Anxiety sensitivity and early relapse to smoking: A test among Mexican daily, low-level smokers


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The aim of the present investigation was to extend previous work on anxiety sensitivity (AS) and early smoking relapse among a sample of 130 (74 females) young adult (mean age = 22.5 years, SD = 2.1) daily low-level smokers (9.3 cigarettes/day, SD = 11.5) from Mexico City, Mexico. Results indicated that of the global-level and lower-order factors (i.e., physical, mental incapacitation, and social concerns) on the Anxiety Sensitivity Index, only the physical concerns factor was significantly related to early lifetime smoking relapse. This effect was observed above and beyond the effects of negative affectivity, cigarettes smoked per day, and alcohol consumption, as well as beyond the other AS mental and social concerns factors. Findings provide novel evidence that AS is an important explanatory construct in early smoking relapse.

Introduction

Research has increasingly highlighted clinically significant relationships between smoking and anxiety symptoms and problems (McCabe et al., 2004; Pohl, Yeragani, Balon, Lycaki, & McBride, 1992; Zvolensky, Feldner, Leen-Feldner, & McLeish, 2005). The vast majority of this work has focused either on rates of comorbidity between certain anxiety conditions and smoking (Hayward, Killen, & Taylor, 1989; Himle, Thyer, & Fischer, 1988; Lasser et al., 2000; Pohl et al., 1992) or on the role of smoking in the onset, maintenance, and exacerbation of anxiety problems (Baker-Morissette, Brown, Wolfsdorf-Kamholz, & Gulliver, 2006; Beckham et al., 1995, 1997; Breslau & Klein, 1999; Breslau, Novak, & Kessler, 2004; Isensee, Wittchen, Stein, Höfler, & Lieb, 2003; Johnson et al., 2000; Zvolensky, Kotov, Antipova, & Schmidt, 2003; Zvolensky, Schmidt, & McCrea, 2003). By comparison, relatively little scientific investigation has looked at the role of anxiety-related factors in smoking cessation. This neglect is unfortunate, because models of anxiety-smoking comorbidity suggest that such affective symptoms and problems may theoretically function as risk factors for decreased success in quitting smoking (Beckham, 1999; Weaver & Etzel, 2003; Zvolensky & Bernstein, 2005; Zvolensky, Schmidt, & Stewart, 2003).

Of the available empirical evidence, a number of studies indicate that both anxiety disorders and premorbid risk factors for such disorders may be related to problems in quitting smoking. For example, Lasser and colleagues (2000) found that the smoking quit rate (proportion of lifetime smokers who were not current smokers) was significantly lower for subjects with lifetime diagnoses of posttraumatic stress disorder (PTSD) and panic disorder than for participants without a psychiatric disorder. Zvolensky, Lejuez, Kahler, and Brown (2004) similarly found that daily smokers with panic attacks, but no Axis I disorder, reported significantly shorter smoking quit attempts, on average, compared with smokers without a history of psychiatric problems. Laboratory data also have indicated that, among daily smokers, increased anxiety reactivity to biological challenge procedures is associated with decreased success in remaining abstinent from smoking.
smoking for at least 1 week during the most recent quit attempt (Zvolensky, Feldner, Eifert, & Brown, 2001); these effects are not attributable to smoking rate or preexisting psychiatric disorders. Such data collectively suggest that certain anxiety disorders or anxious reactivity to bodily sensations may be related to problems quitting smoking.

