both variables were log transformed before model estimation. We used bias-corrected bootstrap resampling with 10,000 replications^{41,42} as a robust alternative to inferential tests. Parameter estimates with 95% confidence intervals (CI), not including 0, were

considered statistically significant at the 0.05 level. Fully standardized coefficients are also presented. Based on previous studies that have found significant associations between marijuana-related variables, other exogenous variables were included in the path models as covariates: (1) age, (2) smoking status, and (3) alcohol use (log transformed).

Results

Sample characteristics

Participant characteristics are summarized in Table 1. The mean age of study participants was 20.47 (± 1.7). Approximately 67.7% ($n = 225$) were Caucasian, 10.5% ($n = 35$) were African American, 11.5% ($n = 38$) were Hispanic, and 10.2% ($n = 34$) were of other racial or ethnic origins. In total, 52.7% ($n = 175$) of participants met diagnostic criteria for marijuana abuse and 39.6% ($n = 131$) met dependence criteria. On average, participants reported using marijuana on 51.5 (± 30.6 , median = 52) of the 90 days before baseline assessment. The mean number of anxiety symptoms was 3.87, and a total of 80 (24.1%) participants exceeded the PDSQ diagnostic GAD cutoff (≥ 7 symptoms). The mean MEEQ tension reduction score was 22.5 (± 4.0). Nearly half of study participants (48.8%) were current cigarette smokers, and the mean number of days of alcohol use (in the past 90 days) was 19.0 (± 16.7).

TABLE 1. SAMPLE CHARACTERISTICS (N = 332)

Characteristic	% (n)		
Race/ethnicity			
Caucasian (non-Hispanic)	67.7 (225)		
African American	10.5 (35)		
Hispanic	11.5 (38)		
Other minority	10.2 (34)		
Some college or degree (Yes)	69.9 (232)		
Never married	96.4 (320)		
Marijuana abuse (Yes)	52.7 (175)		
Marijuana dependence (Yes)	39.6 (131)		
Current cigarette smoker (Yes)	48.8 (162)		
Met alcohol abuse criteria (Yes)	27.1 (90)		
Met alcohol dependence criteria (Yes)	12.1 (40)		
	<i>Mean (± SD)</i>	<i>Median</i>	<i>Range</i>
Age, years	20.47 (1.78)	20.0	18–24
Age first used marijuana	14.73 (2.18)	15.0	8–21
Days (past 90) used marijuana	51.47 (30.56)	52	3–90
Days (past 90) used alcohol	19 (16.74)	14.0	0–80
Anxiety symptom count	3.87 (3.1)	3	0–10
Tension reduction expectancy score	22.54 (4.04)	23	9–30

TABLE 2. PRODUCT-MOMENT CORRELATIONS, MEANS, AND STANDARD DEVIATIONS ($N=332$)

Variable	1	2	3	4	5	6
1 Log total marijuana use	1.00					
2 MEEQ relaxation/tension reduction	0.345*	1.00				
3 Anxiety symptom count	0.149*	0.175*	1.00			
4 Log average alcohol/week	0.045	-0.040	-0.083	1.00		
5 Currently smokes cigarettes (Yes)	0.189*	-0.016	0.147*	0.067	1.00	
6 Years age	0.027	0.046	0.145*	0.162*	0.149*	1.00
Mean	4.39	22.54	3.87	2.04	0.49	20.93
Standard deviation	1.33	4.04	3.10	1.07	0.50	1.79

* $p < 0.05$.

MEEQ, Marijuana Effect Expectancies Questionnaire.

Product-moment correlations and summary statistics are reported in Table 2. A number of relatively weak yet statistically significant correlations were observed. Total marijuana use frequency was positively associated with TRR ($r=0.34$, $p < 0.05$), anxiety symptom count ($r=0.16$, $p < 0.05$), and current cigarette use ($r=0.20$, $p < 0.05$). TRR was associated positively with anxiety symptom count ($r=0.17$, $p < 0.05$).

