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Brief report
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Gender Differences in Negative Reinforcement Smoking Expectancies

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Abstract

Background: Previous research suggests that females may be more motivated to smoke for negative reinforcement (NR) than males. However, it remains unclear whether gender differences in smoking outcome expectancies for negative smoking reinforcement—an important theoretical and clinical target defined as beliefs that smoking alleviates negative affect—exist above and beyond gender differences in depression and/or other outcome expectancies.

Methods: Relations between gender and negative smoking reinforcement expectancies were examined in two independent samples. Sample 1 consisted of non-treatment seeking daily smokers (Male $n = 188$; Female $n = 91$) recruited from Southern California (49.5% Black, 32.2% Caucasian, and 18.3% other race/ethnicity). Sample 2 consisted of treatment seeking daily smokers (Male $n = 257$; Female $n = 237$) in Northern Florida and Vermont (10.7% Black, 82.9% Caucasian, and 6.4% other).

Results: Females (vs. males) reported stronger NR smoking expectancies with and without statistically controlling for nicotine dependence, other smoking expectancies, and anxiety and depression in both samples (βs = .06 to .14, ps = .06 to < .001).

Conclusions: Beliefs that smoking alleviates negative affect may reflect a gender-specific etiological process disproportionately prominent in women. Enhancing ability to cope with negative affect without smoking or challenge NR expectancies may be particularly important for cessation treatment in women.

Introduction

Previous work shows that females report greater increases in negative affect resulting from tobacco abstinence,[1–3] are more likely to resume smoking to relieve distress from withdrawal,[4] and smoke more[5] and sooner[6] following experimental negative mood induction. Thus, negative reinforcement (NR) through smoking-related negative affect reduction may be a disproportionately salient factor in maintaining smoking behavior in women versus men.

NR smoking outcome expectancies—beliefs that smoking relieves negative affect—are important cognitive manifestations of NR smoking motivation. Strength of NR expectancies are associated with greater nicotine dependence, initiation and escalation of smoking, motivation to quit,[7–10] and have been shown to predict relapse.[11] Hence, NR expectancies may be important etiologic and clinical targets for smoking research that, given the experimental research reviewed above, may be different in men and women.

Studies investigating gender differences in NR smoking expectancies have generally supported the notion that women express

greater NR smoking expectancies.[10,12] Although these studies suggest a potential role for gender in smoking expectancies, they did not account for factors that may explain or confound gender differences in smoking. For instance, women (vs. men) may simply have more generalized pro-smoking expectancies. For example, studies suggest that females show greater expectations that smoking contributes to weight control.[7,13] Hence, through controlling for other types of (correlated) smoking expectancies (e.g., positive reinforcement, weight control), one can determine whether the effect of gender is specific to NR expectancies. Furthermore, females typically experience higher levels depression and anxiety,[14] and smokers with elevated depression and anxiety symptoms tend to endorse stronger NR expectancies;[15–17] thus, it is still unclear whether effects of gender on NR expectancies are explained (or confounded) by negative emotional distress. An important question for gender differences research is, regardless of emotional symptomatology, whether women still hold stronger NR expectancies than men. In this secondary analysis report, we examine the association between gender and NR smoking expectancies in two independent samples. We hypothesized that females would report greater NR expectancies and that these relations would remain after controlling for other smoking expectancies, anxiety and depression levels, and nicotine dependence.

Methods

Participants and Procedures

Sample 1

Non-treatment seeking daily smokers (N = 278) were recruited from the Los Angeles, CA area via advertisements for a laboratory study on personality and smoking, which has been published previously.[18] Participants included were 18 years of age or older, had breath CO ≥ 10 ppm, regular smoker (≥10 cigarettes/day) for 2+ years, and were excluded for active mood or substance use disorder or the desire to quit in the next 30 days.

Participants attended a baseline session at the laboratory, which included breath alcohol and carbon monoxide and administration of the Structured Clinical Interview for DSM-IV Non-Patient Edition.[19] Eligible participants continued with the remainder of the session, which involved completing the paper-and-pencil measures described below, for which they were compensated $15. The University of Southern California Internal Review Board approved the protocol.

