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## An Evaluation of Anxiety Sensitivity, Emotional Dysregulation, and Negative Affectivity among Daily Cigarette Smokers: Relation to Smoking Motives and Barriers to Quitting

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### Abstract

The present investigation evaluated the relations between anxiety sensitivity and motivational bases of cigarette smoking, as well as barriers to quitting smoking, above and beyond concurrent substance use, negative affectivity, and emotional dysregulation among a community sample of 189 daily cigarette smokers (46% women;  $M_{age} = 24.97$  years,  $SD = 9.78$ ). Results indicated that anxiety sensitivity was significantly related to coping, addictive, and habitual smoking motives, as well as greater perceived barriers to quitting. These effects were evident above and beyond the variance accounted for by concurrent tobacco, alcohol, and marijuana use and discernable from shared variance with negative affectivity and emotional dysregulation. Emotional dysregulation was significantly related to stimulation, habitual, and sensorimotor smoking motives and greater perceived barriers to quitting, whereas negative affectivity was only significantly related to smoking for relaxation. These findings uniquely add to a growing literature suggesting anxiety sensitivity is an important and unique cognitive factor for better understanding clinically-relevant psychological processes related to cigarette smoking.

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There has been an increased effort to better understand linkages between tobacco use and anxiety disorders (Brown & Wolfe, 1994; Feldner, Babson, & Zvolensky, 2007; Kalman, Morissette, & George, 2005; Koenen et al., 2006; Morissette, Tull, Gulliver, Kamholz, & Zimering, 2007; Morrell & Cohen, 2006; Patton, Carlin, Coffey, Wolfe, Hibbert, & Bowes, 1998; Zvolensky, Bernstein, Marshall, & Feldner, 2006; Zvolensky, Feldner, Leen-Feldner, & McLeish, 2005). These scientific activities are theoretically and clinically important as there are bidirectional relations between tobacco use and anxiety and its disorders (Morissette et al., 2007; Morrell & Cohen, 2006; Zvolensky & Bernstein, 2005).

An important cognitively-based individual difference factor relevant to psychologically-based smoking processes is anxiety sensitivity (AS). AS is the fear of anxiety and arousal-related sensations (McNally, 2002), and it has been conceptualized as a trait-like, cognitive predisposition for anxiety and stress-related psychopathology (Bernstein & Zvolensky, 2007; Taylor, 1999) that is malleable if targeted via cognitive-behavioral or pharmacological clinical

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intervention (Otto & Reilly-Harrington, 1999). This cognitive construct is concurrently and prospectively associated with anxiety and mood disorders, particularly panic and post-traumatic stress psychopathology (Hayward, Killen, Kraemer, & Taylor, 2000; Li & Zinbarg, 2007; Maller & Reiss, 1992; Schmidt, Lerew, & Jackson, 1997, 1999; Schmidt, Zvolensky, & Maner, 2006).

There is emerging empirical evidence that AS also is associated with certain smoking processes as well as greater problems during smoking cessation attempts. For example, higher levels of AS are related to early lapse and relapse during quit attempts (Brown, Kahler, Zvolensky, Lejuez, & Ramsey, 2001; Mullane, Stewart, Rhyno, Steeves, Watt, & Eisner, in press; Zvolensky, Bernstein et al., 2007; Zvolensky, Bonn-Miller, Bernstein, & Marshall, 2006). Higher levels of AS also have been associated with greater perceived intensity of nicotine withdrawal symptoms (Zvolensky, Baker et al., 2004). These data suggest that AS may be an important risk factor for poor cessation outcome (Zvolensky & Bernstein, 2005). Yet, there is limited scientific understanding of the mechanisms linking AS to smoking-related processes. In this context, study of the associations between AS and psychological processes central to smoking behavior (e.g., motivational bases of smoking, perceived barriers to quitting) are particularly underdeveloped. By better understanding these psychological processes, there is opportunity to clarify how and why AS may be related to smoking maintenance and poor cessation outcomes. Pursuing this line of work has the potential to better inform specialized smoking cessation intervention programs for high AS smokers, a notably difficult-to-treat population (Zvolensky & Bernstein, 2005).

A number of clinically-relevant findings have begun to emerge from the empirical study of AS and its association(s) with psychologically-based smoking processes. Here, AS has been found to be associated with coping-oriented smoking motives (negative affect reduction; e.g., “*When I feel uncomfortable or upset about something, I light up a cigarette*”) among adults and adolescents (Brown et al., 2001; Comeau, Stewart, & Loba, 2001; Novak, Burgess, Clark, Zvolensky, & Brown, 2003; Stewart, Karp, Pihl, & Peterson, 1997; Zvolensky, Bonn-Miller et al., 2006). More recently, Leyro, Zvolensky, Vujanovic, and Bernstein (in press) found that AS was also significantly related to smoking for negative affect reduction motives as well as habitual (e.g., “*I smoke cigarettes automatically without even being aware of it*”) and addictive (e.g., “*I get a real gnawing hunger for a cigarette when I haven’t smoked for a while*”) motives. These findings suggest that AS may be related to smoking with the intent of reducing negative affect and other aversive internal states (e.g., craving for cigarettes) as well as reflexive patterns of use. That is, AS should theoretically be related most strong to negative affect reduction, habitual, and addictive smoking motives. If AS is indeed a robust cognitive factor related to these motives, it should maintain relations to these motives that are evident even when shared variance with other related emotional variables is taken into account. Finally, one recent study indicated that AS is significantly related to greater levels of perceived barriers to quitting smoking among adult daily smokers (Zvolensky, Vujanovic et al., 2007). This finding suggests, aside from affect-relevant smoking motives, AS may be relevant to better understanding perceived barriers to quitting. Overall, these investigations suggest that AS is related to (1) beliefs that smoking can be successfully employed in an automatized or habitual fashion to dampen negative affect and related aversive drug-related interoceptive cues (e.g., craving), and (2) the perception that quitting will be personally difficult.

Although extant work is promising, there are at least four central limitations of the empirical work on AS and psychological processes related to smoking that are in need of further scholarly attention. First, it remains unclear whether other theoretically-relevant individual difference factors for emotional vulnerability exhibit similar types of relations with smoking motivational processes and perceived barriers to quitting, and in particular, whether such relations are independent of AS. Of possible factors that could explain the heretofore observed AS-

motivational and perceived barriers to quitting effects, emotional dysregulation and negative affectivity are perhaps the two most viable candidates. Conceptually, emotional dysregulation reflects difficulties in the understanding and awareness of emotions (Gratz & Roemer, 2004), as well as in the self-regulation of affective states and self-control over affect-driven behaviors (Carver, Lawrence, & Scheier, 1996), whereas negative affectivity denotes the tendency to experience negative affect (Watson, 2000). Although emotional dysregulation and negative affectivity are theoretically and empirically related, they are distinct constructs (Gratz & Roemer, 2004). Thus, a higher-order deficit in emotional regulatory capacity (emotional dysregulation) or a generalized vulnerability to experience negative mood states (negative affectivity), rather than AS, could explain the previously documented findings between this anxiety-specific cognitive construct and smoking motives and perceived barriers to quitting. Moreover, past non-smoking oriented work has indicated AS is significantly related to emotional dysregulation (Vujanovic, Zvolensky, & Bernstein, in press) and negative affectivity (Rapee & Medero, 1994). It is possible that previously observed effects between AS and affect-relevant motivational factors and perceived barriers to quitting are due to shared variance with emotional dysregulation or negative affectivity.

