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The Association Between Anxiety Sensitivity and Motivation to Quit Smoking Among Women and Men in Residential Substance Use Treatment

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Abstract

Background—Smoking-attributed mortality is the leading cause of death among individuals in residential substance use treatment. As such, identifying factors that influence smoking cessation is highly relevant and important for this group. Motivation to quit (MTQ) smoking is one such factor that is related to smoking cessation.

Objectives—In the present study we examine the relationship between Anxiety Sensitivity (AS) and MTQ among individuals enrolled in a residential substance use treatment center in Washington, DC. In light of gender differences in smoking cessation as well as factors that contribute to cessation, we examined this relationship by gender in men and women using multiple group path analysis.

Methods—Participants ($n = 472$) completed a measure of MTQ, the structured clinical interview for DSM-IV (SCID-IV-TR), a measure of AS, and self-reported their number of cigarettes smoked per day prior to entering a restricted environment.

Results—Results indicated that AS was significantly related to MTQ in women (standardized path estimate = 0.21, $p = .01$), but was not significantly related to MTQ in men.

Conclusions/Importance—Findings suggest the importance of considering AS as a factor in MTQ for women and subsequent smoking cessation among individuals in residential substance use treatment. Results of this study contribute to the extant literature on predictors of MTQ and highlight the need for tailored cessation interventions with AS as one potential cessation treatment target.

Keywords

anxiety sensitivity; tobacco cessation; motivation to quit; high risk groups; gender

There is a clear need to identify populations at the greatest risk for chronic tobacco use given the significant public health costs associated with smoking (Centers for Disease

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Declaration of Interest

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

Control (CDC, 2011). One population with drastically elevated rates of regular cigarette smoking is individuals in residential substance use treatment. While prevalence estimates of smoking in the United States are approximately 20% (CDC, 2011), estimates of daily cigarette smoking among patients in residential substance use treatment far exceed this nationwide statistic, ranging from 70%–90% (Budney, Higgins, Hughes, & Bickel, 1993; Kalman, Morissette, & George, 2005; Stark & Campbell, 1993). Smoking cessation is uniquely important for individuals in residential substance use treatment as tobacco-related disease is the leading cause of death among this population (Hurt et al., 1996). Moreover, smoking abstinence contributes to improved drug and alcohol abstinence (Baca & Yahne, 2009; Prochaska, Delucchi, & Hall, 2004). Yet, smoking cessation is rarely a treatment target for individuals while they are in substance use treatment (Currie, Nesbitt, Wood, & Lawson, 2003; Prochaska et al., 2004) in spite of the multiple health benefits associated with quitting.

Although direct measurement of smoking cessation is clearly of great importance for this high risk population, there are multiple challenges in effectively measuring the process of intentional behavior change, given restrictions on smoking in the treatment environment as well as the likelihood of subsequent exposure to restricted environments, including additional inpatient treatment as well as incarceration for the large percentage who will relapse back to drugs (Brunette, Mueser, & Drake, 2004; Gossop, Stewart, Browne, & Marsden, 2002). These factors greatly increase the difficulty of conducting follow-up assessments of smoking relapse and make it unclear as to whether the resulting sample is representative of the true population of smokers in substance use treatment.

Thus, within this population of individuals in residential substance use treatment, it is useful to identify indicators important to the process of cessation which do not require long-term tracking. Motivation to quit (MTQ) smoking is a predictor of initiating a cessation attempt (Sciamanna, Hoch, Duke, Fogle, & Ford, 2000; Zhou et al., 2009) and can be considered as an important factor in the process of smoking cessation among smokers in residential substance use treatment. MTQ is comparatively more feasible to measure than smoking cessation among substance-using smokers in residential treatment in line with reasons outlined above, and, to the extent that it is a potential proxy for engaging in a quit attempt, can facilitate our understanding of one essential part of the process of cessation among this group.