Sample 2

Adult daily smokers (N = 494) were recruited from Tallahassee, FL and Burlington, VT (via flyers, newspaper ads, radio announcements) to participate in a randomized controlled trial examining the efficacy of two smoking cessation interventions.[20] Participants were between ages 18–65 who reported smoking ≥8 cigarettes/day, with motivation to quit rated as at least 5 or higher on a 10-point scale. Participants were excluded for inability to give informed consent, current use of smoking cessation products or treatment, past-month suicidality, and history of psychotic-spectrum disorders.

Individuals responding to study advertisements were scheduled for an in-person, baseline assessment. After providing written informed consent, participants were interviewed using the Structural Clinical Interview of DSM-IV Disorders[21] and completed a computerized battery of baseline (pre-treatment) self-report questionnaires. The study protocol was approved by the Institutional Review Boards at the University of Vermont and Florida State University.

Measures

Demographics and Smoking Characteristics

In addition to questionnaires assessing demographic and smoking characteristics (e.g., cigarettes smoked per day and age started regularly smoking), participants were administered the Fagerström test of nicotine dependence (FTND),[22] which is a widely-used six-item self-report measure of nicotine dependence severity.

Smoking Consequences Questionnaire

The smoking consequences questionnaire (SCQ)[7,11] is a 50-item self-report measure, which yields four subscales for different domains of smoking expectancies: NR (e.g., "Smoking calms me down when I feel nervous"), negative consequences (e.g., "The more I smoke, the more I risk my health"), appetite-weight control (e.g., "Smoking keeps my weight down"), and positive reinforcement (e.g., "When I smoke, the taste is pleasant"). In Sample 1, participants rated different expected effects of smoking on a scale from 1 ("Not true of me at all") to 7 ("Very true of me"). In Sample 2, participants rated different expected effects of smoking on how likely or unlikely a consequence was for them on a scale from 0 ("completely unlikely") to 9 ("completely likely"). The scales used had identical wording of the questions with the only difference being the anchor labels for the ratings. Both of these anchor labels tapped into likelihood of expected outcome, which appear most related to predictive value of the scale.[7]

Depression and Anxiety Symptoms

In Sample 1, depression and anxiety was assessed using the Mood and Anxiety Sensitivity Questionnaire-Short Form (MASQ-SF).[23,24] Participants rate the extent to which they experienced each symptom during the previous week. The anxious arousal (AA) subscale focuses on somatic tension and arousal specific to anxiety (17-items). The anhedonic depression (AD) subscale assesses low interest, pleasure, and positive affect specific to depression (22 items).

In Sample 2, participants completed the Inventory of Depression and Anxiety Symptoms[25] by rating the degree to which they experienced symptoms in the past two weeks. This measure yields a global General Depression score (20 items) and a Panic score, which are conceptually similar to the MASQ-AD and MASQ-AA scales (8 items).

Data Analysis

Preliminary analyses involved reporting sample descriptives by gender, correlations of gender and SCQ-NR to demographics, and smoking characteristics. Variables were checked for normality and homoscedastcity and transformations were applied when appropriate. Primary analyses utilized standardized variables and used hierarchical linear regression models. In the first step, we included gender as the sole predictor. In the second step, we added the FTND score as a covariate. In the third step, we added the other SCQ subscales as covariates. The final step, we added anxiety and depression covariates to the SCQ scales and the FTND. Demographic or smoking characteristics were not correlated with gender (Table 1) and were therefore not included as covariates in any analysis. Samples were analyzed separately and results reported as standardized regression coefficients (βs) with 95% confidence intervals (CIs). Significance was set at .05.

Results

Preliminary Analyses

Demographics for the full sample and by gender are reported for each sample in Table 1. Gender and SCQ-NR were associated with

Table 1. Baseline Demographic, Expectancies, and Anxiety and Depression in the Full Samples and by Gender

	Sample 1: non-treatment seeking, Los Angeles, CA, United States					Sample 2: treatment-seeking, Tallahassee, FL and Burlington, VT, United States				
	Descriptive statistics, *M* (*SD*) or %			Correlations[e]		Descriptive statistics, *M* (*SD*) or %			Correlations[e]	
	Full sample (*N* = 278)	Female (*n* = 91)	Male (*n* = 187)	With male gender	With SCQ-NR	Full sample (*N* = 494)	Female (*n* = 237)	Male (*n* = 257)	With male gender	With SCQ-NR
SCQ-NR[a]	4.3 (1.7)	4.8 (1.8)	4.0 (1.7)	−.22***	–	5.7 (1.8)	6.0 (1.8)	5.4 (1.8)	−.18***	–
SCQ-PR[a]	4.5 (1.2)	4.6 (1.2)	4.5 (1.2)	−.01	.53***	5.7 (1.5)	5.7 (1.5)	5.6 (1.6)	−.03	.59***
SCQ-WC[a]	2.9 (2.0)	3.4 (2.3)	2.7 (1.9)	−.15*	.39***	4.2 (2.4)	4.8 (2.4)	3.6 (2.2)	−.26***	.44***
SCQ-NC[a]	4.8 (1.2)	4.9 (1.3)	4.8 (1.1)	−.07	.25***	6.5 (1.3)	6.8 (1.3)	6.3 (1.3)	−.16***	.39***
Anxiety[b]	1.3 (0.38)	1.3 (.4)	1.3 (0.4)	−.04	.28***	1.4 (0.5)	1.4 (0.6)	1.4 (0.5)	−.06	.25***
Depression[c]	2.4 (0.6)	2.4 (.7)	2.4 (0.6)	−.01	.14*	2.1 (0.7)	2.1 (0.7)	2.0 (0.6)	−.11*	.39***
Age	44.1 (10.7)	43.2 (11.4)	44.5 (10.4)	.06	−.07	36.7 (13.5)	37.9 (13.6)	35.6 (13.4)	−.08	−.15**
Race[d]	49.5%	49.0%	49.8%	.00	−.03	10.7%	10.0%	11.3%	−.03	.19***
Cigarettes/day	17.4 (6.7)	16.7 (6.4)	18.0 (6.9)	.07	.12*	16.7 (10.1)	15.4 (8.2)	17.9 (11.4)	.08	.02
Age regular smoker	18.9 (5.3)	18.8 (4.6)	5.5 (5.6)	.02	−.08	17.4 (3.9)	17.2 (3.9)	17.6 (3.9)	.04	−.15**
FTND	5.5 (1.9)	5.5 (1.8)	1.5 (2.0)	.00	.26***	5.2 (2.3)	5.1 (2.3)	5.3 (2.3)	.03	.19***

FTND = Fagerström test of nicotine dependence; *M* = mean; NC = negative consequences; NR = negative reinforcement; PR = positive reinforcement; SCQ = smoking consequences questionnaire; *SD* = standard deviation; WC = weight control. Gender coded (0 = female, 1 = male).

[a]Scores reflect mean response per item—possible range sample 1: 1 (*not true of me at all*) to 7 (*very true of me*); sample 2: 0 (*completely unlikely*) to 9 (*completely likely*).

[b]Anxiety was measured using the anxious arousal subscale of the Mood and Anxiety Symptom Questionnaire for sample 1 and the Panic subscale of the Inventory of Depression and Anxiety Symptoms in sample 2. Scores reflect mean response per item—possible range 1 (*not at all*) to 5 (*extremely*).

[c]Depression was measured using the anhedonic depression subscale of the Mood and Anxiety Symptom Questionnaire for sample 1 and the general depression subscale of the Inventory of Depression and Anxiety Symptoms in sample 2. Scores reflect mean response per item—possible range 1 (*not at all*) to 5 (*extremely*).

[d]Black race coded as 1, other race coded as 2.

[e]Relations between two continuous variables reflect Pearson correlation coefficients. Relations between a binary and continuous variable reflect point-bisearial correlation coefficients. Relations between two binary variables reflect Phi coefficients.

*$p < .05$, **$p < .01$, ***$p < .001$.

each other and other SCQ subscales in both samples; there were no gender differences in demographics and smoking characteristics.

Primary Analyses

Figure 1 shows mean scores by gender and that female gender associated with stronger NR expectancies without any covariates in both samples (sample 1 β [95% CI] = −.22 [−.33, −.10], p <.001; sample 2 β [95% CI] = −.18 [−.27, −.09]; p < .001). After adding FTND score as a covariate, the predictive influence of gender remained (sample 1 β [95% CI] = −.22 [−.33, −.11], p <.001; sample 2 β [95% CI] = −.18 [−.27, −.10]; p < .001). Adding the other three smoking expectancies as covariates, the predictive effects of gender remained (sample 1 β [95% CI] = −.17 [−.27, −.08], p <.001; sample 2 β [95% CI] = −.08 [−.15, −.01], p = .02). When anxiety and depression were added as covariates in conjunction with SCQ scales and FTND, the effect of gender on NR expectancies was significant in sample 1 (β [95% CI] = −.17 [−.27, −.08], p <.001) and reduced to a non-significant trend in sample 2 (β [95% CI] = −.06 [−.13, .00]; p = .06).

Discussion

Consistent with our hypothesis, females reported stronger NR expectancies than men in two independent samples. In Sample 2, Gender differences in NR expectancies were reduced to a trend after controlling for anxiety and depression. There is the possibility that sample differences after controlling for anxiety and depression were a result of exclusion of mood disorders in sample 1, but not in sample 2. This might have limited the variability in depression and anxiety covariates for sample 1 and reduced its predictive power. However, visual inspection of the range of scores of psychopathology measures across the samples did not suggest more range restriction for sample 1 versus sample 2, which potentially offsets this concern. Additionally, the consistency of the association between gender and NR expectancies in every other analysis and in sample 1 provides relatively strong evidence of a gender difference effect that is robust to other expectancies and also potentially robust to concomitant anxiety and depression. Furthermore, the 95% CIs surrounding the gender effect sizes (βs) overlapped for every analysis, suggesting that although the βs for the gender difference vacillated across different samples and levels of covariate adjustment, the presence and magnitude of the gender difference was generalizable.

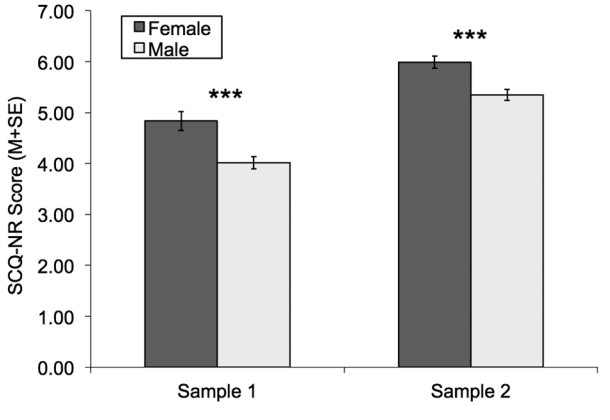

Figure 1. SCQ-NR score mean and standard error by gender in each sample. SCQ-NR = smoking consequences questionnaire negative reinforcement subscale. *** gender difference significant p < .001.

These results are consistent with previous reports showing females express greater NR expectancies,[10,12] and extend these findings to show that these relations exist independent of other cigarette expectancies and mood and anxiety symptoms. Furthermore, these findings are consistent with the idea that negative affect and negative affect reduction may be an important motivational factor driving smoking in women,[1–3,6] and highlights a potential role for cognitive manifestations of this motivational process.

The results of this study need to be interpreted within the context of its limitations. This study used a cross sectional design, which means that the results do not allow for causal inferences and would benefit from research on longitudinal gender differences in expectancy trajectories. Second, the scales for the SCQ differed between samples. This most likely had limited impact on the findings because (a) the wording of the questions were identical in both measures with the only difference being the anchor labels for rating each item; (b) scales were standardized in the models; and (c) both scales addressed the likelihood of the consequence for the individual; thus they were most likely tapping the same information. Lastly, this paper did not link expectancies to actual smoking behavior. Hence, future work examining whether NR expectancies mediate gender differences in smoking behaviors would be useful to determine clinical and etiologic significance of the results reported here.

Despite these limitations this article may have important clinical applications for improving quit success in women. For one, these results suggest that treatment in women should focus on psychoeducation and behavioral techniques oriented on coping with negative affect without smoking as has been done with other addictive behavior.[26] For example, addressing coping-oriented smoking as a "false safety aid" through alternative behavioral practice and psychoeducation may be a useful therapeutic strategy, especially for females.

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Declaration of Interests

None declared.

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