Background and Significance

While half of smokers attempt to quit each year, most relapse even when using evidence-based cessation treatments.1 Enhanced understanding of cognitive/affective processes (e.g., stress response) involved in relapse could inform new and better cessation treatment. Response to stressors is a crucial component in relapse yet stress reactivity in smokers is difficult to precisely measure.2 Relapse is multifaceted, consisting of processes such as anticipation and actual consumption, but most research focuses on administration rather than anticipation. The goal of this study was to use a precise measure of stress to test the effects of anticipation of smoking on stress reactivity in deprived vs. continuing and non-smokers. We also tested the effect actual smoking had beyond the effect of anticipation.

Sample and Procedure

Inclusion criteria: smoking ≥10 cigarettes/day for at least 1 year, no current smoking cessation intervention, no history of severe mental illness, no severe physical illness. Participants were then escorted outside to either smoke or drink water, ad lib, before completing the task a final time (Consumption).

Stress Reactivity Measurement

Startle is a robust physiological measure of stress reactivity resistant to responder bias.1 The eye-blink component of the startle response to acoustic “startle probes” is measured via EMG electrodes placed under the participant’s eye. Participants viewed blocks of colored square cues presented for 5 s each with a variable ITI. Predictable block shocks always occurred 4.5 sec into cue onset, unpredictable block shocks occurred at any time. We used this task because some theories suggest that stress reactivity to unpredictable threat in particular is important in addiction.3 Startle potentiation was calculated as startle during shock cues – no-shock cues (not shown). Self-reported anxiety was calculated as increase in anxiety to shock cues – no-shock cues.

We analyzed startle potentiation and self-reported anxiety in separate general linear models each with a between subjects factor for smoking (deprived smokers, continuing smokers, non-smokers) and repeated measures for threat type (unpredictable, predictable) and task time (baseline, anticipation, consumption).

We decomposed the smoking factor with between-subject contrasts for effects of Anticipation (baseline vs. anticipation of smoking), Manipulation Check (continuing smoking vs. no-smoking), and task times (b=13.5, p<0.001) and significant self-reported anxiety to threat cues across these variables (b=2.3, p<0.001).

Consort diagram

SMOKING ANTICIPATION AND ACTUAL SMOKING BOTH LOWER PHYSIOLOGICAL AND PSYCHOLOGICAL REACTIVITY TO STRESS FOR SMOKERS IN WITHDRAWAL

Daniel E. Bradford1, Katherine P. Magruder1, Olivia S. Subramani1, Nicole M. Marek1, John J. Curtin1, & Megan E. Piper1,2

1. Psychology Department, 2. Center for Tobacco Research and Intervention, School of Medicine and Public Health

Funded by a grant from the Clinical and Translational Science Award program of the National Center for Research Resources, National Institutes of Health, and by University of Wisconsin faculty start-up funds

Anticipation Consumption

Time

Baseline Anticipation

Time

Self Reported Anxiety

Deprived Smokers

Continuing Smokers

Non-Smokers

b= -0.8  *

b= -0.1

b= 0.0

Time

Baseline Anticipation

Self Reported Anxiety

Deprived Smokers

Continuing Smokers

Non-Smokers

b= 0.0

b= 0.1

b= -0.4

Summary and Future Directions

We used a well-validated, objective psychophysiological measure to assess the effects of anticipating smoking and actually smoking on stress reactivity in deprived, continuing, and non-smokers.

Anticipation of smoking was sufficient to reduce stress reactivity for deprived smokers compared to continuing smokers and non-smokers as measured by startle and self-report.

Participants’ stress reactivity was not affected by actual smoking beyond the earlier effects of anticipation which conflicts with smokers’ report that smoking itself lowers their stress reactivity.4,5

Our data are consistent with previous work that suggests that non-pharmacological factors (e.g., smoking cues) in nicotine addiction may be an important component of relapse.6

Although anticipation of smoking has not been extensively studied to date, our data suggests that this component of smoking may be an important target for clinical intervention. Future research should assess the role of smokers’ expectancies on the effects seen here as well as the degree to which current smoking cessation treatments such as nicotine replacement and varenicline influence stress while anticipating and actually smoking.

References