Research also has indicated that anxiety sensitivity (AS) may be related to success in smoking cessation attempts (Brown, Lejuez, Kahler, Strong, & Zvolensky, 2005; Stewart & Kushner, 2001; Zvolensky, Schmidt, & Stewart, 2003). Anxiety sensitivity is a well-established cognitive factor implicated in the development and maintenance of panic and related anxiety disorders (e.g., PTSD; McNally, 2002; Taylor, 2003). The global AS construct encompasses lower-order fears of physical, mental, and publicly observable experiences (Zinbarg, Barlow, & Brown, 1997). This construct has been conceptualized as an individual difference factor related to a sensitivity to aversive internal states (Reiss & McNally, 1985). To illustrate, people high in AS physical concerns may be frightened of harmless heart palpitations because they believe the sensations will lead to cardiac arrest, whereas people low in AS do not fear these sensations because they believe them to be harmless. Empirically AS is, in fact, distinguishable from anxiety symptoms and other negative affect states (Rapee & Medoro, 1994; Zvolensky, Kotov, Antipova, & Schmidt, 2005). Various lines of research indicate AS increases the risk of the future development of anxiety symptoms, panic attacks, and certain anxiety disorders (Hayward, Killen, Kraemer, & Taylor, 2000; Keogh, Ayers, & Francis, 2002; Maller & Reiss, 1992; Schmidt, Lerew, & Jackson, 1999).

Extant work on AS and smoking has indicated that this cognitive factor is related to certain aspects of smoking behavior. For example, AS is correlated with smoking motives to reduce negative affect, but not with other motives (e.g., pleasure, handling, taste), among adolescent and adult smokers after controlling for variance accounted for by nicotine dependence, smoking rate, and gender (Comeau, Stewart, & Loba, 2001; Novak, Burgess, Clark, Zvolensky, & Brown, 2003; Stewart, Karp, Pihl, & Peterson, 1997; Zvolensky et al., 2006; Zvolensky, Schmidt et al., 2005). Initial evidence indicates that AS is associated with problems during cessation attempts. Specifically, Brown, Kahler, Zvolensky, Lejuez, and Ramsey (2001) found that higher AS levels were associated with increased risk of smoking lapse during the first 7 days after quit day among heavy smokers ($M=26.1$ cigarettes/day, $SD=9.4$) with a history of major depressive disorder. Other work has found that high levels of AS are related to greater intensity of affect-relevant withdrawal symptoms during quit attempts after controlling for theoretically relevant smoking (e.g., nicotine dependence) and affective (e.g., panic attack history) factors (Zvolensky, Baker et al., 2004).

Although these results are promising, further investigation is needed into the role of AS in smoking cessation problems; a number of key issues could be addressed in such inquiry. First, research to date has not accounted for variance in smoking cessation attempts that may be related to a generalized tendency to experience negative affect states or alcohol use. Indeed, given that higher levels of both negative affectivity (Piasecki, Kenford, Smith, Fiore, & Baker, 1997) and alcohol use (Dawson, 2000) are related to higher levels of smoking relapse as well as anxiety vulnerability (Baker-Morissette, Gulliver, Wiegel, & Barlow, 2004; Stewart, Zvolensky, & Eifert, 2001), it is important to explicate the incremental effect of AS relative to these other factors.

Second, Brown and colleagues (2001) sampled from a treatment-seeking North American population of heavy smokers. To generalize findings in the area beyond this segment of the population, it would be useful to study non-treatment-seeking, low-level daily smokers from a country other than the United States. This type of work would rigorously evaluate the generalizability of past AS-smoking cessation findings by studying smokers with different use patterns, from a different region of the world, and in a non-treatment-seeking environment. Third, extant studies have examined only the global AS construct. It remains unclear which lower-order factors of the construct relate to the smoking cessation outcome. Nonsmoking research suggests that lower-order AS factors differentially predict anxious and fearful responses to specific stimuli (e.g., physical concerns best predicts responding to physical but not social stress; Schmidt, 1999; Zinbarg, Brown, Barlow, & Rapee, 2001; Zvolensky, Goodie, McNeil, Sperry, & Sorrell, 2001). Thus it would be likely that only certain AS facets, such as physical concerns but not other lower-order factors, relate to the early manifestation of smoking cessation problems, given that this is a time when bodily arousal specifically, and aversive internal cues more generally, are the most pronounced. This more refined understanding of AS and smoking cessation is of particular importance for generating testable hypotheses regarding possible mechanisms linking these behaviors and “translating” such research efforts into the development of smoking cessation treatments tailored to individuals at “high risk” of early relapse because of cognitive-affective vulnerability.