We estimated two structural equation models. The first was a just identified model estimating the direct effect, the indirect effect as mediated by TRR, and the total effects of anxiety symptom count on total quantity of marijuana use, adjusting for age, current cigarette smoking, and average weekly alcohol consumption. We do not report all the parameter estimates from this model but note that the total effect ($b_{yx} = 0.056$, 95% CI 0.012–0.098, $p < 0.05$) of anxiety symptom count on total marijuana use was statistically significant, as was the indirect effect ($b_{yx} = 0.025$, 95% CI 0.010–0.046, $p < 0.05$) of anxiety symptom count on total marijuana use as mediated by TRR. However, the direct effect ($b_{yx} = 0.031$, 95% CI -0.013–0.098, $p > 0.05$) of anxiety symptom count on total marijuana use was not statistically significant.

The second model is the full mediation model, which constrains the direct effect of anxiety symptom count on total marijuana use to 0 (Fig. 1). The Satorra-Bentler scaled chi-square test indicated the mediation model provided acceptable fit with the observed data (likelihood ratio [LR²] = 2.25, $df=1$, $p=0.134$) and was consistent with the hypothesis that the effects of anxiety symptom count on total marijuana use was fully mediated by TRR. Additionally, the BIC also favored the fully mediated model; BIC for the fully mediated model was 7454.0 vs. 7457.9 for the just identified model. Unstandardized and standardized parameter estimates and all implied total, direct, and indirect effects for this model are reported in Table 3.

Coefficients and CI estimates for the TRR equation indicate that age, being a current cigarette smoker, and weekly alcohol use were not significantly associated with TRR expectancies (Table 3) (fully standardized path coefficients corresponding to this model are also presented in Fig. 1). GAD symptom count has a statistically significant direct effect ($b_{yx} = 0.227$, 95% CI 0.086–0.369, $p < 0.05$) on TRR expectancies. Total marijuana use was not associated significantly with either age ($b_{yx} = -0.020$, 95% CI -0.101–0.058, $p > 0.05$) or weekly alcohol consumption ($b_{yx} = 0.063$, 95% CI -0.051–0.182, $p > 0.05$). Current regular cigarette use was positively and significantly associated with total marijuana use ($b_{yx} = 0.519$, 95% CI 0.242–0.784, $p < 0.05$). TRR expectancies had a statistically signifi-

cant ($b_{yx} = 0.116$, 95% CI 0.084–0.146, $p < 0.05$) direct effect on total marijuana use. Total effects, direct effects, and specific indirect effects of GAD symptom count and selected covariates on total marijuana use are also reported in Table 3. Because the direct effect of GAD symptom count on total marijuana use was constrained to 0, the total effect of GAD and indirect effect of GAD on total marijuana use are equal; GAD symptom count has a statistically significant indirect effect ($b_{yx} = 0.026$, 95% CI 0.010–0.046, $p < 0.05$) on total marijuana use as mediated by TRR expectancies.

Additional analyses were conducted to determine if the mediation process was specific to TRR expectancies or if the effect of GAD symptoms on total marijuana use was more generally mediated by other positive marijuana expectancies, such as social and sexual facilitation or perceptual and cognitive enhancement. In a model that included these other positive expectancies as possible mediators, the specific indirect effects of GAD on total marijuana use via social and sexual facilitation ($b_{yx} = 0.002$, 95% CI -0.004–0.008, $p > 0.05$) and via perceptual and cognitive enhancement ($b_{yx} = 0.011$, 95% CI -0.023–0.001, $p > 0.05$) were not statistically significant. The specific indirect effect of GAD symptoms on total marijuana use remained substantively and statistically consistent ($b_{yx} = 0.029$, 95% CI 0.009–0.049, $p < 0.05$) with the more parsimonious model results that we previously pre-

