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Anger and Psychobiological Changes During Smoking Abstinence and in Response to Acute Stress: Prediction of Smoking Relapse

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Abstract

Nicotine may be used to manage negative emotions, and recent research suggests that smokers with high levels of hostility may use cigarettes to cope with anger provoking situations. This study evaluated the extent to which a high level of trait anger is associated with risk for relapse among smokers interested in cessation. Chronic smokers with different levels of trait anger provided reports of withdrawal symptoms, craving, and state anger, and collected saliva samples for cortisol during 24-hour ad libitum smoking and the first 24-hour abstinence period of a quit attempt. They also attended a laboratory session conducted after the 24-hour abstinence during which they performed brief mental and social stress challenges and provided blood samples for adrenocorticotropin (ACTH) and cortisol assays. High trait anger was associated with greater increases in state anger, withdrawal symptoms, and craving during the first 24 hour of abstinence. It was also associated with greater ACTH concentrations during the laboratory session. High trait anger was also associated with increased risk for early relapse. The findings support the hypothesis that smokers high in anger trait may have greater mood difficulties during abstinence and may be more vulnerable to early relapse than smokers with low anger trait.

Introduction

We examined the extent to which trait anger predicts intensity of craving, withdrawal symptoms, and neuroendocrine changes during the first day of a quit attempt. One of the important reinforcing qualities of smoking is its effects in managing negative affect (Gilbert 1995; Kassel et al. 2003) and studies have demonstrated that nicotine reduces reports of anger (Jamner et al. 1999). Also, smokers who experience anger situations are likely to increase their smoking behaviors (Jamner et al. 1999; Kalman 2002; Kenford et al. 2002). However, the extent to which negative affect influences smoking behavior is highly variable between individuals and is influenced by various situational factors (Gilbert 1995; Abrams et al. 1988; Gilbert et al. 2002; Hughes et al. 1991).

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High levels of trait anger may contribute to maladaptive behavioral responses, including a greater likelihood of seeking out substances such as nicotine and alcohol (Whalen et al. 2001; Brady and Sonne 1999). It is therefore possible that smokers who are high in trait anger draw enhanced benefits from smoking, and may consequently experience more difficulties during abstinence. Consistent with this hypothesis, one study assessed ambulatory anger reports in both smokers and non-smokers who were classified as high or low in hostility (Jamner et al. 1999). Results of that study showed that nicotine administration was associated with reports of reduced anger in people who were high in hostility. Another study showed that response to provocation was reduced in smokers after use of nicotine compared with placebo gum (Cherek et al. 1991). On the other hand, it has been shown that trait hostility predicts higher cigarette smoking rates (Barefoot et al. 1987; Whiteman et al. 1997; Siegler et al. 1992). Also, smokers as a group have been characterized as being higher in neurotic traits, including anger (Gilbert and Gilbert 1995), and children who are high in anger are prone to take up smoking as college students and be still smoking 20 years later (Lipkus et al. 1994). Considered together, these studies suggest that high levels of anger are likely to contribute to increased tobacco use, and situational factors may accentuate anger-related traits in increasing risk for tobacco use or relapse.

Abstinence from smoking is associated with increased negative affect, including anger and irritability, that begins within 4 to 24 hours of abstinence (al'Absi et al. 2002; Piasecki et al. 1998; Swan et al. 1996; Gulliver et al. 1995). The intensity of these symptoms peaks within the first three days (Ward et al. 2001) and may not resolve even after 30 days of abstinence (Gilbert et al., 2002). It is possible that these mood alterations are particularly pronounced among smokers who are high in trait anger. As such, these smokers may also have greater difficulties in their attempt to quit and may relapse earlier than smokers low in anger and hostility. Studies have also shown that enhanced experience of anger is associated with increased physiological responses to acute stress (Bongard et al., 1997; Engbretson et al. 1989). In laboratory studies, effects of anger seem to be more consistently present when provocation of anger is applied (Everson et al. 1995; Engbretson et al. 1989; Larson and Langer 1997). While the present study does not include a specific anger provocation procedure, it focuses on nicotine withdrawal among smokers, a phenomenon known to increase irritability and anger (Hughes et al., 1991). This natural manipulation may be more relevant to the experience of these individuals than circumscribed laboratory provocation. The study includes multiple measures of mood and hormonal activation to carefully examine these changes during the initial stage of a smoking cessation attempt and their relevance to the risk for relapse.