Finally, Brown and colleagues (2001) focused on early smoking lapse (i.e., relapse) during the first week of a single quit attempt. Theoretically, smokers
with high levels of AS may be vulnerable to early relapse the first day of quitting, as they are highly sensitive to initial signals of negative affect and bodily sensations (Zvolensky & Bernstein, 2005). Under this type of “high-stress” situation, wherein physical nicotine withdrawal sensations arise, high-AS smokers may reflexively respond to such aversive internal stimuli by relapsing to smoking at higher rates to relieve such distressing experiences. Case studies support this account (Zvolensky, Lejuez, Kahler, & Brown, 2003), but to more definitively evaluate this perspective, it would be useful to assess lifetime rates of the longest duration of smoking abstinence during all previous quit attempts, rather than rely solely on the duration of time to first smoking behavior in a single quit attempt.

Together, the overarching aim of the present investigation was to explore AS and early problems in relapse to smoking among low-level daily smokers. To extend past work, we examined a sample of young adult non-treatment-seeking daily smokers from Mexico. This sampling strategy was used to evaluate the generalizability of AS–smoking relapse effects by studying a sample from an age range during which modal quitting behavior occurs (i.e., young adulthood; Baker, Brandon, & Chassin, 2004) in a country outside of the United States. This approach had the additional advantage of providing empirical data on anxiety and smoking among a Mexican population, an area of behavioral research that has been limited both in depth and comprehensiveness despite its clinical importance (Medina-Mora, Peña-Corona, Cravioto, Villatoro, & Kuri, 2002; Mirowsky & Ross, 1987; Ortega, Rosenheck, Alegría, & Desai, 2000).

We hypothesized that high levels of AS (global factor) would be associated with a unique increase in the odds of early smoking relapse above and beyond negative affectivity, alcohol consumption, and number of cigarettes smoked per day. To explore the specific lower-order components of the AS construct, we also hypothesized that the physical concerns factor, but not the cognitive or social concerns factors, would be related to early smoking relapse. Overall, these AS hypotheses were driven by conceptual models (Zvolensky & Bernstein, 2005) and empirical data (Brown et al., 2001) suggesting that AS would bias motivational processing (i.e., drug-seeking behavior) early in the quit process. Because the time period immediately after quitting often is associated with the highest level of bodily stress (Hughes, Higgins, & Hatsuakami, 1990), high-AS individuals would be reactive to, and perhaps intolerant of, cessation-related aversive internal cues and would be apt to smoke very early (i.e., 1 day or less after quit initiation) to ameliorate aversive states elicited by smoking discontinuation.

**Method**

**Participants**

Participants ($n=130$; 74 female) were daily cigarette smokers from the greater Mexico City, Mexico, community. The mean age of the sample was 22.5 years ($SD=2.1$). Participants averaged 9.3 cigarettes/day ($SD=11.5$) in the past week, had smoked cigarettes regularly for 5.4 years ($SD=3.6$), began smoking at a mean age of 15.7 years ($SD=2.7$), and considered themselves regular smokers by a mean age of 17.6 years ($SD=2.2$). These individuals were considered “low-level smokers” because they collectively averaged fewer than 10 cigarettes/day. All participants had made previous attempts to quit smoking, with the average number of total quit attempts being 2.8 ($SD=4.0$).

Participants reported the following alcohol use patterns: frequency ($M=53$ days/year, $SD=64$) and volume ($M=5.2$ drinks/occasion, $SD=4.2$). Additionally, 13% of the sample reported consuming 10 or more drinks per drinking occasion, and approximately 9% of the sample reported drinking 3 or more times per week. Participants were part of a larger study on the assessment of psychological characteristics and substance use behavior, conducted at the Universidad Nacional Autónoma de México. They were recruited via notification or advertisements around the Universidad Nacional Autónoma de México. Participants were excluded from the study if they evidenced limited mental competency or the inability to give informed, written consent. No other inclusion or exclusion criteria were used, including minimum or maximum criteria regarding level of smoking.