With MTQ as an important indicator for initiating cessation among substance-using smokers in residential treatment, factors that influence MTQ in turn warrant investigation. While few studies have investigated predictors of MTQ smoking specifically among individuals in residential substance use treatment, predictors of MTQ have been identified in the general population of smokers and may be relevant to this high risk group. One particularly relevant factor is Anxiety Sensitivity (AS), or sensitivity to anxiety-related aversive internal states with sub-factors including concerns about negative physical, mental, and social consequences of anxiety symptoms (Zinbarg, Barlow, & Brown, 1997). Drawing from the conceptual model of AS, as well as the extant empirical literature, high AS smokers should be more prone to smoking-related bodily sensations and more likely to negatively interpret such sensations. Further, to the extent that high AS smokers may be more concerned about

negative health consequences of continued tobacco use (Dijkstra & Brosschot, 2003), they may also be more motivated to quit smoking as compared with individuals lower in AS (Zvolensky et al., 2004). In community smokers, the relationship between AS and MTQ has been supported such that higher levels of AS are predictive of higher levels of MTQ (Zvolensky et al., 2004; 2007c). This relationship may be especially relevant among groups with elevated smoking rates because of the differential smoking-related health burden on these groups such as among individuals in residential substance use treatment.

However, there are also important gender differences in both AS (Stewart, Taylor, & Baker, 1997) and MTQ (Curry, Grothaus, & McBride, 1997; Royce, Corbett, Sorensen, & Ockene, 1997). In particular, gender plays a role in the magnitude of the association between AS and various health outcomes, including pain experience, drinking behavior, and sedative use (e.g., Hearon et al., 2011; Keogh & Birkby, 1999; Keogh, Hamid, Hamid, & Ellery, 2004; Lawyer, Karg, Murphy, & Dudley McGlynn, 2002). Although the role of gender has not yet been examined in the relationship between AS and MTQ, in light of gender differences in the relationship between AS and other processes in smoking cessation, there is reason to believe that similar gender differences may exist in the relationship between AS and MTQ. As such, the extension of this work to individuals in residential substance use treatment also should consider the influence of gender in the relationship between AS and MTQ. The purpose of the present study was to examine the relationship between AS and MTQ in men and women enrolled in residential substance use treatment. Considering previous work by Zvolensky and colleagues (2004; 2007c), we hypothesized that higher levels of AS would be predictive of higher levels of MTQ when controlling for relevant covariates such number of cigarettes smoked per day (CPD) prior to entering a restricted environment. We expected that the relationship between AS and MTQ would vary across gender but did not have specific *a priori* hypotheses regarding the magnitude of these differences.

METHOD

Participants

Participants included 472 individuals (31.4% females) at a residential substance use treatment center in Washington DC admitted to the center between 2009 and 2012, who reported smoking at least one CPD before entering a restricted environment. The sample was primarily African-American (86.8%) and had a mean age of 42.1 years ($SD = 10.5$). The majority of the participants reported attending some high school (34.2%), graduating high school (30.5%), or passing a general educational development (GED) (21.0%). On average, the participants smoked 11.6 CPD ($SD = 9.1$) before entering a restricted environment (defined as prison, a detoxification facility, or the current treatment program).

Regarding the substance use treatment facility, at the time of treatment entry, participants were required to submit a negative urine drug screen. Individuals submitting positive urine drug screens had to complete a detoxification program. Length of treatment stay was typically between 28 and 180 days and was dependent on the participant's source of treatment funding. Patients were only permitted to leave the facility for scheduled appointments such as medical and legal appointments. Drug testing occurred on a weekly basis and any use was a ground for immediate removal from the center. Patients were

involved in a number of daily programs based on Alcoholics Anonymous and Narcotics Anonymous techniques, including relapse prevention skills training. Cigarette smoking was permitted in the facility, and patients were given four optional cigarette breaks daily. Smoking cessation was not part of substance use treatment at the center and there were no available smoking cessation programs, including no provision of nicotine replacement therapy.

Procedure

Permission to conduct research was obtained from the University of Maryland Institutional Review Board. Data for the present study were collected as part of an intake to treatment interview at the residential substance use treatment center. As part of the interview, the participants were escorted to a private room within the treatment facility by a doctoral-level trained interviewer, and were asked questions about their smoking, psychiatric, and substance use history. At the end of the interview, the participants were given the option to provide informed consent for the data they shared to be used for research purposes. The vast majority of individuals did consent to be included in research. Only those individuals who consented to research are included in the present analyses.

Measures

Demographic information—Demographic information (sex, age, race, and education) was collected using the demographic portion of the Psychiatric Research Interview for Substance and Mental Disorders (PRISM; Hasin et al., 1996). Age was coded continuously, while sex, race, and education were coded categorically.