Smoking relapse rates remain disturbingly high, with approximately 50% of smokers relapsing within 3 days and 75% within the first 2 weeks (Garvey et al. 1992; Law and Tang 1995; Rose 1996). Studies have shown that personality traits (e.g., related to depression and anxiety) may also predict risk for smoking relapse (Hall et al. 1993; Hughes et al. 1991; Killen and Fortmann 1997). Research also suggests that subjects who relapse within the first week of a quit attempt experience greater negative affect than those who successfully abstain (al'Absi et al. 2004). It is therefore possible that individuals prone to increased anger during abstinence are most susceptible to early relapse. Supporting this possibility, a recent study has shown an association between increased trait hostility and risk of early relapse (Kahler et al. 2004). This increased risk of relapse may be related to increased proneness to experience situational irritants, leading to increase in their craving for cigarettes.

The present study addresses the extent to which trait anger is associated with deterioration in mood and hormonal changes during the first day of abstinence and with increased risk of early relapse. Data reported here are part of a larger longitudinal project conducted to examine stress psychophysiological and biological stress responses, and withdrawal symptoms as markers of relapse (al'Absi et al., 2005).

Methods

Participants

This study included 34 women and 38 men who were dependent cigarette smokers between the ages of 18 and 68 (means $\pm$ S.E.M. = 37.2 ± 1.68) and who indicated strong motivation to stop smoking. Recruitment was conducted using newspaper advertisements and posters placed in the community. Potential participants were screened first by a telephone interview. The interview included questions concerning any current or recent history of medical or psychiatric disorders, medication intake, and smoking criteria (having smoked an average of 15 cigarettes or more per day for a minimum of 2 years). An on-site screening session was scheduled for those potential participants who met inclusion criteria. All participants in the study were screened for history of major illness or psychiatric disorder, weight within $\pm$ 30% of Metropolitan Life Insurance norms, consumption of two or fewer alcoholic drinks a day, and use of medications (contraceptives exempt). Qualified participants reviewed and signed a written consent form approved by the Institutional Review Board of the University of Minnesota. Monetary compensation was provided for participation.

Measures

Saliva samples were collected during a 24-hour period of ad libitum monitoring and during the first 24-hours of a quit attempt. Samples were assayed for cortisol using a time-resolved fluorescence immunoassay with a cortisol-biotin conjugate as a tracer (Dressendorfer et al. 1992). This assay has a sensitivity of 0.4 nmol/L with inter- and intra-assay coefficients of variation less than 10 and 12% respectively. Cotinine concentrations and expired CO levels were assessed in this study to confirm smoking status. Cotinine levels were assayed using enzyme immunoassay (EIA; DRG Diagnostics, Marburg, Germany). Inter- and intra-assay variations for cotinine measurements were below 12%. Measurement of expired CO was performed using MicroCO™ monitors (Micro Direct Inc., Auburn, Maine).

Blood samples were collected using indwelling catheter during the laboratory session to assay for cortisol and ACTH before and after performing two acute challenges, as described below. ACTH was assayed using RIA kits (Nicols Institute, Bad Nauheim, Germany) with a lower sensitivity of 1 pg/mL. Plasma cortisol was assayed in duplicate using EIA (DSL, Sinsheim, Germany) with a lower sensitivity of 0.1 μ g/dL. Inter- and intra-assay coefficients of variance for these assays were below 10%. Blood pressure and heart rate were collected during the laboratory sessions during rest and while performing the acute challenges using Dinamap blood pressure monitors.

During the screening session, participants completed measures of trait anger and hostility using the Spielberger's State-Trait Anger Expression Inventory (STAXI) (Spielberger et al. 1985). Participants also completed other measures to assess history and level of their nicotine dependence, including the Fagerström Test of Nicotine Dependence (FTND; (Heatherton et al. 1991))

A modified version of the Minnesota Nicotine Withdrawal Scale (MNWS; (Hughes and Hatsukami 1986; Hughes and Hatsukami 1998)) was included during the ambulatory assessment. Each time a saliva sample was collected, the MNWS was completed by the participant. Due to evidence suggesting craving patterns to be distinct from other symptoms of withdrawal (Hughes and Hatsukami 1998) the "desire to smoke" item was analyzed separately. Because of the specific focus of this study on anger, we also analyzed the anger rating separately. We assessed positive affect using items of cheerfulness, content, calmness, controllability, and interest. We included physical symptoms that have been shown to be

associated with smoking abstinence, including headache, stomachache, drowsiness, sweating, tremor, fatigue, and coughing (American Psychiatric Association 1994).