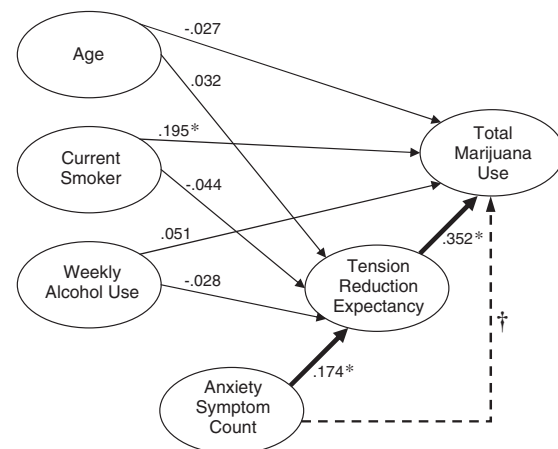


FIG. 1. Structural model. All values are standardized coefficients, * $p < 0.05$. †Indicates the nonsignificant direct effect of the just identified model that was subsequently dropped in the final model.

TABLE 3. MEDIATION MODEL PARAMETER ESTIMATES AND TOTAL, DIRECT, AND INDIRECT EFFECTS ON TOTAL QUANTITY OF MARIJUANA USE (N = 332)

Equation	b_{yx} (95% CI) ^a	β_{yx} ^b
TRR on		
Age	0.073 (-0.169-0.324)	0.032
Current cigarette smoker (Yes)	-0.355 (-1.257-0.520)	-0.044
Log drinks/week	-0.241 (-0.563-0.342)	-0.028
Anxiety symptom count	0.227* (0.086-0.369)	0.174
Log total times used marijuana on		
Age	-0.020 (-0.101-0.058)	-0.027
Current cigarette smoker (Yes)	0.519* (0.242-0.784)	0.195
Log drinks/week	0.063 (-0.051-0.182)	0.051
TRR	0.116* (0.084-0.146)	0.352
Anxiety symptom count		
Total, direct, and indirect effects		
Effects of age on marijuana use		
Total effect	-0.011 (-0.094-0.069)	-0.015
Direct effect	-0.020 (-0.101-0.058)	-0.027
Indirect effect via TRR	0.008 (-0.020-0.040)	0.011
Effects of Smoking on marijuana use		
Total effect	0.478* (0.184-0.767)	0.180
Direct effect	0.519* (0.242-0.784)	0.198
Indirect effect via TRR	-0.041 (-0.151-0.057)	-0.015
Effects of alcohol/week on marijuana use		
Total effect	0.051 (-0.079-0.181)	0.041
Direct effect	0.063 (-0.051-0.182)	0.051
Indirect effect via TRR	-0.012 (-0.068-0.039)	-0.010
Effects of GAD on marijuana use		
Total effect	0.026* (0.010-0.046)	0.061
Direct effect		
Indirect effect via TRR	0.026* (0.010-0.046)	0.061

^aUnstandardized coefficients. Confidence interval (CI) estimates were made by bias-corrected bootstrap resampling with 10,000 replications.

^bStandardized coefficients.

* $p < 0.05$ (zero is not included in the 95% CI estimate).

GAD, general anxiety disorder; TRR, tension reduction and relaxation.

sented in detail. These findings are consistent with the hypothesis that the effect of GAD symptoms on total marijuana use is specifically mediated by TRR expectancies.

Discussion

Our findings indicate that the relationship between anxiety symptoms and overall marijuana use is mediated by the expectancy that marijuana use will relieve tension and help young female users relax. For these women, marijuana use may represent a reliable method that they expect will decrease tension and anxiety. Previous studies have established an association between marijuana use and anxiety-related constructs, that is, agoraphobic cognitions, anxiety arousal,^{27,43} affective liability,²⁸ negative affect,²⁹ and worry.²⁴ Our findings add support to this link between anxiety and marijuana use by demonstrating that TRR expectancies mediate the relationship between GAD symptoms and use in a nontreatment-seeking sample of young women.

The prevalence of anxiety symptoms in our sample is noteworthy, considering that we did not specifically seek to include those experiencing anxiety in our study. The mean number of anxiety symptoms among participants in the current study was 3.87, and approximately one fourth of participants breached the PDSQ diagnostic screening threshold for

GAD. This comorbidity of anxiety symptoms and marijuana use in our sample supports the notion that anxiety is an important facet of the psychiatric profile of young female marijuana users. Similarly, the high rate of tobacco use in our sample is also noteworthy. Nearly half of our sample reported being a current smoker, which raises the question of whether tobacco use may also serve as a way to cope with anxiety symptoms. Previous studies have shown a link between affect regulation and tobacco use.^{44,45} Further research is needed to fully explore whether coping expectancies in particular mediate this relationship in young adult women.