**Measures**

All measures were translated from English to Spanish by the chief investigator at the Universidad Nacional Autónoma de México (SJC). The scales were then backtranslated by a separate party using structured guidelines (Geisinger, 1994). The accuracy of the translated measure was then evaluated; no major discrepancies were detected in the backtranslation procedure. However, wording for certain measures was adjusted in minor ways to enhance readability based on the back translation procedure. This approach is recommended for translation, and it has been used extensively in past work (Brislin, 1970; Kotov, Schmidt, Zvolensky, Vinogradov, & Antipova, 2005; Van de Vijver, 1996; Zvolensky, Arrindell et al., 2003). All measures used in the present investigation can be accessed in the Spanish language by contacting the senior author on the present paper.

Smoking history and patterns were assessed with the well-established Smoking History Questionnaire...
(SHQ; Brown, Lejuez, Kahler, & Strong, 2002) that includes items pertaining to smoking rate, age at initiation, years of being a daily smoker, and quit history. The SHQ has been used successfully in previous studies as a descriptive measure of smoking history generally (Zvolensky, Schmidt et al., 2005) and length of past quit attempts specifically (Brown et al., 2002; Zvolensky, Lejuez et al., 2004). We used the smoking rate item from the SHQ as a primary index of smoking exposure. Smoking rate, compared with other potential indices of smoking history (e.g., nicotine dependence), was investigated as a primary predictor variable, given that this represents the most well-established factor in research on smoking and emotional vulnerability processes (Zvolensky, Feldner et al., 2005). Relapse duration was indexed by the longest period of time that the participant was able to abstain from cigarette smoking since becoming a daily smoker; it therefore reflects a lifetime rather than single-trial index of the amount of time abstinent from smoking in all previous quit attempts. Specifically, participants rated their longest quit attempt in terms of years, months, days, and hours, and their responses were subsequently standardized into a common metric (days). This approach to indexing quit history length is useful because it utilizes the entire range of data available rather than relying only on one single experience. In this sense, it is a conservative estimate of maximum quit duration length. No psychometric data are reported for the SHQ because it is descriptive in nature; therefore, typical psychometric properties cannot be computed (e.g., internal consistency).

The Anxiety Sensitivity Index (ASI; Reiss, Peterson, Gursky, & McNally, 1986) is a 16-item measure in which respondents indicate on a 5-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 (e.g., “It scares me when I feel shaky”). Factor analysis of this and other AS scales in cross-national work indicates that it has a hierarchical structure, with three first-order factors titled AS-physical concerns, AS-mental incapacitation concerns, and AS-social concerns and a single, higher-order general factor (Zinbarg et al., 1997; Zvolensky, Schmidt, & Stewart, 2003). The ASI has high levels of internal consistency for the global score (range of \( z \) coefficients = .79–.90) and good test–retest reliability (\( r = .70 \) for 3 years; Peterson & Reiss, 1992), including among Spanish-speaking samples (Sandin, Chorot, & McNally, 1996, 2001). In the present investigation, the internal consistency of the global and subscale scores was excellent, except for the social concerns factor, a pattern of findings similar to data from North American studies (Zinbarg et al., 1997): AS total score \( z = .94 \), physical concerns \( z = .93 \), mental incapacitation concerns \( z = .86 \), and social concerns \( z = .66 \). The ASI is unique from, and demonstrates incremental validity relative to, trait anxiety (Rapee & Medoro, 1994); thus this construct is distinguishable from the frequency of anxiety symptoms (McNally, 1996).

The Positive Affect Negative Affect Scale (PANAS; Watson, Clark, & Tellegen, 1988) is a 20-item measure in which respondents indicate on a 5-point Likert-type scale (1 = “very slightly or not at all” to 5 = “extremely”) the extent to which they generally experience different feelings and emotions (e.g., “hostile”). The PANAS is a well-established measure commonly used in psychopathology research (Watson et al., 1988). Factor analysis indicates that it assesses two global dimensions of affect: negative and positive. Both subscales of the PANAS have demonstrated good convergent and discriminant validity. Additionally, both the negative affectivity as well as the positive affectivity scales of the PANAS have demonstrated high levels of internal consistency across a range of populations, including cross-national samples (range of \( z \) coefficients = .83–.90 and .85–.93, respectively; Watson, 2000). Only the negative affectivity scale (PANAS-NA) was used in the present study (\( z = .87 \) for the PANAS-NA and \( z = .84 \) for the PANAS-PA in the present sample).