A second limitation is that previous studies of AS-motivational processes have focused on a narrow range of smoking motives; namely, coping-oriented motives (Novak et al., 2003; Stewart et al., 1997; Zvolensky, Bonn-Miller et al., 2006), and to a far lesser extent, addictive and habitual motives (Leyro et al., in press). Theoretically, although AS has been most consistently applied to coping-oriented, and more recently, automatized and addictive-oriented patterns of smoking (Zvolensky & Bernstein, 2005), this cognitive factor would not necessarily be expected to share similar relations with all smoking motives (e.g., stimulation, taste). That is, discriminant relations should be evident for AS and other types of smoking motives. Future work is therefore needed to address the explanatory specificity of AS in regard to a comprehensive profile of smoking motives. Third, it is noteworthy that past research on AS and smoking motives and perceived barriers to quitting has not clarified whether the observed effects are attributable to concurrent degrees of tobacco, alcohol, or marijuana use. For AS to be a clinically meaningful explanatory variable for smoking behavior, it should not be conceptually redundant with concurrent substance use. Given AS is related to substance use and disorders (Schmidt et al., 2006), which are related to the maintenance of smoking (Zvolensky, Bernstein, Marshall, & Feldner, 2006), the previously observed effects for AS may possibly be attributable to pre-existing frequency of substance use. Future work is needed to address whether AS is related to smoking motives above and beyond concurrent substance use. Finally, there has been only one investigation of AS focused on perceived barriers to quitting smoking (Zvolensky, Vujanovic et al., 2007). Although medium-sized statistical effects were observed in that investigation (Zvolensky, Vujanovic et al., 2007), there is a need for replication and extension of such findings to increase confidence that AS is an explanatory mechanism for perceived barriers to quitting.

Together, the present investigation sought to address key limitations of past work by comprehensively evaluating AS in regard to smoking motivational factors and perceived barriers to quitting among a community-recruited sample of adult daily cigarette smokers. It was hypothesized that AS would be significantly related to coping-oriented, addictive, and habitual smoking motives. These effects were expected to be evident above and beyond the variance accounted for by concurrent substance use as well as shared variance with negative affectivity and emotional dysregulation. AS effects were not expected for other smoking motives. It also was hypothesized that AS would be significantly associated with perceived barriers to quitting smoking after controlling for the variance of concurrent substance use and the shared variance with negative affectivity and emotional dysregulation. Overall, these hypotheses were driven by integrative conceptual models of smoking-anxiety comorbidity (Morissette et al., 2007; Zvolensky & Bernstein, 2005) and empirical data (Novak et al.,

2003) that suggest AS may play a specific and clinically-relevant role in psychologically-based smoking processes.

## Method

Participants included 189 (46% women;  $M_{\text{age}} = 24.97$  years,  $SD = 9.78$ ) persons who endorsed being daily (current) cigarette smokers. Participants were recruited from the community for participation in a laboratory study on “emotion” via placement of specifically-tailored (i.e., “Are you a smoker?”) study flyers throughout various community settings as well as posting of printed advertisements in local newspapers. The racial distribution of the sample generally reflected that of the Vermont population (State of Vermont Department of Health, 2007): 96% of the sample identified as Caucasian, 2% as African American, and 2% as “other.” On average, participants reported smoking sixteen cigarettes per day ( $M = 16.44$ ,  $SD = 12.84$ ; observed range = 0 – 120) in the last week, smoking their first cigarette at age fourteen ( $M = 14.26$ ,  $SD = 3.70$ ), and smoking regularly by age sixteen ( $M = 15.97$ ,  $SD = 3.62$ ). According to the Fagerström Test for Nicotine Dependence (FTND; Fagerström, 1978), the sample was mildly nicotine dependent ( $M = 2.73$ ,  $SD = 1.68$ ). Approximately 87% of the sample reported being a current drinker, consuming alcoholic beverages approximately 2–4 times per month and having approximately 3 or 4 drinks per occasion. Seventy-one percent of the sample reported using marijuana in the past 30 days. Current marijuana-using individuals reported smoking marijuana an average of six times in the past 30 days ( $M = 5.55$ ,  $SD = 2.45$ ).

Participants were eligible for this study if they were current cigarette smokers between 18 and 65 years of age. Exclusionary criteria for the investigation included: (1) current suicidality or homicidality; (2) limited mental competency (indexed by not being oriented to person, place, or time during the consenting process) or the inability to provide informed, written consent; (3) endorsement of current or past psychotic-spectrum symptoms; and (4) self-reported major medical illness (e.g., human immunodeficiency virus; cancer).

## Measures

The *Structured Clinical Interview for DSM-IV Axis I Disorders- Non-Patient Edition (SCID-NP)*. The SCID-NP (First, Spitzer, Gibbon, & Williams, 1995) is a well-established diagnostic interview for psychiatric problems. The interview was principally administered in order to determine if participants had current or past psychotic-spectrum symptoms and suicidal ideation in the context of the exclusionary criteria.

The *Smoking History Questionnaire SHQ*; (Brown, Lejuez, Kahler, & Strong, 2002) is a self-report questionnaire used to assess smoking history and pattern. The SHQ includes items pertaining to smoking rate, age of onset of smoking initiation, and years of being a daily smoker. The SHQ also assesses information regarding quit attempts, including problematic symptoms experienced during such attempts. The SHQ has been successfully used in previous studies as a measure of smoking history, pattern, and symptom-based problems during quitting (Zvolensky, Leen-Feldner et al., 2004; Zvolensky, Lejuez, Kahler, & Brown, 2004). The current investigation utilized the following variables from the SHQ: average number of cigarettes smoked per day, age at first cigarette, and age at onset of regular (daily) cigarette smoking.

The *Fagerström Tolerance Questionnaire (FTQ)*; (Fagerström, 1978) was used as a continuous self-report measure of nicotine dependence. Specifically, the FTQ was administered and scored as the Fagerström Test for Nicotine Dependence (FTND). The FTND is a 6-item scale designed to assess gradations in tobacco dependence (Heatherton, Kozlowski, Frecker, & Fagerstrom, 1991). Two items are rated on a four-point Likert-style scale (0–3); and four items are rated dichotomously (yes/no). The FTND has shown good internal consistency, positive relations

with key smoking variables (e.g., saliva cotinine; Heatherton et al., 1991; Payne, Smith, McCracken, McSherry, & Antony, 1994), and high degrees of test-retest reliability (Pomerleau, Carton, Lutzke, Flessland, & Pomerleau, 1994).