Our study's focus on symptoms of GAD extends previous findings with social anxiety and addresses individuals experiencing symptoms of GAD, one of the most common psychiatric conditions. Furthermore, in previous studies, young adult marijuana users have been recruited exclusively from colleges and universities.^{28,33,43,44} Our community sample of young adult females provides a first look at the mediating role of TRR expectancies and marijuana use in a sample with a more varied level of educational achievement and socioeconomic status.

Studies involving alcohol use expectancies have found greater endorsement levels of TRR among men.⁴⁶⁻⁵⁰ Because of our exclusively female sample, we cannot draw conclusions about gender differences in TRR marijuana expectancies.

However, our findings underscore the need for future studies that include men so that gender distinctions in marijuana expectancies can be further explored.

Study limitations

Self-reports may misrepresent participants' substance use because of social desirability or poor recall of substance use experiences. Despite the potential for such self-report biases, studies have found a high concordance rate between self-report and biomarkers of marijuana use.^{51–53} Second, we used GAD symptom counts as a dimensional measure of severity. This measurement approach is limited, as the number of endorsed anxiety symptoms may not be a valid measure of anxiety severity. Symptom counts on the lower and higher ends of the continuum are more clearly indicative of level of severity. For symptom counts in the middle range, however, severity is less clear. Nevertheless, the use of symptom counts is a common and useful method for capturing DSM psychiatric symptoms for use as a dimensional measure of severity.⁵⁴ A more comprehensive measurement approach would have included more specific measures of GAD severity as well as measures of additional anxiety disorders, for example, social anxiety, panic disorder, and agoraphobia. The inclusion of additional anxiety disorders would have provided greater clarity with respect to the differential role of TRR on the relationship between these conditions and marijuana use.

Third, the cross-sectional nature of the current study limits our ability to draw conclusions about the stability of relationships over time. This also limits our ability to make conclusions about the temporal ordering of relationships; for example, we are unable to fully appreciate the potential impact of marijuana use on GAD symptoms in our models. Future studies that employ a longitudinal approach are needed to validate our findings. Finally, we specifically sought to investigate the subpopulation of women between the ages of 18 and 24. Thus, our findings may not generalize to older women, women who are not sexually active, noncommunity samples, nonheterosexuals, or men. We recognize that a less restrictive sample population would allow for a broader generalization of findings; however, we specifically focused on this highly vulnerable subgroup because of their high levels of marijuana use and associated risks.

Conclusions

Considering that young adults have the highest rates of marijuana use¹ and use of marijuana is associated with a number of physical health^{2–5} and psychosocial problems,^{6–11} findings from the current study may have public health implications. Our findings can be used to further refine and develop treatment interventions for young women with more heterogeneous levels of marijuana use and who struggle with symptoms of GAD. A number of treatment modalities for marijuana dependence have been developed and tested.⁵⁵ With anxiety symptoms prevalent in this population, TRR is an important factor to consider when designing interventions for young adult female marijuana users. Intervention programs targeting marijuana use may be enhanced by including elements that address the relief of anxiety-related symptoms. Specifically, young women may benefit from interventions that teach alternative methods of tension reduction to relieve distressing anxiety symptoms. Several anxiety reduction be-

havioral interventions as well as pharmacological agents have been shown to be efficacious both independently and combined⁵⁶; however, such treatments have yet to be fully incorporated into marijuana treatment. Similarly, our findings may have implications for the development of prevention interventions. Such interventions can seek to identify women with GAD symptoms and attempt to target such symptoms, with the intended goal of thwarting use as a means of relieving tension or anxiety. The development of more targeted and symptom-specific treatments for young adult marijuana users can impact the greater public health when one considers the prevalence of use in this age group and the associated health and psychosocial correlates of use.

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Disclosure Statement

No competing financial interests exist.

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