We also administered the abbreviated version of the Questionnaire of Smoking Urges (QSU-brief) (Cox et al. 2001) (Tiffany and Drobes 1991) before and after the 24-hour abstinence period and during the laboratory session. The QSU-brief includes two factors measuring appetitive urges to smoke (Factor 1) and urges associated with relieving aversive experience of withdrawal (Factor 2) (Cox et al. 2001).

Procedures

Participants were asked to report to the laboratory for a session approximately two weeks before their scheduled quit day while they were still smoking at their regular rate. Participants gave a breath sample for measurement of expired CO and saliva for cotinine assay. They were provided with a set of saliva sample tubes and copies of the mood monitoring scale to complete over the next 24 hours. Participants were directed to collect saliva samples at 8:00 pm of that day (nadir level) and at 9:00, 10:00, and 11:00 am of the next day, bringing the samples in to the laboratory around noon of that day. Every time a sample was collected, participants completed the mood form.

Each participant was asked to decide on a quit-date to fall within two to three weeks from their ad libitum monitoring period. No pharmacological or systematic behavioral interventions were applied in this study. Cortisol samples and withdrawal symptoms over the first 24 hours of abstinence were collected following the same timing and procedures as the baseline ad libitum assessment (see above). All participants were asked to abstain from smoking for a minimum 24-hour period starting at noon.

After the 24-hour abstinence, participant attended a laboratory session starting between 12 and 2 pm. The session protocol included a 30-minute baseline rest period, followed by public-speaking challenges for 24 minutes (al'Absi et al., 1997), and a 30-minute recovery period. Then participants performed the mental arithmetic task and the Paced Auditory Serial Addition Task (PASAT; 16 min), which were followed by a final recovery period of 30 minutes. Plasma cortisol and ACTH, salivary cortisol samples, and ratings of mood and withdrawal symptoms were collected before the stressors and after the completion of the public speaking and then after the completion of the two cognitive challenges. The cardiovascular measures were collected every three minutes during the rest periods and every two minutes during the stressors.

Four weekly follow-up assessments were conducted after quit day to assess abstinence status. Participants provided expired-CO and saliva samples to verify abstinence or smoking status. They also completed mood and withdrawal symptom measures. Earlier reports from this project focused on the prediction of early relapse over the first week using data from the ambulatory monitoring days (al'Absi et al. 2004) and survival prediction model using cardiovascular and hormonal responses to the laboratory stressors in predicting relapse (al'Absi et al. 2005). This paper specifically examines the role of trait anger in predicting changes in mood, adrenocortical responses to stress, and relapse risk using data obtained from both the ambulatory assessment and laboratory stress protocols.

Data Analysis

Mood and cortisol measures were collected over two ambulatory assessment periods (24 hours during ad libitum smoking and during the first 24 hours period of abstinence) to obtain respective averages over these two periods. Hormonal and cardiovascular response measures during the acute stressors were calculated by subtracting values obtained during baseline from measures during the stressors. We used regression analysis to determine the associations of

trait anger with various demographic and smoking history characteristics. Regression models included trait anger as the independent variable to predict craving, state anger, withdrawal symptoms, and other mood changes during the initial period of abstinence (obtained from the modified Minnesota Nicotine Withdrawal Scale, as described above). The same strategy was used to predict baseline hormonal and cardiovascular measures during the laboratory session and to predict responses to the acute stressors. Trait anger was also used to predict the number of days until relapse. Fifty-four of 72 participants relapsed (smoked at least one cigarette after the 24-hour abstinence) within the four week post-quit period. Demographic and smoking history characteristic measures that were found to be predicted by trait anger were subsequently partialled out from significant models.

Results

Subject Characteristics

Table 1 shows participant characteristics. Preliminary regression analysis to assess the association between anger and demographic and smoking measures showed no correlation with education, gender, caffeine intake, alcohol use, average hours of sleep, body mass index ($t_s < 1.6$, $p_s > 0.12$). Age was significantly associated with trait anger, with increased age associated with reduced trait anger ($t_{(72)} = -2.04$, $R^2 = .06$; $p < 0.05$). Association of trait anger with smoking measures, including age when smoking started, duration of smoking, motivation to quit, and number of previous quit attempts were not significant ($t_s < 0.89$, $p_s > 0.38$). Smoking rate prior to quitting showed a trend of association with trait anger ($t_{(72)} = -1.9$; $R^2 = .05$; $p = 0.06$). Based on these analyses, age and rate of smoking were included in partial correlation analyses whenever appropriate.

