



## Smoking cue reactivity across massed extinction trials: Negative affect and gender effects

Bradley N. Collins<sup>\*</sup>, Uma S. Nair, Eugene Komaroff

Temple University, Department of Public Health, 929 Ritter Annex, 1301 Cecil B. Moore Avenue, Philadelphia, PA-19122, USA

### ARTICLE INFO

#### Keywords:

Smoking cue exposure  
Extinction  
Gender  
Negative affect

### ABSTRACT

Designing and implementing cue exposure procedures to treat nicotine dependence remains a challenge. This study tested the hypothesis that gender and negative affect (NA) influence changes in smoking urge over time using data from a pilot project testing the feasibility of massed extinction procedures. Forty-three smokers and ex-smokers completed the behavioral laboratory procedures. All participants were over 17 years old, smoked at least 10 cigarettes daily over the last year (or the year prior to quitting) and had expired CO below 10 ppm at the beginning of the ~4-hour session. After informed consent, participants completed 45 min of baseline assessments, and then completed a series of 12 identical, 5-minute exposure trials with inter-trial breaks. Smoking cues included visual, tactile, and olfactory cues with a lit cigarette, in addition to smoking-related motor behaviors without smoking. After each trial, participants reported urge and negative affect (NA). Logistic growth curve models supported the hypothesis that across trials, participants would demonstrate an initial linear increase followed by a decrease in smoking urge (quadratic effect). Data supported hypothesized gender, NA, and gender  $\times$  NA effects. Significant linear increases in urge were observed among high and low NA males, but not among females in either NA subgroup. A differential quadratic effect showed a significant decrease in urge for the low NA subgroup, but a non-significant decrease in urge in the high NA group. This is the first study to demonstrate gender differences and the effects of NA on the extinction process using a smoking cue exposure paradigm. Results could guide future cue reactivity research and exposure interventions for nicotine dependence.

© 2011 Elsevier Ltd. All rights reserved.

### 1. Introduction

Cue exposure treatment is a behavioral intervention based on associative learning theories. These theories provide a framework for understanding smoking cessation and relapse and have demonstrated robust research support that illustrates how previously neutral, conditioned stimuli (CSs) elicit conditioned responses (CRs) such as drug urges and approach behaviors. With nicotine dependence, CSs can include external stimuli (e.g., smoking paraphernalia, other smokers) and internal stimuli (e.g., negative affect). Reactivity (CR) to drug-related CSs is a valid and reliable predictor of smoking cessation and relapse (Brandon, Piasecki, Quinn, & Baker, 1995; Drummond, Tiffany, Glautier, & Remington, 1995). To date, researchers have successfully investigated a variety of smoking-related cues (CSs) that can elicit reliable and meaningful measures of smoking behavior. Behavioral laboratory studies of cue reactivity have used exteroceptive, tobacco-specific cues such as exposure to a lit cigarette (LaRowe, Saladin, Carpenter, & Upadhyaya, 2007; Sayette, Martin, Wertz, Shiffman, & Perrott, 2001), interoceptive cues such as negative affect (Tiffany & Drobes, 1990), broader contexts presented through guided imagery or

the use of smoking confederates (Drobes & Tiffany, 1997), and the experience of nicotine deprivation (Bailey, Goedeker, & Tiffany, 2010; Payne, Smith, Sturges, & Holleran, 1996). The potency of CSs in motivating smoking can be inferred from animal studies of nicotine self-administration. For example, (Caggiula et al., 2001) found that cues previously paired with nicotine were more effective than nicotine itself at reinstating nicotine self-administration in rats.

Cue exposure treatment aims to reduce smokers' reactivity to smoking cues by facilitating the extinction process. Extinction, or the reduction of CRs over time, occurs over repeated presentations of drug-related CSs in the absence of unconditioned stimuli (e.g., ingesting the drug and experiencing its effects). The process of extinction happens naturally during the course of a smoker's quit attempt: if the smoker continues to be exposed to smoking cues and does not smoke, s/he will experience fewer, less intense urges to smoke (CRs) over time.