The Alcohol Consumption Assessment (ACA; Zvolensky et al., 2006) was used to assess patterns of alcohol use. The ACA is a two-item measure that examines (a) the presence or absence of current alcohol use and (b) the frequency (weekly, monthly, or yearly) of such use in a manner commonly used in previous research (Stewart, Peterson, & Pihl, 1995). In regard to frequency, participants reported the number of occasions per week on which they normally consumed alcohol in their lifetime; those who consumed alcohol on less than one occasion weekly estimated monthly or yearly frequency. In regard to quantity, participants indicated the average number of alcoholic beverages (using standardized conversions) they normally consumed per drinking occasion in their lifetime. As recommended in past work (Wechsler, Davenport, Dowdall, Moeykens, & Castillo, 1994), average lifetime alcohol volume was indexed via the product of the frequency by quantity measures. No psychometric data are reported for the ACA because it is descriptive in nature; therefore, typical psychometric properties cannot be computed (e.g., internal consistency).

Procedure

Interested participants were given a description of the investigation at the Universidad Nacional Autónoma de México. After providing informed consent, participants received the assessment measures in a group format. All participants had access to researchers during the administration to address
questions and were thanked and debriefed about the aims of the study at the end of the session.

Data analyses

Two hierarchical logistic regression analyses were performed with relapse rate (coded dichotomously, differentiating relapse that occurred in 1 day or less and relapse that occurred after more than 1 day) as the primary dependent measure. This approach to defining early relapse was driven by data from studies on smoking and panic comorbidity that suggest many high-AS smokers report relapse in 1 day or less (Zvolensky, Bernstein, Yartz, McLeish, & Feldner, in press). At level 1 in the model, negative affectivity, cigarettes smoked per day in the past week, and alcohol consumed per year (frequency by quantity) were entered as covariates. Number of quit attempts was not related to relapse status and therefore was not included as a covariate. At level 2, either ASI total score (for the first regression) or the three lower-order factors (physical, mental, or social concerns subscales; for the second regression) were entered simultaneously. In this model, any observed effects for AS variables at level 2 in the model were unique and cannot be attributed to shared variance with factors in level 1 (Cohen & Cohen, 1983). Moreover, in terms of the second regression, wherein the three ASI lower-order scores were entered simultaneously at level 2 of the model, the incremental effect of one or more ASI lower-order factor cannot be attributed to shared variance with the other ASI lower-order factors; the latter was conducted in line with the study hypotheses to explore the specific lower-order components of the AS construct in relation to smoking relapse.

Results

Descriptive data and zero-order relationships among theoretically relevant variables

See Table 1 for means and standard deviations of the relevant predictor and criterion variables. First, we examined patterns of associations between the covariates and AS. Higher levels of negative affectivity were significantly associated with higher ASI total scores and scores on each of the lower-order factors, as well as greater daily cigarette smoking levels. Cigarettes smoked per day also was significantly positively correlated with alcohol consumption, ASI total score, as well as the factor scores. Neither the higher-order ASI total score nor the lower-order subscale scores were significantly associated with alcohol consumption.

Second, patterns of associations among the predictor variables and smoking relapse were examined (Table 1). Cigarettes smoked per day; alcohol consumption; negative affectivity; and the ASI total, physical, and mental incapacitation concerns factor scores were all positively associated with smoking relapse: Greater levels on each of these factors were associated with earlier relapse. No significant zero-order associations were evident between cigarettes smoked per day or the ASI social concerns subscale and early relapse.