The *Alcohol Use Disorders Identification Test* AUDIT; (Babor, de la Fuente, Saunders, & Grant, 1992) is a 10-item self-report screening measure developed by the World Health Organization to identify individuals with alcohol problems (Babor et al., 1992). There is a large body of literature attesting to the reliability and validity of the AUDIT (Saunders, Aasland, Babor, de la Fuente, & Grant, 1993). In the present study, the frequency and quantity items from the AUDIT were used to index current alcohol consumption (an average frequency-by-quantity composite score; Stewart, Zvolensky, & Eifert, 2001).

The *Marijuana Smoking History Questionnaire* MSHQ; (Bonn-Miller & Zvolensky, 2005) was used to assess marijuana smoking use history and pattern. The MSHQ is a self-report instrument that includes items pertaining to marijuana smoking rate (frequency of use in lifetime and past 30 days). The MSHQ has been employed successfully in past research (e.g., Bonn-Miller, Zvolensky, Leen-Feldner, Feldner, & Yartz, 2005) and is available by contacting Dr. Zvolensky.

The *Positive Affect Negative Affect Scale* (PANAS; Watson, Clark, & Tellegen, 1988) assesses two global dimensions of affect: negative and positive. For each of 20 adjectives (e.g., "irritable"), participants indicate on a 5-point Likert-type scale (1 = *very slightly* to 5 = *extremely*) the degree to which the descriptor typifies how they generally feel. Only the negative affectivity scale (PANAS-NA) was used in this study as a global index of the trait-level propensity to experience negative affect symptoms. The PANAS-NA has demonstrated sound internal consistency in clinical and non-clinical populations (range of alpha coefficients: .85 to .93), test-retest reliability (e.g.,  $r = .71$  for two months to  $r = .43$  for seventy-two months), as well as convergent and discriminant validity in relation to multiple measures of state-level affect, trait-level mood, and personality (Watson, 2000). The alpha coefficient for the PANAS-NA in this study was .91.

The *Anxiety Sensitivity Index* ASI; (Reiss, Peterson, Gursky, & McNally, 1986) is a 16-item measure in which respondents indicate on a five-point Likert-type scale (0 = *very little* to 4 = *very much*) the degree to which they are concerned about possible negative consequences of anxiety symptoms. The ASI is unique from, and demonstrates incremental validity to, trait anxiety (Rapee & Medoro, 1994) and trait-level negative affectivity/neuroticism (Zvolensky, Kotov, Antipova, & Schmidt, 2005). The ASI in the current study was found to have high levels of internal consistency (Cronbach  $\alpha = .93$ ).

The *Difficulties in Emotion Regulation Scale* DERS; (Gratz & Roemer, 2004) was used to assess emotion dysregulation. This scale consists of 36 items, rated on a 5-point Likert-style scale (1 = *almost never* to 5 = *almost always*), which comprise six subscales: non-acceptance (e.g., "when I'm upset, I feel guilty for feeling that way. "), goals (e.g., "when I'm upset, I have difficulty getting work done. "), impulse (e.g., "when I'm upset I have difficulty controlling my behaviors. "), non-awareness (e.g., "I pay attention to how I feel. "; reverse scored), strategies (e.g., "when I'm upset any emotions feel overwhelming. "), and lack of clarity (e.g., "I have no idea how I am feeling. "). Consistent with past work (e.g., Gratz & Roemer, 2004), the DERS total score demonstrated good internal consistency (Cronbach  $\alpha = .88$ ).

The *Reasons for Smoking* RFS; (Ikard, Green, & Horn, 1969) questionnaire was used to assess the role of different smoking motives. The psychometric properties of this scale, including measures of factor structure, internal consistency, and test-retest reliability, have been well-established (Shiffman, 1993). In this study, the RFS evidenced good internal consistency in regard to the the six subscales (range of Cronbach's  $\alpha = .66-.84$ ). The version of the RFS used

in this study consists of 23 items, rated on a 5-point Likert-style scale (1 = *never* to 5 = *always*), which comprise six subscales: habitual (e.g., "I've found a cigarette in my mouth and didn't remember putting it there"), addictive (e.g., "Between cigarettes, I get a craving only a cigarette can satisfy"), negative affect reduction (e.g., "When I feel uncomfortable or upset about something, I light up a cigarette"), relaxation (e.g., "I find cigarettes pleasurable"), sensorimotor (e.g., "Part of the enjoyment of smoking a cigarette comes from the steps I take to light up"), and stimulation (e.g., "I like smoking when I am busy and working hard").

The *Barriers to Cessation Scale* BCS (Macnee & Talsma, 1995a) was used to assess barriers, or specific stressors, associated with smoking cessation. This scale consists of 19 items, rated on a 4-point Likert-style scale (0 = *not a barrier* to 3 = *large barrier*), which comprise three subscales: addictive barriers (e.g., "Being addicted to cigarettes"), external barriers (e.g., "No encouragement or help from friends"), and internal barriers (e.g., "Fear of failing to quit"). Participants are asked to rate the extent to which they identify each item as a barrier to cessation. The BCS has been found to have good internal consistency in regard to the total score (Cronbach's  $\alpha = .81-.87$ ) as well as the three subscales (range of Cronbach's  $\alpha = .71-.84$ ; Macnee & Talsma, 1995a). The alpha for the BCS total score for this study was .88. The BCS also has evidenced good content and predictive validity (Macnee & Talsma, 1995a). To maintain consistency with past work using the BCS (e.g., Macnee & Talsma, 1995b; Zvolensky, Vujanovic et al., 2007), only the total BCS score was utilized in this study.

## Procedure

Interested persons, responding to various community-based advertisements specifically targeting daily smokers, who contacted the research team were given a detailed description of the study over the phone and scheduled for an appointment. Upon arrival to the laboratory, each participant was greeted by a research assistant and provided verbal and written consent to participate in the research study. Next, participants were administered the SCID-NP (First et al., 1995) by trained interviewers to assess for current or past psychotic-spectrum symptoms and other Axis I psychopathology. If deemed eligible, participants then completed a battery of self-report measures.<sup>1</sup> At the end of the laboratory session, participants were debriefed and compensated \$20 for their participation.

## Data Analytic Strategy

Criterion variables in the hierarchical regression analyses included: (1) RFS-derived smoking motives (i.e., RFS-Stimulation, RFS-Habitual, RFS-Addictive, RFS-Negative Affect Reduction, RFS-Sensorimotor, RFS-Relaxation) and (2) BCS-total score. The main effects of average number of cigarettes smoked per day, alcohol use (an average frequency-by-quantity composite score), and marijuana use in the past 30 days were entered as a block at step 1. These covariates were chosen on an *a priori* basis on theoretical grounds as factors that could affect relations between the studied predictor and criterion variables. At step 2, the main effects of PANAS-NA, ASI-total score, and DERS-total score were simultaneously entered.