Anxiety sensitivity—The Anxiety Sensitivity Index (ASI; Reiss, Peterson, Gursky, & McNally, 1986) is a 16-item measure of fear related to anxiety-related symptoms and exhibits high levels of internal consistency in clinical and nonclinical samples as well as good test-retest reliability (Peterson & Reiss, 1992). Factor analytic studies indicate that the ASI has a hierarchical structure with three first-order factors (physical concerns, cognitive concerns, and social concerns) and one single, higher-order general AS factor (Zinbarg et al., 1997). Consistent with past research on the relationship between AS and MTQ (Zvolensky et al., 2007a), the present investigation uses the higher-order general AS factor as a predictor of MTQ.

Cigarette smoking—In order to determine frequency of cigarette smoking among the sample, the participants were asked to self-report the number of CPD that they typically smoked before entering a restricted environment. Participants were asked: “On average, how many cigarettes a day did you smoke before entering a restricted environment (treatment, jail) or coming to (name of the treatment facility)?” Participants were asked specifically for their cigarette smoking prior to entering a restricted environment because the nature of the treatment facility was such that residents of the facility were limited to four smoking breaks daily. Thus, smoking behavior was restricted by environmental constraints during treatment. Similar constraints were present if participants were incarcerated or in a detoxification program prior to treatment entry. Because the intake to treatment interview was not intended to track smoking outcomes during treatment or following treatment completion, information

regarding smoking behaviors over time was not available. All the participants included in our sample were regular daily smokers prior to entering substance use treatment.

Motivation to quit—The participants were asked by interviewers to self-report their MTQ smoking cigarettes in the next month on a scale of 1 to 10 with 1 being the lowest and 10 being the highest. Interviewers asked the participants the following question: “On a 10-point scale, where 1 is the lowest and 10 is the highest, how much do you want to quit smoking within the next month?” Among the full sample, average MTQ was 6.44 (SD 3.60). Although it approached significance, MTQ was not significantly different between men and women ($F(1, 462) = 3.70, p = .06$).

Substance use and anxiety disorder diagnosis—As part of the standard intake battery at the treatment facility, psychiatric history and current psychopathology were diagnosed by trained doctoral-level interviewers using the Structured Clinical Interview for the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision (DSM-IV-TR; First, Spitzer, Gibbon, & Williams, 2002). For data regarding current substance-dependence diagnoses for the participants in the present study, see Table 1.

Data Analytic Strategy

All descriptive analyses were conducted in SPSS v. 21 and multiple group path analyses were conducted in Mplus. First, zero-order correlations were obtained to examine associations between AS, AS subscales, theoretically related constructs (CPD, age, race, and education), and MTQ. Subsequently, we used multiple group path analysis (Kline, 2011), an extension of multiple regression, to determine whether the relationship between AS and MTQ, covarying for CPD, differed across the two gender groups. The aim of the multiple group path analysis is to provide estimates of the magnitude and significance of hypothesized relationships among sets of variables separately by group. Through use of observed variables, multiple group path analysis allows the estimation of effects separately within gender from AS to MTQ.

RESULTS

Zero-Order Correlations

See Table 2 for descriptive data and zero-order correlations among the studied variables. Consistent with predictions, for women, AS was significantly positively correlated with MTQ ($r = 0.21, p < .05$). For men, AS was not significantly related to MTQ. Consistent with previous literature (West, 2004), CPD was significantly negatively correlated with MTQ for men ($r = -0.17, p < .01$). This relationship was positive and non-significant for women. Age, race, and education were not significantly related to MTQ for men or women and were not included as covariates in subsequent regression analyses.

Women were significantly more likely than men to meet current cocaine and hallucinogen/PCP substance-dependence criteria. These diagnoses were not significantly related to MTQ for women or men and as such were not included as covariates in our subsequent regression analyses. Current and lifetime anxiety disorder diagnoses

(Generalized Anxiety Disorder, Post-traumatic Stress Disorder, Social Phobia, Obsessive Compulsive Disorder) were also not significantly related to MTQ for women or men and also were not included as covariates in subsequent regression analyses.

Multiple Group Path Analysis

Prior to conducting the following path analysis, we examined the overall distribution of our data to determine whether it fulfilled the required normality assumptions. Results revealed that our data met the standards of normality, and therefore no subsequent transformations were necessary.