Relationship between mean differences in anxiety sensitivity and smoking relapse

We then examined mean AS levels for each of the two smoking relapse groups using a one-way ANOVA to characterize the differences in this cognitive factor among early and nonearly relapers. First, a significant difference was found in regard to the higher-order AS factor (ASI total score), F = 17.4, p < .001, d = .875. The mean ASI total score among those who relapsed in 1 day or less was 32.70 (SD = 13.38), whereas the mean for those who relapsed in more than 1 day was 21.04 (SD = 13.27). A similar pattern was evident for AS physical concerns (F = 18.6, p < .001, d = .887); mean levels among those who relapsed in 1 day or less were 16.52 (SD = 7.67) and among those who relapsed in more than 1 day were 9.72 (SD = 7.62). Additionally, early relapers had significantly (F = 11.4, p < .01, d = .684) higher AS mental incapacitation concerns

Table 1. Descriptive data and zero-order relationships among theoretically relevant variables.

<table>
<thead>
<tr>
<th>Relapse</th>
<th>Negative affectivity</th>
<th>Cigarettes/day</th>
<th>Alcohol/year</th>
<th>ASI-Total</th>
<th>ASI-Physical</th>
<th>ASI-Mental</th>
<th>ASI-Social</th>
<th>Mean (SD) or %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relapse</td>
<td>1</td>
<td>.29*</td>
<td>.37**</td>
<td>.30*</td>
<td>.35**</td>
<td>.36**</td>
<td>.29*</td>
<td>.16</td>
</tr>
<tr>
<td>Negative affectivity</td>
<td>1</td>
<td>.33**</td>
<td>.07</td>
<td>.43**</td>
<td>.34**</td>
<td>.48**</td>
<td>.32**</td>
<td>24.8 (8.1)</td>
</tr>
<tr>
<td>Cigarettes/day</td>
<td>1</td>
<td>.45**</td>
<td>.13</td>
<td>.11</td>
<td>.17</td>
<td>.24*</td>
<td>9.3</td>
<td>(11.5)</td>
</tr>
<tr>
<td>Alcohol/year</td>
<td>1</td>
<td></td>
<td></td>
<td>.97**</td>
<td>.88**</td>
<td>.82**</td>
<td>23.8</td>
<td>(14.2)</td>
</tr>
<tr>
<td>ASI-Total</td>
<td>1</td>
<td></td>
<td></td>
<td>.78**</td>
<td>.71**</td>
<td></td>
<td>11.4</td>
<td>(8.1)</td>
</tr>
<tr>
<td>ASI-Mental</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1.61</td>
<td>4.6</td>
<td>(4.2)</td>
</tr>
<tr>
<td>ASI-Social</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1.7</td>
<td>(3.3)</td>
</tr>
</tbody>
</table>

Note. Relapse coded dichotomously (1 = more than 1 day; 2 = 1 day or less). ASI, Anxiety Sensitivity Index (Reiss et al., 1986); PANAS-NA, Positive Affect Negative Affect Schedule–Negative Affect Subscale (Watson et al., 1988); SD, standard deviation. *p < .01; **p < .001.
Hierarchical logistic regressions were then completed to test the incremental validity of AS in regard to early relapse. At level 1, cigarettes smoked per day \((OR=1.08, 95\% \ CI=1.02-1.14, \ p<.05)\) was associated with a unique change in the odds of early smoking relapse, wherein a higher smoking rate was associated with early relapse; in contrast, negative affectivity \((OR=1.06, 95\% \ CI=1.00-1.13, \ p>.05)\) and alcohol consumption \((OR=1.00, 95\% \ CI=1.00-1.00, \ p>.05)\) were not associated with a significant change in the odds of early smoking relapse. Inconsistent with prediction, ASI total score was not significantly associated with a unique change in the odds of early smoking relapse above and beyond the covariates \((OR=1.04, 95\% \ CI=1.00-1.08, \ p>.05)\).

As predicted, the ASI physical concerns subscale was associated with a unique change in the odds of early smoking relapse above and beyond the covariates and the ASI mental and social concerns subscales \((OR=1.19, 95\% \ CI=1.04-1.35, \ p<.01)\); greater levels of AS physical concerns were associated with early relapse. Interestingly, the ASI social concerns subscale was associated with a unique change in the odds of early smoking relapse above and beyond the covariates and the ASI physical and mental incapacitation concerns subscales \((OR=.75, 95\% \ CI=.59-.97, \ p<.05)\); however, the social concerns subscale’s relationship with relapse was in the opposite direction observed for the physical concerns subscale. That is, lower levels of social concerns, as opposed to higher physical concerns, were associated with early smoking relapse. Finally, as predicted, the ASI mental incapacity subscale \((OR=99, 95\% \ CI=.80-1.23, \ p>.05)\) was not incrementally related to early smoking relapse above and beyond the covariates or the ASI physical and social concerns subscales.

Discussion

Although AS is a well-established factor in terms of its role in anxiety symptoms and problems (Taylor, 1999), recognition is growing that this construct also may be related to certain problematic aspects of smoking behavior (Zvolensky, Feldner et al., 2004). The present investigation was designed to evaluate the incremental validity of the global AS construct and its lower-order factors in relation to early smoking relapse using lifetime data attained from a sample of young adult Mexican daily low-level smokers.

Evidence indicated that the AS physical concerns lower-order factor was significantly related to early smoking relapse among daily low-level Mexican smokers. This statistically large effect (Cohen, 1988) was observed above and beyond the variance accounted for by negative affectivity, alcohol use, average number of cigarettes smoked per day, and the other AS mental and social concerns lower-order factors. No similar type of effect was observed for the global or other lower-order AS facets. These data are only partially consistent with a priori prediction whereby a similar effect was expected for the global AS factor, but they suggest that greater fears of bodily sensations are uniquely related to early relapse and that such effects are not attributable to other theoretically relevant common factors among low-level daily smokers. Given the aversive internal symptoms often elicited during the early stages of smoking quit attempts (Hughes et al., 1990), a high level of fear of interoceptive cues (high AS physical concerns) may serve to increase cognitive-affective reactivity to such stimuli. For example, a smoker high in AS physical concerns may be more apt to fear that immediate changes in bodily sensations occurring in response to smoking discontinuation reflect personally threatening events (“I am having a heart attack”). Under these conditions, such a smoker may be prone to smoke for negative affect reduction reasons (Stewart et al., 1997; Zvolensky, Feldner et al., 2004; Zvolensky, Schmidt et al., 2005) and may be “biased” to respond to these aversive sensations by smoking. In this way, early relapse to smoking among those high in AS physical concerns may serve to prevent, avoid, or control what may be perceived as intolerable internal cognitive-affective responses to nicotine withdrawal. Although the present research design cannot fully elucidate such processes, it does set the stage for future mechanism-based research to explicate the precise series of events involved in instances of early relapse among affectively intolerant “high-risk” individuals.

At least three other aspects of the present findings warrant brief discussion. First, the present results are broadly conceptually consistent with previous research (Brown et al., 2001; Zvolensky, Baker et al., 2004) but extend these findings to a sample of low-level daily smokers from Mexico. Thus, given the current findings, we can be more confident in the generalizability of the associations between AS and early smoking cessation problems and that this association is not accounted for by
shared variance with other emotional vulnerability (i.e., negative affectivity) or substance use (i.e., alcohol use or smoking rate) factors. The current findings also extend research addressing the characteristics related to early relapse among low-level smokers, a growing segment of the smoking population that may have unique intervention needs (Hyland, Rezaaishiraz, Bauer, Giovino, & Cummings, 2005).