## Results

### Descriptive Data and Correlations among Theoretically-Relevant Variables

Means, standard deviations, and zero-order correlations of all variables are reported in Table 1. The ASI-total score was significantly associated with each of the RFS subscales with the exception of relaxation motives (range of observed  $r$ 's: .14 to .43; see Table 1). The ASI-total score also was significantly associated with the BCS-total score ( $r = .49$ ). A generally similar

<sup>1</sup>The present data were a subset of a larger project that involved a laboratory challenge component. The present data have not been published previously and represent a novel heretofore un-examined aspect of the larger data set.

pattern of results was apparent for the DERS-total score, which showed significant relations to each of the RFS subscales except relaxation motives (range of observed  $r$ 's: .12 to .40; see Table 1); the DERS-total score also was significantly related to BCS-total score ( $r = .45$ ). The PANAS-NA was significantly related to all RFS subscales (range of observed  $r$ 's: .20 to .41; see Table 1) as well as the BCS-total score ( $r = .46$ ). It also is noteworthy that the ASI-total score, DERS-total score, and PANAS-NA were significantly related to each other (range of observed  $r$ 's: .57 to .71) and shared a range of 30% to 50% of variance with one another. In contrast, these same affective vulnerability variables were not significantly related to current cigarette, marijuana, or alcohol use (see Table 1).

### Hierarchical Regression Analyses

**Smoking motives**—Please see Table 2 for a summary of hierarchical regression analyses. Regarding the RFS-Stimulation subscale, substance use variables at step one together accounted for a significant portion of variance ( $\Delta R^2 = .04$ ;  $p < .05$ ). The only significant predictor at this level was average number of cigarettes smoked per day ( $\beta = .22$ ,  $p < .01$ ). At step two, the affective vulnerability variables accounted for an additional 22% of the variance ( $p < .001$ ), with the ASI-total and DERS-total scores each serving as significant incremental predictors ( $\beta = .22$ ,  $p < .001$  and  $\beta = .27$ ,  $p < .01$ , respectively). No significant incremental effect was evident for PANAS-NA.

With regard to the RFS-Habitual subscale, substance use variables entered in step one accounted for a significant amount of variance ( $\Delta R^2 = .10$ ,  $p < .001$ ); and average number of cigarettes smoked per day was the only significant predictor ( $\beta = .32$ ,  $p < .001$ ). Predictor variables entered in step two accounted for an additional 19% of the variance ( $p < .001$ ). Here, both the ASI-total and DERS-total scores were significant incremental predictors ( $\beta = .23$ ,  $p < .05$  and  $\beta = .28$ ,  $p = .001$ , respectively). No significant incremental effect was evident for PANAS-NA.

In terms of the RFS-Addictive subscale, substance use variables entered at step one accounted for 12% of the variance ( $p < .001$ ); and average number of cigarettes smoked per day was the only significant predictor ( $\beta = .32$ ,  $p < .001$ ). At step two, the affective vulnerability variables accounted for an additional 16% of the variance ( $p < .001$ ), with the ASI-total score being the only significant incremental predictor ( $\beta = .23$ ,  $p < .05$ ). No significant incremental effects were evident for PANAS-NA or DERS-total.

Regarding the RFS-Negative Affect Reduction subscale, substance use variables entered at step one accounted for 4% of the variance ( $p < .05$ ). An additional 22% of the variance was accounted for by affective vulnerability variables entered at step two ( $p < .001$ ). The ASI-total score was the only significant incremental predictor at this level ( $\beta = .22$ ,  $p < .05$ ). No significant incremental effects were evident for PANAS-NA or DERS-total.

Concerning the RFS-Sensorimotor subscale, substance use variables at step one did not account for a significant amount of variance, and there were no significant predictors. The affective vulnerability factors at step two accounted for 8% of variance ( $p < .01$ ). The DERS-total score was the only significant predictor ( $\beta = .20$ ,  $p < .05$ ); no effects were evident for ASI-total or PANAS-NA.

In terms of the RFS-Relaxation subscale, substance use variables at step one together did not predict a significant amount of variance. Of the affective vulnerability variables at step two, PANAS-NA was a significant predictor ( $\beta = .23$ ,  $p < .05$ ), though the overall step was not significant. No effects were evident for ASI-total or DERS-total.

**Perceived barriers to quitting**—Regarding the BCS-total score, substance use predictor variables together did not account for a significant portion of the variance, although there was a significant univariate effect for average number of cigarettes smoked per day ( $\beta = .17, p < .05$ ). The affective vulnerability variables entered at step two accounted for 27% of additional variance ( $p < .001$ ). The ASI-total and DERS-total scores each were significant incremental predictors ( $\beta = .28, p < .01$  and  $\beta = .21, p < .05$ , respectively). No significant incremental effect was evident for PANAS-NA.

## Discussion

There has been an increased effort to better understand linkages between individual differences in anxiety and the nature of cigarette smoking (Brown & Wolfe, 1994; Morissette et al., 2007; Zvolensky, Feldner et al., 2005). Building from this corpus of work, the present investigation was focused on clarifying the nature of the association between AS and smoking motives and perceived barriers in quitting among adult daily cigarette smokers.

Consistent with prediction, AS was significantly related to habitual, addictive, and coping, smoking motives. These effects were evident above and beyond the variance accounted for by concurrent tobacco, alcohol, and marijuana use. The AS effects also were consistently discernable from the shared variance with negative affectivity and emotional dysregulation. That is, although AS was significantly related to both negative affectivity and emotional dysregulation and these emotional vulnerability factors were correlated with coping, addictive, and habitual motives (see Table 1), this cognitive construct was consistently related to the dependent measures. In contrast, there was little evidence that negative affectivity or emotional dysregulation were related to habitual, addictive, and coping smoking motives once taking into account the shared variance with AS. The one exception to this pattern of findings pertained to habitual smoking motives, whereby emotional dysregulation demonstrated a relatively robust incremental association explaining 6% of unique variance. Overall, these data generally replicate and uniquely extend past work (e.g., Leyro et al., in press) by documenting an association between AS and habitual, addictive, and coping smoking motives, while taking into account the variance associated with concurrent substance use as well as negative affectivity and emotional dysregulation. Such empirical findings are consistent with theoretical models of anxiety-smoking comorbidity that predict AS, denoting a sensitivity in internal cues, should be related to reflexive smoking behavior aimed at achieving addictive-oriented or affect reduction psychological functions (Zvolensky & Bernstein, 2005).

Inspection of the other smoking motive variables provided further novel insight into the nature of AS-smoking pattern relations. Here, as generally expected, AS was not significantly incrementally related to sensorimotor or relaxation motives. However, there was an unexpected and relatively robust (7% unique variance) significant AS effect for stimulation motives. Thus, although AS was not globally related to all types of smoking motives, it appears to be related to smoking for stimulation reasons. In this same context, it is noteworthy that emotional dysregulation also was significantly related to stimulation motives. Collectively, it is possible that stimulation motives for smoking cigarettes may reflect a pattern of use that is related to self-regulation, with daily smokers with higher levels of AS and emotional dysregulation smoking for stimulation reasons. This finding may suggest that there are numerous types of psychological functions, many of which are related to self-regulation (e.g., stimulation, coping-oriented), for high AS or emotionally dysregulated smokers. Before confidence can be placed into this type of account, future work is needed to better understand the theoretical and clinical relevance of stimulation motives for smokers with emotional vulnerabilities such as AS and emotional dysregulation.



Also as hypothesized, there was a significant incremental effect for AS in regard to perceived barriers in quitting. This effect explained 5% of unique variance and was evident above and beyond the variance accounted for by concurrent polysubstance use and shared variance with negative affectivity and emotional dysregulation. This finding replicates and extends past work by Zvolensky, Vujanovic et al. (2007) and documents that the AS-perceived barriers to quitting association is not attributable to co-occurring level of substance use or shared variance with negative affectivity. This finding is clinically important, as it suggests that high AS daily adult smokers tend to perceive quitting as personally challenging and problematic. It is possible this AS-perceived barriers to quitting effect may contribute, along with other factors (e.g., emotional reactivity to interoceptive cues), to why higher AS smokers tend to relapse faster and at higher rates than their lower AS counterparts (Brown et al., 2001; Zvolensky, Bernstein et al., 2007; Zvolensky, Bonn-Miller et al., 2006). To facilitate cessation success among high AS smokers, it may be necessary for clinicians to address the beliefs such individuals have about the quit experience prior to attempting a quit attempt. By correcting maladaptive beliefs about quitting (e.g., “I will fail”) and providing skills in affect management, it may be possible to promote greater levels of cessation success for these anxiety-prone smokers.

Although not the primary focus of the present investigation, it is important to acknowledge the effects of negative affectivity and emotional dysregulation for motivational smoking processes and barriers in quitting. Emotional dysregulation was incrementally related to stimulatory, habitual, and sensorimotor motives for smoking above and beyond the shared variance with AS and negative affectivity. In addition, emotional dysregulation was incrementally related to perceived barriers in quitting smoking. These results provide novel evidence that dysregulated emotional experiences are related to certain self-regulation oriented smoking motives and beliefs about difficulties in quitting. To a certain extent, these results are consistent with past work suggesting that anxiety and depressive problems, prototypical dysregulated emotional experiences, are related to the maintenance of smoking and higher rates of relapse (Hitsman, Borrelli, McChargue, Spring, & Niaura, 2003; Lasser et al., 2000). Yet, the findings also suggest that difficulties with regulating emotions may be a useful clinical target that may facilitate change in certain smoking motives by alleviating negative perceptions about quitting smoking. On the other hand, negative affectivity was only significantly incrementally related to smoking for relaxation motives. Thus, although the tendency to experience negative affective states is a vulnerability factor for poorer cessation outcome (Piasecki et al., 1997), it may not be associated with *all* types of smoking motives or perceived barriers in quitting, once the shared variance with AS and emotional dysregulation are considered. This pattern of findings, considered with the aforementioned AS and emotional dysregulation effects, suggests that there may be theoretical and clinical promise in regard to incorporating a multi-risk factor conceptualization of affective vulnerability in terms of better understanding the psychological processes underlying smoking.

A number of limitations of the present investigation and points for future direction should be considered. First, the present study included daily, but not necessarily, heavy smokers, as indexed by the rate of smoking per day and level of nicotine dependence, with high rates of alcohol consumption and marijuana use (see Table 1). One next step for future work would be to study participants who smoke at heavier rates and manifest greater levels of nicotine dependence to aid understanding of the observed effects from a generalizability perspective. Furthermore, future work is needed to discern the singular and interactive effects of concurrent substance use on psychological smoking processes. Second, the present sample is limited in that it is comprised of a relatively homogenous (e.g., primarily Caucasian) group of adult smokers who volunteered to participate for financial compensation. To rule out potential self-selection bias among persons with these characteristics and increase the generalizability of these findings, it will be important for researchers to draw from other populations and utilize recruitment tactics other than those used in the present study. In this context, it may be

particularly useful to ascertain the psychiatric histories of the smokers given many types of mental illness co-occur with cigarette smoking (Goodwin, Zvolensky, & Keyes, in press). Third, given that self-report measures were employed as the assessment methodology, shared method variance may have contributed to the observed results. To address this concern, future research could utilize alternative assessment methodologies, including experimental cognitive methodologies that tap both strategic and automatic aspects of psychological processes involved with smoking motivation.

Fourth, the present study utilized a cross-sectional design. This methodological design cannot elucidate processes over time or isolate causal relations between variables. Thus, the study results are best construed as a “snapshot” of the relations among AS and certain psychological smoking processes. Future work is needed to evaluate the temporal relations between AS and other affective vulnerability factors in regard to smoking motives, perceived barriers in quitting, and perhaps other theoretically-relevant factors (e.g., smoking outcome expectancies). Fifth, the covariates included in the present study were selected on an *a priori* basis on theoretical grounds. In future work, it would be useful to include other relevant variables as covariates to re-evaluate whether the observed effects are evident above and beyond other relevant factors. For example, it may be fruitful to include a measure of socioeconomic status, medical status, and other types of drug use (beyond tobacco, alcohol, and marijuana) as covariates in future research. Finally, the present investigation focused on examining the higher-order factors of the principal constructs. Future work could usefully build from the present findings and examine the relevance of lower-order factors of the studied constructs. This type of work may provide further insight into the nature of the observed relations between variables such as AS and particular elements of perceived barriers to quitting. In a related way, the current research was oriented theoretically on the discernable relations between AS and smoking motives and perceived barriers to quitting. At some level, this is a first step in this line of inquiry, as it is principally directed at clarifying unique explanatory relevance of the studied constructs in relation to one another. Future work is poised to making further exciting inroads into this domain of study by exploring the empirical merit of more complex models. For example, it is possible AS may interact with certain affect-relevant smoking motives (e.g., negative affect reduction) in regard to perceived barriers for quitting. Similarly, it is conceivable that AS may act synergistically with emotional dysregulation in terms of affect-relevant smoking motives and perceived barriers to quitting.

Overall, the present study offers novel empirical insight into the nature of the association between AS and smoking motives and perceived barriers in quitting among adult daily smokers. Results suggest AS is significantly related to coping, addictive, and habitual smoking motives as well as perceived barriers in quitting. These effects are not attributable to concurrent substance use or shared variance with negative affectivity or emotional dysregulation.

## References

- Babor, TF.; de la Fuente, JR.; Saunders, J.; Grant, M. AUDIT- Alcohol Use Disorders Identification test: Guidelines for use in primary health care. Geneva: World Health Organization; 1992.
- Bernstein A, Zvolensky MJ. Anxiety sensitivity: Selective review of promising research and future directions. *Expert Review in Neurotherapeutics* 2007;7:97–101.
- Bonn-Miller MO, Zvolensky MJ. The Marijuana Smoking History Questionnaire. Unpublished manuscript, The Anxiety and Health Research Laboratory, University of Vermont. 2005
- Bonn-Miller MO, Zvolensky MJ, Leen-Feldner EW, Feldner MT, Yartz AR. Marijuana use among daily tobacco smokers: Relationship to anxiety-related factors. *Journal of Psychopathology and Behavioral Assessment* 2005;27:279–289.

- Brown RA, Kahler CW, Zvolensky MJ, Lejuez CW, Ramsey SE. Anxiety sensitivity: relationship to negative affect smoking and smoking cessation in smokers with past major depressive disorder. *Addictive Behaviors* 2001;26:887–899. [PubMed: 11768550]
- Brown RA, Lejuez CW, Kahler CW, Strong DR. Distress tolerance and duration of past smoking cessation attempts. *Journal of Abnormal Psychology* 2002;111:180–185. [PubMed: 11866171]
- Brown PJ, Wolfe J. Substance abuse and post-traumatic stress disorder comorbidity. *Drug and Alcohol Dependence* 1994;35:51–59. [PubMed: 8082556]
- Carver, CS.; Lawrence, JW.; Scheier, MF. A control-process perspective on the origins of affect. In: Martin, LL.; Abraham, A., editors. *Striving and feeling: interactions among goals, affect and self-regulation*. Hillsdale, NJ, England: Lawrence Erlbaum Associates, Inc.; 1996. p. 11-52.
- Comeau N, Stewart SH, Loba P. The relations of trait anxiety, anxiety sensitivity, and sensation seeking to adolescents' motivations for alcohol, cigarette, and marijuana use. *Addictive Behaviors* 2001;26:803–825. [PubMed: 11768546]
- Fagerstrom KO. Measuring degree of physical dependence to tobacco smoking with reference to individualization of treatment. *Addictive Behaviors* 1978;3:235–241. [PubMed: 735910]
- Feldner MT, Babson KA, Zvolensky MJ. Smoking, traumatic event exposure, and posttraumatic stress: A critical review of the empirical literature. *Clinical Psychology Review* 2007;27:14–45. [PubMed: 17034916]
- First, MB.; Spitzer, RL.; Gibbon, M.; Williams, JBW. *Structured Clinical Interview for DSM-IV patient edition (SCID-N/P, Version 2.0)*. New York: Biometrics Research Department; 1994.
- Goodwin RD, Zvolensky MJ, Keyes K. Nicotine dependence and mental disorders among adults in the United States: Evaluating the role of mode of administration. *Psychological Medicine*. (in press)
- Gratz KL, Roemer L. Multidimensional assessment of emotion regulation and dysregulation: Development, factor structure, and initial validation of the Difficulties in Emotion Regulation Scale. *Journal of Psychopathology and Behavioral Assessment* 2004;26:41–54.
- Hayward C, Killen JD, Kraemer HC, Taylor CB. Predictors of panic attacks in adolescents. *Journal of the American Academy of Child & Adolescent Psychiatry* 2000;39(2):207–214. [PubMed: 10673832]
- Heatherton TF, Kozlowski LT, Frecker RC, Fagerstrom KO. The Fagerstrom test for nicotine dependence: A revision of the Fagerstrom Tolerance Questionnaire. *British Journal of Addiction* 1991;86:1119–1127. [PubMed: 1932883]
- Hitsman B, Borrelli B, McChargue DE, Spring B, Niaura R. History of depression and smoking cessation outcome: A meta-analysis. *Journal of Consulting and Clinical Psychology* 2003;71:657–663. [PubMed: 12924670]
- Ikard FF, Green DE, Horn D. A scale to differentiate between types of smoking as related to the management of affect. *The International Journal of the Addictions* 1969;4:649–659.
- Kalman D, Morissette SB, George TP. Co-morbidity of smoking in patients with psychiatric and substance use disorders. *The American Journal of Addictions* 2005;14:106–123.
- Koenen K, Hitsman B, Lyons M, Stroud L, Niaura R, McCaffery J, et al. Posttraumatic stress disorder and late-onset smoking in Vietnam Era Twin Registry. *Journal of Consulting and Clinical Psychology* 2006;74:186–190. [PubMed: 16551156]
- Lasser K, Boyd JW, Woolhandler S, Himmelstein DU, McCormick D, Bor DH. Smoking and mental illness: A population-based prevalence study. *AMA: Journal of the American Medical Association* 2000;284:2606–2610.
- Leyro TM, Zvolensky MJ, Vujanovic A, Bernstein A. *Anxiety Sensitivity and smoking motives and outcome expectancies among adult daily smokers: Replication and extension*. *Nicotine and Tobacco Research*. (in press)
- Lin W, Zinbarg RE. Anxiety sensitivity and panic attacks: A 1-year longitudinal study. *Behavior Modification* 2007;31:145–161. [PubMed: 17307932]
- Macnee CL, Talsma A. Development and testing of the barriers to cessation scale. *Nursing Research* 1995a;44:214–219. [PubMed: 7624231]
- Macnee CL, Talsma A. Predictors of progress in smoking cessation. *Public Health Nursing* 1995b;12:242–248. [PubMed: 7667177]

- Maller RG, Reiss S. Anxiety sensitivity in 1984 and panic attacks in 1987. *Journal of Anxiety Disorders* 1992;6:241–247.
- McCracken LM, McSherry WC, Antony M. Assessing nicotine dependence: A comparison of the Fagerstrom Tolerance Questionnaire (FTQ) with the Fagerstrom Test for Nicotine Dependence (FTND) in a clinical sample. *Addictive Behaviors* 1994;19:307–317. [PubMed: 7942248]
- McNally RJ. Anxiety sensitivity and panic disorder. *Biological Psychiatry* 2002;52:938–946. [PubMed: 12437935]
- Morissette SB, Tull MT, Gulliver SB, Kamholz BW, Zimering RT. Anxiety, anxiety disorders, tobacco use, and nicotine: A critical review of interrelationships. *Psychological Bulletin* 2007;133:245–272. [PubMed: 17338599]
- Morrell HER, Cohen LM. Cigarette smoking, anxiety, and depression. *Journal of Psychopathology and Behavioral Assessment* 2006;28:281–295.
- Mullane, JC.; Stewart, SH.; Rhyno, E.; Steeves, D.; Watt, MC.; Eisner, A. Anxiety sensitivity and difficulties with smoking cessation. In: Columbus, F., editor. *Advances in Psychology Research*. Hauppauge, NY: Nova Science Publishers; (in press)
- Novak A, Burgess ES, Clark M, Zvolensky MJ, Brown RA. Anxiety sensitivity, self-reported motives for alcohol and nicotine use, and level of consumption. *Journal of Anxiety Disorders* 2003;17:165–180. [PubMed: 12614660]
- Otto, MW.; Reilly-Harrington, N. The impact of treatment on anxiety sensitivity. In: Taylor, S., editor. *Anxiety sensitivity: Theory, research and treatment of the fear of anxiety*. New Jersey: Lawrence Erlbaum; 1999. p. 321–336.
- Patton GC, Carlin JB, Coffey C, Wolfe R, Hibbert M, Bowes G. Depression, anxiety, and smoking initiation: A prospective study over 3 years. *American Journal of Public Health* 1998;88:1518–1522. [PubMed: 9772855]
- Payne TJ, Smith PO, McCracken LM, McSherry WC, Antony M. Assessing nicotine dependence: A comparison of the Fagerstrom Tolerance Questionnaire (FTQ) with the Fagerstrom Test for Nicotine Dependence (FTND) in a clinical sample. *Addictive Behaviors* 1994;19:307–317. [PubMed: 7942248]
- Peterson, RA.; Reiss, S. *Anxiety Sensitivity Index Manual*. Vol. 2nd ed.. Worthington, OH: International Diagnostic Systems; 1992.
- Piasecki TM, Nofziger SL, Smith SS, Fiore MC, Baker TB. Listening to nicotine: Negative affect and the smoking withdrawal conundrum. *Psychological Science* 1997;8:184–189.
- Pomerleau CS, Carton SM, Lutzke ML, Flessland KA, Pomerleau OF. Reliability of the Fagerstrom Tolerance Questionnaire and the Fagerstrom Test for Nicotine Dependence. *Addictive Behaviors* 1994;19:33–39. [PubMed: 8197891]
- Rapee R, Medoro L. Fear of physical sensations and trait anxiety as mediators of the response to hyperventilation in nonclinical subjects. *Journal of Abnormal Psychology* 1994;4:693–699. [PubMed: 7822570]
- Reiss S, Peterson RA, Gursky DM, McNally RJ. Anxiety sensitivity, anxiety frequency, and the prediction of fearfulness. *Behaviour Research and Therapy* 1986;24:1–8. [PubMed: 3947307]
- Saunders JB, Aasland OG, Babor TF, de la Fuente JR, Grant M. Development of the Alcohol Use Disorders Identification Test (AUDIT): WHO collaborative project on early detection of persons with harmful alcohol consumption-II. *Addiction* 1993;88:791–804. [PubMed: 8329970]
- Schmidt NB, Lerew DR, Jackson RJ. The role of anxiety sensitivity in the pathogenesis of panic: Prospective evaluation of spontaneous panic attacks during acute stress. *Journal of Abnormal Psychology* 1997;106:355–364. [PubMed: 9241937]
- Schmidt NB, Lerew DR, Jackson RJ. Prospective evaluation of anxiety sensitivity in the pathogenesis of panic: Replication and extension. *Journal of Abnormal Psychology* 1999;108:532–537. [PubMed: 10466277]
- Schmidt NB, Zvolensky MJ, Maner JK. Anxiety sensitivity: Prospective prediction of panic attacks and Axis I pathology. *Journal of Psychiatric Research* 2006;40:691–699. [PubMed: 16956622]
- Shiffman S. Assessing smoking patterns and motives. *Journal of Consulting and Clinical Psychology* 1993;61:732–742. [PubMed: 8245271]

- State of Vermont Department of Health. 2007 [ Retrieved June 30, 2007]. from <http://www.healthyvermonters.info/>
- Stewart SH, Karp J, Pihl RO, Peterson RA. Anxiety sensitivity and self-reported reasons for drug use. *Journal of Substance Abuse* 1997;9:223–240. [PubMed: 9494951]
- Stewart SH, Zvolensky MJ, Eifert GH. Negative-reinforcement drinking motives mediate the relation between anxiety sensitivity and increased drinking behavior. *Personality and Individual Differences* 2001;31:157–171.
- Taylor, S. *Anxiety sensitivity: Theory, research, and treatment of the fear of anxiety*. Mahwah, NJ: Erlbaum; 1999.
- Vujanovic AA, Zvolensky MJ, Bernstein A. The interactive effects of anxiety sensitivity and emotion dysregulation in predicting anxiety-related cognitive and affective symptoms. *Cognitive Research and Therapy*. (in press)
- Watson, D. *Mood and temperament*. New York: Guilford Press; 2000.
- Watson D, Clark LA, Tellegen A. Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology* 1988;54:1063–1070. [PubMed: 3397865]
- Zvolensky MJ, Baker KM, Leen-Feldner EW, Bonn-Miller MO, Feldner MT, Brown RA. Anxiety sensitivity: Association with intensity of smoking-related withdrawal symptoms and motivation to quit. *Cognitive Behavior Therapy* 2004;33:114–125.
- Zvolensky MJ, Bernstein A. Cigarette smoking and panic psychopathology. *Current Directions in Psychological Science* 2005;14:301–305.
- Zvolensky MJ, Bernstein A, Marshall EC, Feldner MT. Panic attacks, panic disorder, and agoraphobia: Associations with substance use, abuse, and dependence. *Current Psychiatry Reports* 2006;8:279–285. [PubMed: 16879791]
- Zvolensky, MJ.; Bernstein, A.; Yartz, AR.; McLeish, A.; Feldner, MT. Cognitive-behavioral treatment of comorbid panic psychopathology and tobacco use and dependence. In: Stewart, SH.; Conrad, P., editors. *Comorbidity of anxiety and substance use disorders*. New York: Springer; 2007.
- Zvolensky MJ, Bonn-Miller MO, Bernstein A, Marshall EC. Anxiety sensitivity and abstinence duration to smoking. *Journal of Mental Health* 2006;15:659–670.
- Zvolensky MJ, Bonn-Miller MO, Feldner MT, Leen-Feldner E, McLeish AC, Gregor K. Anxiety sensitivity: Concurrent associations with negative affect smoking motives and abstinence self-confidence among young adult smokers. *Addictive Behaviors* 2006;31:429–439. [PubMed: 15964151]
- Zvolensky MJ, Feldner MT, Leen-Feldner EW, McLeish AC. Smoking and panic attacks, panic disorder, and agoraphobia: A review of the empirical literature. *Clinical Psychology Review* 2005;25(6):761–789. [PubMed: 15975699]
- Zvolensky MJ, Kotov R, Antipova AV, Schmidt NB. Diathesis-stress model for panic-related distress: A test in a Russian epidemiological sample. *Behaviour Research and Therapy* 2005;43:521–532. [PubMed: 15701361]
- Zvolensky MJ, Leen-Feldner EW, Feldner MT, Bonn-Miller MO, Lejuez CW, Kahler CW, Stuart G. Emotional responding to biological challenge as a function of panic disorder and smoking. *Journal of Anxiety Disorders* 2004;18:19–32. [PubMed: 14725866]
- Zvolensky MJ, Lejuez CW, Kahler CW, Brown RA. Nonclinical panic attack history and smoking cessation: An initial examination. *Addictive Behaviors* 2004;29:825–830. [PubMed: 15135567]
- Zvolensky MJ, Vujanovic AA, Bonn-Miller MO, Bernstein A, Yartz AR, Gregor KL, McLeish AC, Marshall EC, Gibson LE. Incremental validity of anxiety sensitivity in terms of motivation to quit, reasons for quitting, and barriers to quitting among community-recruited daily smokers. *Nicotine and Tobacco Research* 2007;9:965–975. [PubMed: 17763114]

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**Table 1**  
Descriptive Data and Zero-order Relations between Variables