For women, results indicated that AS (unstandardized coefficient = 0.04, $SE = 0.02$; standardized coefficient = 0.21; $p = .01$), and not CPD (unstandardized coefficient = 0.01, $SE = 0.03$; standardized coefficient = 0.03; $p = .40$), was a significant predictor of MTQ (see Figure 1 for path diagrams). The full model accounted for 4.8% of the variance in MTQ.

In contrast, for men, results indicated that CPD (unstandardized coefficient = -0.05 , $SE = 0.03$; standardized coefficient = -0.12 ; $p = .05$), and not AS (unstandardized coefficient = 0.001, $SE = 0.005$; standardized coefficient = 0.02; $p = .86$), was a significant predictor of MTQ (see Figure 1 for path diagram). The full model accounted for 1.5% of the variance in MTQ.

DISCUSSION

The present study investigated the relationship between AS and MTQ smoking by gender among women and men enrolled in residential substance use treatment. Results suggest that AS is significantly related to MTQ for women but not for men. Specifically, women higher in AS were more motivated to quit smoking. While AS was not significantly related to MTQ for men, CPD was significantly negatively related to MTQ such that men smoking more CPD were less motivated to quit. A strength of this study was that the sample size was relatively large, suggesting that the lack of association between AS and MTQ among men was not due to a lack of power to detect an effect in this group. Taken together, these results suggest that different factors may contribute to MTQ smoking for women and men and that AS may be one relevant factor for women enrolled in residential substance use treatment. To the extent that MTQ can serve as an important indicator for initiating a cessation attempt among smokers in residential substance use treatment, AS may serve as an important target for cessation interventions among women in treatment.

The results of the current study have important implications for smoking cessation treatment among individuals enrolled in residential substance use treatment. Smoking cessation is especially important for this population due to elevated rates of tobacco-associated mortality for these individuals when compared with the general population (Budney et al., 1993; Hurt et al., 1996; Kalman et al., 2005; Stark & Campbell, 1993). Targeting subgroups who are more motivated to quit may be one way to identify individuals who would most likely engage in a smoking cessation treatment (Martin, Rohsenow, MacKinnon, Abrams, & Monti, 2006). Current findings suggest that high AS female smokers in residential substance use treatment are such a group to target as they are more motivated to quit smoking and

might be more likely to attempt cessation or engage in smoking cessation treatment. It is important to note that while AS may be associated with MTQ among women in residential substance use treatment, after initiation of the quit attempt, higher AS may place these women at higher risk for relapse compared with their low AS counterparts (Brown et al., 2001; Zvolensky et al., 2007a). Recent research among community smokers suggests that change in AS during smoking cessation may be one mechanism through which relapse is prevented (Assayag, Bernstein, Zvolensky, Steeves, & Stewart, 2012). Although we did not measure the role of AS in cessation outcomes in this sample, this is an important target for the future cessation research in this population. In addition, while the vast majority of research suggests that AS is a dimensional construct, other work has also demonstrated taxonic properties of AS (e.g., Zvolensky, Forsyth, Bernstein, & Leen-Feldner, 2007b). In order to better understand this potentially complex relationship between AS and MTQ, future studies would benefit from the examination of the structure of AS as it relates to MTQ.

These results have important clinical implications such that evidence-based strategies for modifying AS may be critically important for high AS female smokers in residential substance use treatment, a group that may be motivated to quit smoking but may have difficulties after initiating a quit attempt. Cognitive-behavioral strategies such as interoceptive exposures and cognitive restructuring have found support for reducing AS (for meta-analytic review, see Smits, Berry, Tart, & Powers, 2008). These strategies have been recently incorporated into smoking cessation treatment programs and have found preliminary support in small pilot studies (e.g., Zvolensky, Yartz, Gregor, Gonzalez, & Bernstein, 2008; Zvolensky, Bogiaizian, Salazar, Farris, & Bakhshaie, 2013). Extension to high AS female smokers in residential substance use treatment is an important next step.

There were several limitations to the present study. First, our sample was predominantly male, which is representative of adults in residential substance use treatment (Chen et al., 2011), but may not be representative of all cigarette smoking substance users. Second, data analysis was conducted retrospectively and the parent study was not specifically designed to examine the constructs presented here. As such, we used single item measures of MTQ and CPD and did not measure additional potentially relevant smoking constructs, cessation behaviors, other negative affectivity constructs, or drug use quit motivation. Future studies should incorporate such measures and examine the utility of including additional variables as covariates. Third, cigarette smoking information was limited to a self-report of cigarettes smoked per day prior to entering a restricted environment and this was not supplemented with biochemical verification or information on nicotine dependence. Future extension studies would benefit from multiple measurements of cigarette smoking.