Second, from a descriptive standpoint, and as a clinically relevant index of the magnitude of the observed AS–smoking relapse effect, it is noteworthy that those individuals who relapsed in 1 day or less reported global, physical, and mental incapacitation AS levels comparable with those observed for persons with panic disorder and PTSD. In both cases, AS total scores on the 16-item version of the instrument were over 30, whereas nonclinical persons score approximately 19 (Taylor, Koch, & McNally, 1992). By contrast, those who relapsed in more than 1 day showed levels comparable with nonclinical populations. These data suggest that low-level daily smokers may be at risk of early relapse because of high levels of certain facets of AS. Given that no psychiatric interview was administered to participants as part of the present investigation, the lifetime and current histories of Axis I psychopathology among the sample cannot be discerned from the study. Future work could usefully incorporate such interview assessments into work on this topic to better understand the relationship between psychiatric histories and early relapse. It is possible that early relapers are more likely to have panic disorder or PTSD. At the same time, given that past work has indicated that AS is not equivalent to anxiety psychopathology status (McNally, 2002), the observed effect is unlikely to be solely attributable to a clinical anxiety condition. That is, AS maintains unique explanatory value relative to anxiety psychopathology and therefore may be usefully conceptualized as a potential risk marker or factor for early relapse.

Finally, an unexpected significant effect was detected for AS social concerns in regard to early relapse. Here, however, lower levels of social concerns were associated with early smoking relapse. It is presently unclear, theoretically or empirically, why lower social concerns would be related to early relapse. It should be noted that the internal consistency of the AS social concerns factor was relatively low (α = .66). Nonetheless, a potential, albeit speculative, explanation for this finding may be that Mexican smokers high in AS social concerns are able to sustain a quit attempt for a longer period of time because they fear negative evaluation by others if they fail early in the quit process. Before more confidence can be placed into this finding, independent replication is warranted.

A number of limitations of the present investigation should be considered. First, we used retrospective data derived from self-report scales for determining the maximum duration of early relapse. The strength of this approach is that it utilizes lifetime relapse data rather than data from a single quit attempt and thereby provides a broader quit-related context for understanding associations between AS and early relapse. The challenge to this approach is that it introduces the possibility of memory or recall biases as an alternative explanation for the observed effects related to retrospective reporting biases. For example, it may be that smokers high in AS physical concerns only perceive their relapse during previous quit attempts as earlier, perhaps because they had such distressing emotional reactions early in the quit process. This alternative explanation seems unlikely given the results of Brown et al. (2001), but further confidence in the AS–early relapse association could be attained by using prospective methodologies. In a related manner, we did not verify smoking status by biochemical verification. Future work could usefully replicate and extend the present work by including biochemical assays in addition to self-report methodologies related to smoking status.

Second, the sample was comprised of young adult Mexican smokers who volunteered to participate in the study. Significant diversity exists among Spanish-speaking groups in regard to myriad parameters (e.g., country of origin, rural versus urban residence, cultural elements linked to particular nationalities; Straussner, 2001). The findings should therefore be generalized only to young adult smokers from the Mexico City area and not be assumed to apply to all Spanish-speaking groups. Moreover, recruitment tactics other than those used in the present study should be utilized in future studies to rule out a potential self-selection bias. Third, shared method variance may theoretically have contributed to the observed results. To address this concern, future research could bolster the assessment approach to include methodologies other than self-report. For example, researchers could assess reactivity to physical stressors or smoking-based withdrawal symptoms as a predictor of early relapse, which would lend further theoretical support to an AS model of early relapse. Fourth, although we used validated measures that are well accepted in the field, independent tests of the psychometric properties of these scales were not completed as part of the present investigation. The scales used here performed as would be expected and with high levels of internal consistency, but future work may usefully evaluate
the psychometric properties of these and other measures in the Spanish language among Mexican samples. Finally, though not the primary focus of the present investigation, no significant association was found between AS and volume of alcohol consumed among this sample. Based on the descriptive data (see Participants component of the methods section for details), ample variability existed in the nature of alcohol use among this sample. To better gauge the nature of alcohol use in the context of understanding the relationship between anxiety vulnerability factors such as AS and early relapse, it may be useful for future research to include a diagnostic assessment of alcohol use disorders rather than rely solely on alcohol use patterns.

Together, the present findings uniquely extend previous work documenting an association between AS and early smoking relapse among young adult Mexican daily smokers. Results suggest that elevations in AS physical concerns may increase the probability of early relapse and that this association is not attributable to negative affectivity, alcohol consumption, or smoking rate. These findings provide further evidence that AS is an important construct in terms of smoking cessation.

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