Mood and Craving Measures

As expected, participants reported greater craving, withdrawal symptoms, anger, and less positive affect during abstinence than ad libitum monitoring periods ($F_s (1, 69) > 6.6$; $p_s < 0.01$). Results from the regression analyses showed that increased trait anger predicted greater changes in mood and withdrawal symptoms during the abstinence day, as demonstrated by significant associations with craving ($r = .36$; $df = 68$; $p < 0.01$; Figure 1), withdrawal symptoms ($r = .41$; $df = 68$; $p < 0.0001$), physical symptoms ($r = .53$; $df = 68$; $p < 0.0001$), and state anger measures ($r = .49$; $df = 68$; $p < 0.0001$). These correlations remain significant after partialing out for age and smoking rate (partial $r_s = .39, .51$, and $.47$; $p_s < 0.001$, for withdrawal symptoms, physical symptoms, and state anger, respectively).

Higher trait anger predicted less positive affect ($r = -.25$; $df = 68$; $p < 0.05$), but this correlation was reduced to a trend after partialling out age and smoking rate (partial $r = -.23$, $p = 0.06$). Furthermore, close inspection of Figure 1 indicates that a relatively more consistent association between trait anger and craving was evidenced in participants with trait anger scores = 20.

Trait anger was associated with significant increases in appetitive urges to smoke (Factor 1 on QSU; $r = .31$; $df = 71$; $p < 0.05$) and withdrawal symptoms ($r = .53$; $df = 71$; $p < 0.001$) during baseline assessment of the lab session. Both of these correlations remained significant after partialling out age and smoking rate (partial r for appetitive urges to smoke = $.29$; $p < 0.05$; and partial r for withdrawal symptom = $.53$, $p < 0.001$).

Similarly, trait anger was associated with significant increases in aversive urges to smoke (Factor 2 on QSU; $r = .45$; $df = 71$; $p < 0.001$), and this correlation remains the same after partialling out the effects for age and smoking rate (partial $r = .45$; $p < 0.001$). Trait anger also predicted greater reports of both factors of smoking urges after each of the acute stressors (r_s

$> .33$; $ps < 0.01$). It also predicted withdrawal symptoms after each stressor ($rs > .57$, $ps < 0.0001$).

Using a score of 20 as a cutoff on the trait anger scale, we further categorized participants into high and low trait anger and compared levels of craving between these two groups. Smokers with high trait anger tended to report greater increase in craving during abstinence compared with smokers low in trait anger ($F(1, 67) = 4.80$, $p < 0.05$). Relative to smokers with low trait anger, smokers high in trait anger also reported greater appetitive urges to smoke and greater increases in aversive urges to smoking during baseline assessment of the lab session ($Fs(1, 69) > 4.70$, $ps < 0.03$).

Endocrine and Cardiovascular Measures

While trait anger did not predict cortisol concentrations during the ad libitum period ($r = .09$, $p = 0.43$), trait anger was marginally associated with reduced cortisol production during the first day of abstinence ($r = -.20$; $df = 70$; $p = 0.09$). The later correlation reached significance when age and smoking rate were partialled out ($r = -.29$; $p = 0.02$).

Trait anger predicted higher ACTH concentrations during baseline rest in the laboratory stress session ($r = .36$; $df = 59$; $p < 0.01$; Figure 2), and this was actually strengthened after partial correlation ($r = .40$, $p < 0.01$). On the other hand, levels of trait anger did not predict resting levels of plasma cortisol or salivary cortisol concentrations ($rs < .06$). ACTH and cortisol changes in response to the public-speaking stressors were not significantly predicted by trait anger ($rs = -.09$ to $-.22$; $ps > 0.08$). There was a significant association between ACTH in responses to the cognitive stressor and trait anger, with higher levels of trait anger predicting attenuated ACTH responses to the cognitive stressors ($r = -.30$, $df = 55$; $p < 0.05$). This association remained significant after partialling out effects of age and smoking rate ($r = -.29$; $p < 0.05$). Trait anger did not predict cortisol response to the cognitive challenge ($r = .11$). Trait anger did not predict baseline systolic BP, diastolic BP, heart rate, or responses to the acute stressors ($r < .20$, $ps > 0.10$).