With these limitations in mind, the present study implicates the role of AS in predicting MTQ smoking for women enrolled in residential substance use treatment. This study extends previous research which has found a similar relationship between AS and MTQ for community smokers (Zvolensky et al., 2004; 2007a) to individuals enrolled in residential substance use treatment and highlights that gender may be an important domain for future study when examining the relationship between AS and MTQ. Results of this study contribute to the extant literature, which suggests gender differences in MTQ, and highlights

the potential need for tailored interventions. Because tobacco-associated illness is the leading cause of death for individuals in residential substance use treatment, continuing to examine factors that contribute to MTQ is necessary. Anxiety sensitivity and gender differences in the relationship between AS and MTQ are two such factors that merit further examination among this population.

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Biography



Jennifer Dahne is a doctoral candidate in Clinical Psychology at the University of Maryland, College Park. Her research focuses on factors that contribute to the initiation and maintenance of tobacco use as well as on the dissemination of evidence-based treatments for psychopathology and substance use.



Elana M. Hoffman is a doctoral student in Clinical Psychology at the University of Maryland, College Park. Her research focuses on substance use, with a particular emphasis on nicotine addiction. She is interested in applying behavioral treatments for smoking cessation to undeserved populations.



Dr. Laura MacPherson is an Associate Professor of Psychology at the University of Maryland, College Park. Her research focuses on a developmentally informed examination

of the progression and cessation of addictive behaviors among adolescents and young adults to improve youth-tailored interventions as well as developing behavioral treatments for adult smokers with psychiatric comorbidities.

GLOSSARY

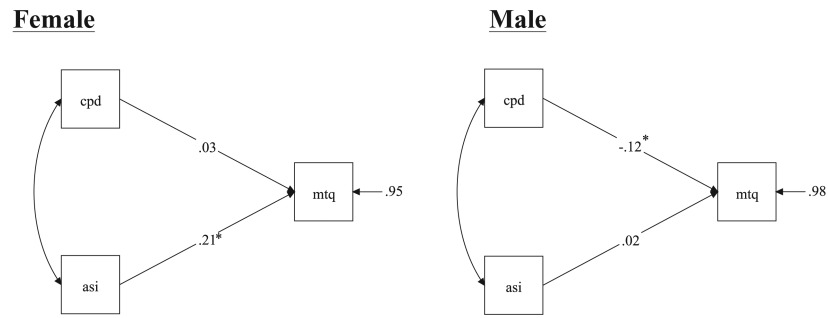
<i>Anxiety Sensitivity</i> (AS)	Sensitivity to anxiety-related aversive internal states with sub-factors including concerns about negative physical, mental, and social consequences of anxiety symptoms.
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Note: Standardized path estimates are presented; cpd = Cigarettes per day, mtq = motivation to quit, asi = anxiety sensitivity; * $p < .05$

FIGURE 1.
Multiple group path models

TABLE 1

Drug dependence information for women and men in the sample

Current drug dependence	Women (%)	Men (%)	χ^2	<i>p</i>
Alcohol	31.10	26.70	0.96	.33
Cocaine	48.30	34.40	8.23	.004
Opioid	18.40	20.80	0.36	.55
Hallucinogen/PCP	17.0	10.60	3.71	.05
Cannabis	8.20	10.3	0.55	.46

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TABLE 2

Zero-order correlations and descriptive data for studied variables

	1	2	3	4	M (SD)
Women					
1. MTQ	1	0.21 *	0.04	0.09	5.97 (3.74)
2. ASI total		1	0.20 *	0.10	23.31(17.77)
3. CPD			1	0.07	11.39 (9.36)
4. Age				1	41.56 (9.17)
Men					
1. MTQ	1	0.01	-0.17 **	.00	6.66 (3.52)
2. ASI Total		1	0.09	0.19 **	23.42 (17.26)
3. CPD			1	0.06	11.71 (8.75)
4. Age				1	42.38 (11.07)

Note

*
 $p < .05$ **
 $p < .01$.