Studies of cue exposure interventions have demonstrated post-treatment decreases in drug cravings and consumption (Childress, McLellan, & O'Brien, 1986; Drummond & Glautier, 1994; McLellan, Childress, Ehrman, O'Brien, & Pashko, 1986; Monti et al., 1987; O'Brien, Childress, McLellan, & Ehrman, 1990; Rankin, Hodgson, & Stockwell, 1983; Sitharthan, Sitharthan, Hough, & Kavanagh, 1997; Stasiewicz et al., 1997) even though long-term clinical outcomes remain modest. A previous meta-analysis of cue-exposure treatments for substance abuse found that cue-exposure for tobacco cessation was less successful in

<sup>\*</sup> Corresponding author. Tel.: +1 215 204 5534; fax: +1 215 204 1538.  
E-mail address: collinsb@temple.edu (B.N. Collins).

promoting cessation compared to cue exposure treatment for other drug dependencies (Conklin & Tiffany, 2002).

We posit that factors known to relate to smoking cessation outcomes could influence variability in smoking cue extinction performance. Examining individual differences in cue reactivity over repeated exposure trials is warranted as it may help improve the clinical applications of extinction-based behavioral treatment methods. Two plausible factors that could affect cue extinction performance include gender and negative affect (NA).

Despite well-established gender differences observed in tobacco cessation and relapse studies, we are not aware of any studies that have examined gender differences in response to smoking cue extinction procedures. A small body of research on gender differences in cue reactivity in nicotine and other drug research has shown conflicting results (e.g., Elman, Karlsgodt, & Gastfriend, 2001; Field & Duka, 2004; Fox et al., 2006; Franklin et al., 2004; Lynch, Roth, & Carroll, 2002; Monti et al., 1993; Nescic & Duka, 2006; Sterling, Dean, Weinstein, Murphy, & Gottheil, 2004). Current research examining gender differences in reactivity could be informed by growing evidence that males and females respond differently to various reinforcing effects of tobacco smoking (see, Perkins, Donny, & Caggiula, 1999) even though the physiological effects of smoking are similar for males and females (e.g., increased heart rate, blood pressure, decreased skin temperature.) For example, males experience greater positive reinforcement from the pharmacological properties of nicotine than females, perhaps explaining why men have greater smoking cessation success with nicotine replacement therapy than women (Cepeda-Benito, Reynoso, & Erath, 2004; Wetter et al., 1999). Conversely, women experience greater reinforcement from the subjective effects of smoking, such as the social contexts in which they smoke and relief from NA (Borrelli, Bock, King, Pinto, & Marcus, 1996; Eissenberg, Adams, Riggins, & Likness, 1999; File, Fluck, & Leahy, 2001; Leventhal et al., 2007; Xu et al., 2009), perhaps explaining in part why women respond more favorably than men to smoking cessation medications that relieve NA (Gonzales et al., 2002; Scharf & Shiffman, 2004).

Also, women may have a greater drug urge than men in response to experimentally induced negative moods (Rubonis et al., 1994). Niaura and colleagues (Niaura et al., 1998) showed that women had a greater reactivity to negatively valenced scripts, implicating potential mediating affects of NA on smoking cue reactivity among women. However, we are not aware of any studies that have examined the effects of gender and non-induced variability in NA on smoking urges using repeated cue exposure methods. Examining the potential differential influence of NA between males and females during the cue extinction process may help guide the development of improved behavioral treatments for smoking cessation.

The objectives of the current investigation were to test the influence of gender and NA on change in reported smoking urge reactivity to smoking cues over time during an analog cue exposure procedure with massed extinction trials. We tested three hypotheses: 1) we hypothesized a gender effect on urge over time such that males would demonstrate greater urge reactivity to smoking cues than females over time; 2) we hypothesized that greater NA would influence greater urge reactivity over time; and 3) we hypothesized there would be a gender  $\times$  NA interaction over time such that the difference between high and low NA groups would be more pronounced among females compared to males during initial increases in urge reactivity and later reduction in reactivity.