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	M	SD
1 Cigarettes/day <sup>1</sup>	---	.26**	-.01	.08	.05	.02	.20**	.31**	.33**	.19**	.04	.05	.17*	16.44	12.84
2 Alcohol Use <sup>2</sup>	---	---	.33**	-.03	.01	.06	.01	-.04	-.20**	-.14	.04	.09	-.02	6.75	5.05
3 Marijuana use <sup>3</sup>	---	---	---	-.01	.10	-.04	.01	-.01	-.09	-.08	.01	.01	.08	5.55	2.45
4 Negative Affectivity <sup>4</sup>	---	---	---	---	.71**	.66**	.32**	.34**	.36**	.41**	.21**	.20**	.46**	20.35	8.31
5 ASI-Total Score <sup>5</sup>	---	---	---	---	---	.57**	.43**	.38**	.37**	.41**	.23**	.14**	.49**	20.81	13.29
6 DERS-Total Score <sup>6</sup>	---	---	---	---	---	---	.40**	.40**	.31**	.37**	.27**	.12	.45**	80.87	22.69
7 RFS: Stimulation <sup>7</sup>	---	---	---	---	---	---	---	.50**	.44**	.48**	.31**	.26**	.28**	2.56	.90
8 RFS: Habitual	---	---	---	---	---	---	---	---	.56**	.46**	.26**	.08	.34**	2.00	.75
9 RFS: Addictive	---	---	---	---	---	---	---	---	---	.69**	.23**	.35**	.51**	3.00	.84
10 RFS: Negative Affect Reduction (Coping)	---	---	---	---	---	---	---	---	---	---	.26**	.38**	.46**	3.22	.86
11 RFS: Sensorimotor	---	---	---	---	---	---	---	---	---	---	---	.42**	.26**	2.72	.10
12 RFS: Relaxation	---	---	---	---	---	---	---	---	---	---	---	---	---	3.84	.84
13 BCS-Total Score <sup>8</sup>	---	---	---	---	---	---	---	---	---	---	---	---	---	26.86	11.83

\* Note: =  $p < .05$

\*\*  $p < .01$

<sup>1</sup> average number of cigarettes smoked per day

<sup>2</sup> alcohol use (number of drinks per occasion X number of occasions)

<sup>3</sup> average number of times marijuana used in the past 30 days

<sup>4</sup> Negative Affect sub-scale, Positive Affect Negative Affect Scale (PANAS; Watson, Clark, & Tellegen, 1988)

<sup>5</sup> ASI: Anxiety Sensitivity Index (Reiss, Peterson, Gursky, & McNally, 1986)

<sup>6</sup> DERS: Difficulties in Emotion Regulation Scale (Gratz & Roemer, 2004)

<sup>7</sup> RFS: Reasons for Smoking (Ikard, Green, & Horn, 1969)

<sup>8</sup> BCS: Barriers to Cessation Scale (Macnee & Talsma, 1995).

**Table 2**  
Predictors of Reasons for Smoking and Barriers to Cessation

	$\Delta R^2$	$t$ (each predictor)	$\beta$	$sr^2$	$p$
<i>Dependent variable: RFS<sup>1</sup>: Stimulation</i>					
Step 1	.04				<.05
Cigarettes/day <sup>2</sup>		2.87	.22	.04	<.01
Alcohol Use <sup>3</sup>		.73	.01	.00	ns
Marijuana Use <sup>4</sup>		.06	.00	.00	ns
Step 2	.22				<.001
Negative Affectivity <sup>5</sup>		-1.24	-.13	.01	ns
ASI-Total Score <sup>6</sup>		3.85	.22	.07	<.001
DERS-Total Score <sup>7</sup>		3.11	.27	.05	<.01
<i>Dependent variable: RFS: Habitual</i>					
Step 1	.10				<.001
Cigarettes/day		4.41	.32	.10	<.001
Alcohol Use		.52	.04	.00	ns
Marijuana Use		.24	.02	.00	ns
Step 2	.19				<.001
Negative Affectivity		-.18	-.02	.00	ns
ASI-Total Score		2.47	.23	.03	<.05
DERS-Total Score		3.27	.28	.06	.001
<i>Dependent variable: RFS: Addictive</i>					
Step 1	.12				<.001
Cigarettes/day		4.13	.30	.08	<.001
Alcohol Use		-1.42	-.11	.01	ns
Marijuana Use		-.31	-.02	.00	ns
Step 2	.16				<.001
Negative Affectivity		.91	.09	.00	ns
ASI-Total Score		2.47	.23	.03	<.05
DERS-Total Score		1.51	.13	.01	ns
<i>Dependent variable: RFS: Negative Affect Reduction (Coping)</i>					
Step 1	.04				<.05

	$\Delta R^2$	$t$ (each predictor)	$\beta$	$sr^2$	$p$
Cigarettes/day		2.23	.17	.03	<.05
Alcohol Use		-.95	-.08	.00	ns
Marijuana Use		-.35	-.03	.00	ns
Step 2	.22				<.001
Negative Affectivity		1.46	.15	.01	ns
ASI-Total Score		2.34	.22	.03	<.05
DERS-Total Score		1.87	.16	.02	ns
<i>Dependent variable: RFS; Sensorimotor</i>					
Step 1	.00				ns
Cigarettes/day		.66	.05	.00	ns
Alcohol Use		.63	.05	.00	ns
Marijuana Use		-.12	-.01	.00	ns
Step 2	.08				<.01
Negative Affectivity		-.19	-.02	.00	ns
ASI-Total Score		1.24	.13	.01	ns
DERS-Total Score		2.06	.20	.02	<.05
<i>Dependent variable: RFS; Relaxation</i>					
Step 1	.01				ns
Cigarettes/day		1.04	.08	.01	ns
Alcohol Use		1.44	.12	.01	ns
Marijuana Use		-.38	-.03	.00	ns
Step 2	.04				ns
Negative Affectivity		2.04	.23	.02	<.05
ASI-Total Score		-.06	-.01	.00	ns
DERS-Total Score		-.49	-.05	.00	ns
<i>Dependent variable: BCS-Total Score</i>					
Step 1	.04				ns
Cigarettes/day		2.20	.17	.03	<.05
Alcohol Use		-.14	-.01	.00	ns
Marijuana Use		1.18	.09	.01	ns
Step 2	.27				<.001
Negative Affectivity		1.09	.11	.01	ns
ASI-Total Score		2.95	.28	.05	<.01



	$\Delta R^2$	<i>t</i> (each predictor)	$\beta$	$sr^2$	<i>p</i>
DERS-Total Score		2.30	.21	.03	<.05

Note:  $\beta$  = standardized beta weights

- <sup>1</sup> RFS: Reasons for Smoking (Ikard, Green, & Horn, 1969)
- <sup>2</sup> average number of cigarettes smoked per day
- <sup>3</sup> Alcohol use calculated by (number of drinks per occasion X number of occasions)
- <sup>4</sup> average number of times marijuana used in the past 30 days
- <sup>5</sup> Negative Affect sub-scale from Positive and Negative Affect Schedule (PANAS Watson, Clark, & Tellegen, 1988)
- <sup>6</sup> ASI: Anxiety Sensitivity Index (Reiss, Peterson, Gursky, & McNally, 1986)
- <sup>7</sup> DERS: Difficulties in Emotion Regulation Scale (Grazt & Roemer, 2004).