Anger and Risk of Relapse

As shown in Figure 3, regression analyses to predict the number of days until relapse showed that higher levels of trait anger was associated with smaller number of abstinence days ($r = -.25$; $df = 72$; $p < 0.05$). This association remained significant after partialing out effects of age and smoking rate ($r = -.24$; $p < 0.05$). Further examination of Figure 3 shows that 13 out of the 14 participants who had trait anger score = 20 relapsed within one week. This association was confirmed using a non-parametric test examining relapse (relapse, no relapse) among those whose scores on trait anger were below 20 versus those with scores were equal to or above 20 ($X^2 = 8.06$, $p < 0.005$). In addition, increases in anger experienced during the first day of abstinence predicted shorter time to relapse ($r = -.31$; $df = 71$; $p < 0.01$), and the partial correlation was smaller but still significant ($r = -.25$; $p < 0.05$). Similarly, anger reports obtained during the laboratory session was associated with early relapse ($r = -.32$; $df = 72$; $p < 0.01$). This correlation was reduced but remains significant after partialing out effects of age and smoking rate ($r = -.26$; $p < 0.05$). Further, when comparing smokers high in trait anger with those low in trait anger, using score of 20 as a cutoff, we found high trait anger smokers tended to relapse sooner than smokers low in trait anger (13.2 and 8.5 days for low and high trait anger, respectively, ($F(1, 69) = 3.66$; $p = 0.06$).

Discussion

There are three primary findings relevant to effects of anger on risk for smoking relapse. First, high trait anger was associated with deterioration of mood and withdrawal symptoms during

the first 24-hour period of abstinence. Second, high trait anger was associated with attenuated adrenocortical activity during early abstinence, but predicted greater pituitary production of ACTH during the laboratory stress session. Third, both measures of anger (trait and state) predicted shorter time until relapse. Smokers with relatively high levels of trait anger were particularly vulnerable to relapse within one week after abstinence. This is the first study to evaluate specifically the potential effects of anger as a predictor of relapse, acute effects of abstinence, mood and neuroendocrine changes during initial days of an abstinence attempt.

The results of this study show consistent patterns of associations between trait anger and mood changes during abstinence and in response to stress, as well as with cortisol and ACTH concentrations. On the other hand, associations with blood pressure and hormonal responses to acute stress were not significant. This lack of association with reactivity may be explained by two possibilities. First, smokers as a group show attenuated blood pressure and cortisol responses to acute stress (al'Absi et al. 2003; Kirschbaum et al. 1993) restricting the range of variance and the possibility for identifying meaningful association with personality dispositions, such as anger. Second, it is possible that the nature of the stressors used in this study was not powerful enough to bring about individual differences in reactivity related to trait anger. This possibility is supported by previous work showing that challenges that involve anger-related manipulations produced enhanced cardiovascular activity in individuals with high anger predisposition (Everson et al. 1995; Siegman et al. 1990; Engbretson et al. 1989; Larson and Langer 1997; Suarez and Williams 1989). We must also acknowledge the possibility the null findings in this study may have been due to the small sample size, weakening the power of the analyses and increasing chances of type II error.

It was interesting to observe that trait anger was associated with increased basal ACTH, even though no such association reached significance with cortisol concentrations. It is possible that this finding reflects greater sensitivity of the more centrally produced ACTH to emotion-related individual differences. In a previous study, we found that ACTH differentiated groups high in outward anger expression and defensiveness in response to acute stress better than cortisol and other cardiovascular measures (al'Absi et al. 2000). The HPA axis is activated by emotional distress, resulting in the secretion of ACTH from the pituitary and cortisol from the adrenal cortex (Dallman 1993), and it can be sensitive to individual differences such as risk for hypertension (al'Absi and Lovallo 1993), heart rate reactivity (Lovallo et al. 1990), and individual differences in distress that may result from defensive avoidance of anger expression (Brown et al. 1996).

This study found that trait anger predicted cortisol concentrations during the abstinent ambulatory period only, with high trait anger predicting lower concentrations. This finding indicates multiple possibilities related to emotion-related differences in the dynamics of nicotine addiction. Systemic increases in cortisol secretion can result from exposure to high daily stress as well as from smoking (Wilkins et al. 1982; Seyler Jr. et al. 1984). High anger experience is usually associated with enhanced physiological activity and greater impact of environmental stressors (Suarez et al. 1998; Bongard and al'Absi 2005). Under chronic conditions, this heightened activation may lead to allostatic load, as the body attempts to accommodate this chronic physical activation, resulting in lowering the set point of activation in order to maintain homeostasis (McEwen 2004; Heim et al. 2000). The allostatic load in smokers due to the direct pharmacological effects of smoking might be worse in individuals who experience greater daily negative emotions, such as those experienced by high trait anger smokers. It is therefore possible that the combined chronic activation states produced by both chronic smoking and high anger experience would lead to pronounced allostatic changes manifested here by steeper declines in cortisol production in high anger smokers relative to low anger smokers.

Anger is one of the most prominent mood perturbations during smoking abstinence (Hughes et al. 1991; Ward et al. 2001), and therefore is likely to have a broad contribution to the high relapse rates in smokers, especially during the first few days of a quit attempt. Indeed a previous report showed that increased anger in early abstinence was associated with early relapse in the same time frame reported here (Swan et al. 1996). Our current results extend this by demonstrating that anger as a stable trait predicted exacerbation of state mood and withdrawal symptoms upon cessation. This exacerbation of negative affect experienced by high trait anger smokers indicates that these individuals may be particularly vulnerable to mood turbulence induced by nicotine cessation. It is likely that these effects contribute directly to the enhanced risk for smoking relapse. This possibility is supported by previous results indicating that state measures obtained during abstinence were more predictive of number of days until relapse than measures obtained during ad libitum day (al'Absi et al. 2004). It is worth noting that the associations with trait anger were particularly evident among smokers at the relatively high range of trait anger, suggesting the presence of a threshold level of trait anger beyond which this trait becomes an important predictor of relapse. This is the first study to indicate such a possibility, and ongoing studies in our laboratory are being conducted to examine the clinical usefulness of such a threshold concept in predicting mood deterioration and relapse in smokers.

It is possible that smokers high in trait anger draw greater benefit from smoking in managing their mood (Baker et al. 2004), and may therefore be particularly vulnerable to the effect of situational as well as abstinence-induced negative affect. This in turn may make it more difficult for this group to overcome this addiction. It is also possible that other biochemical factors, including metabolic processes, mediate effects of these emotional processes (e.g., Fallon et al. 2004). It is also possible that other affective states, including depression and anxiety, may interact or increase vulnerability to enhanced reactivity to smoking abstinence contributing to increased desire to smoke in this group (Hall et al. 1993; Killen and Fortmann 1997). This influence may also be determined by situational factors, confirming the Situation x Trait Adaptive Response (STAR) model prediction of increased influences of trait anger on affective states and their consequences on smoking withdrawal symptoms and risk for relapse (Gilbert, 1995).

In conclusion, this study found supporting evidence for a critical role of trait anger in predisposing smoking to exaggerated mood deterioration during initial smoking abstinence. Smokers with high level of trait anger experienced greater intensity of craving and negative affect during the first day of a quit attempt and were more likely to relapse within the first week of abstinence.

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Figure 1. Scatterplot depicting the relationship between trait anger and craving during the first day of abstinence.

Figure 2. Scatterplot depicting the relationship between trait anger and adrenocorticotrophic hormone (ACTH) concentration (pg/mL) after 24 hours of abstinence.

Figure 3. Scatterplot depicting the relationship between trait anger and the number of days until relapse.

Table 1

Means and association of trait anger and other subject characteristics

Demographics	Mean (SEM)	t	p
Female sex	34 (47%)	0.41	0.68
Age (years)	36.0 (1.7)	-2.04	0.05
BMI (kg/m ²)	25.0 (0.5)	-0.16	0.88
Education (years)	14.4 (0.3)	0.34	0.73
Caffeine intake (servings/day)	4.3 (0.4)	-0.12	0.91
Cigarettes per day	19.8 (0.8)	-1.91	0.06
FTND	5.5 (0.25)	0.11	0.91
Age of first cigarette (years)	16.4 (0.5)	-0.88	0.39
Duration of smoking (years)	12.4 (1.3)	-0.80	0.42
Motivation to quit	6.0 (0.1)	-0.16	0.87
Previous quit attempts	6.1 (1.5)	0.46	0.65

Entries show mean (standard error of the mean). BMI, body mass index; FTND, Fagerström

Test of Nicotine Dependence