## 2. Methods

All procedures were approved by the institutional review board (IRB). Participants were recruited through advertisements in free community newspapers available in urban Philadelphia neighborhoods. The target sample included current pack-a-day smokers and ex-smokers with 6–12 months of abstinence. Participants were screened for eligibility by telephone. Ineligible participants were those who

reported current severe psychopathology, had a history of heart disease or chronic respiratory conditions (e.g., emphysema), currently used snuff, chewing tobacco, nicotine replacement therapy, or psychotropic medication including medications used for smoking cessation.

### 2.1. Enrollment and pre-session procedures

Current smokers were required to maintain overnight abstinence before attending the lab session. Participants were excluded from beginning their lab sessions if pre-session expired carbon monoxide (CO) was greater than 10 ppm. Participants were instructed to eat breakfast within an hour prior to arriving at the lab. Sessions commenced between 8 and 9 AM for all participants. After completing the informed consent and verifying abstinence, smokers were provided with a 14 mg nicotine patch to control for nicotine withdrawal symptoms. All participants sat in a lounge area for 45 min, during which time they completed baseline questionnaires and were instructed to relax and use the available reading materials until the experimenter arrived to start their session.

Then, the experimenter took participants to the test room, where they were seated in a comfortable recliner chair. The experimenter then described instructions for the trial. Participants were informed that, while seated in the test room, they would engage in a series of trials that followed similar procedures: at the beginning of each trial, they would complete short rating forms while the experimenter set up the room for the subsequent trial. The experimenter pointed out a turntable set up on a stand beside the participant's chair. The turntable had a partition blocking the participant's line of sight on one side where the experimenter would set up cues at the beginning of each trial. After assembling the cues, the experimenter would leave the test room, and from the observation room would start an audiotape of instructions and remotely rotate the turntable such that the cues were within reach of the participant. They were further instructed that they would follow the audiotape instructions to handle the various objects on the turntable, "which could range from a pen and paper to a cigarette and lighter." During these smoking cue trials, they would handle a cigarette, but they would not be permitted to smoke. The experimenter demonstrated how to light the cigarette away from their mouth with one hand while lighting it with the other and blowing at the burning end to ensure that the cigarette remained lit. Additionally, participants were informed that the experimenter could view and hear them from the observation room, and that they could call the experimenter if they had any questions or concerns during any trial. Participants were told that if there were observed smoking, their session would be terminated and they would need to reschedule a new session on a future day.

### 2.2. Resting baseline trial

Prior to initiation of cue exposure trials, participants were instructed to relax and sit quietly alone in the testing room while listening to a relaxation tape. This 15-minute trial allowed participants to become familiar with the room and the testing context. Self-report measures of smoking urge and NA were obtained at the end of the trial and all subsequent cue exposure trials.

### 2.3. Smoking cue reactivity test procedures

Following the resting baseline trial, participants completed two, five-minute cue exposure trials during which they were presented with either a neutral cue or the smoking cues in counterbalanced order. This step was used to validate differential craving reactivity to the two distinct cue presentations. For the purpose of analyses and interpretation of results, the first smoking cue trial was referred to as "Trial 1."

From the observation room, the experimenter clocked a 60-second intra-trial resting baseline period, and then started audiotape instructions while rotating the turntable to make the cues accessible

متن کامل مقاله

دریافت فوری ←

**ISI**Articles

مرجع مقالات تخصصی ایران

- ✓ امکان دانلود نسخه تمام متن مقالات انگلیسی
- ✓ امکان دانلود نسخه ترجمه شده مقالات
- ✓ پذیرش سفارش ترجمه تخصصی
- ✓ امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
- ✓ امکان دانلود رایگان ۲ صفحه اول هر مقاله
- ✓ امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
- ✓ دانلود فوری مقاله پس از پرداخت آنلاین
- ✓ پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات