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Short Communication

Mood and smoking behavior: The role of expectancy accessibility and gender

Andrea H. Weinberger [a,b,*], Sherry A. McKee [a]

[a] Divisions of Substance Abuse and Women's Behavioral Health Research, Department of Psychiatry, Yale University School of Medicine, New Haven, CT 06519, USA
[b] Cancer Prevention and Control Research Program, Yale Cancer Center, New Haven, CT 06520, USA

HIGHLIGHTS

- Smoking expectancies were assessed following a mood induction.
- A link was demonstrated between gender, mood, and smoking belief accessibility.
- Women with faster negative affect expectancy accessibility smoked more intensely.
- Understanding expectancy accessibility can guide smoking treatment development.

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ABSTRACT

Little is known about overall or gender-specific factors that may influence the relationship between negative affect and smoking behavior such as smoking expectancies. This paper presents a secondary analysis from a laboratory studying gender differences in smoking behavior following a musical mood induction [Weinberger, A.H., & McKee, S.A., 2012, Gender differences in smoking following an implicit mood induction. *Nicotine & Tobacco Research, 14*(5), 621–625]. The current analyses examine the role of expectancies (endorsement and accessibility) in the relationship of gender, affect, and smoking. Ninety adult smokers (50% female) were randomly assigned to a negative mood induction, positive mood induction, or neutral condition while completing a single laboratory session. Expectancy endorsement, expectancy accessibility, affect, and smoking topography were assessed following the mood induction. Female smokers with faster accessibility of negative reinforcement expectancies smoked more cigarettes, had longer puff durations, and had shorter inter-puff intervals. Women with faster expectancy accessibility were also more likely to endorse negative reinforcement smoking expectancies. This study was the first to demonstrate links among gender, mood, and accessibility of smoking-related beliefs. Information about the role of expectancy accessibility in smoking behavior can lead to both a better understanding of gender-specific mechanisms of smoking behavior and new directions for smoking treatment development.

1. Introduction

Negative affect plays an important role in smoking behavior (Copeland, Brandon, & Quinn, 1995) especially for women (e.g., Husky, Mazure, Paliwal, & McKee, 2008; Wetter et al., 1999). We previously reported results from a laboratory study utilizing a musical mood induction that women began smoking more quickly than men following a negative mood induction (Weinberger & McKee, 2012). The purpose of these secondary analyses was to examine whether smoking expectancies interacted with affect and gender in predicting smoking behavior.

Smokers learn to connect negative affect relief to smoking through repeated experience. As a result, negative affect becomes a conditioned cue to smoke and this learned connection is stored cognitively as an expectancy (e.g., "Cigarettes help me deal with anxiety or worry."; Brandon & Baker, 1991). Negative affect expectancies play an important role in the relationship between negative affect and smoking (Kassel, Stroud, & Paronis, 2003) and poor cessation outcomes (Weinberger, McKee, & George, 2010; Wetter et al., 1994).

Explicit expectancies, accessible to conscious awareness, and implicit expectancies, outside of conscious awareness, each have a unique relationship with drug use behavior (e.g., McCarthy & Thompsen, 2006; Wiers, van Woerden, Smulders, & de Jong, 2002). Implicit expectancies are elicited through methods such as expectancy accessibility (i.e., reaction time measures; Palfai, Monti, Ostafin, & Hutchison, 2000). Reaction time measures are suggested to reflect the strength of an expectancy (i.e., well-learned beliefs will be accessed more quickly) and provide an estimate of how a belief would likely impact behavior in real world situations (Fazio, Powell, & Williams, 1989).

Few laboratory studies have examined the relationship of smoking expectancies (explicit or implicit), mood, and smoking. Perkins et al. (2008) found that induction of negative affect increased and induction of positive affect decreased endorsement that smoking would reduce negative affect (although see also Conklin & Perkins, 2005). McKee,

* Corresponding author at: Yale University School of Medicine, 34 Park Street, SAC, Room S-211, New Haven, CT 06519, USA. Tel.: +1 203 974 7598; fax: +1 203 974 7366.
E-mail addresses: andrea.weinberger@yale.edu (A.H. Weinberger), sherry.mckee@yale.edu (S.A. McKee).

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Wall, Hinson, Goldstein, and Bissonnette (2003) reported that participants in a negative mood condition were more likely to generate negative reinforcement expectancies assessed using measure of implicit expectancies (first associates).

The current study was a secondary analysis from a fully-crossed 3 (Negative Mood Induction, Positive Mood Induction, Neutral Mood condition) by 2 (female, male) between-subjects design (Weinberger & McKee, 2012). It was hypothesized that greater explicit expectancies (i.e., higher likelihood ratings), and greater accessibility of implicit expectancies (i.e., faster reaction times) would each interact with greater negative affect ratings to predict more intense smoking behavior. It was further expected that this relationship would be stronger in female smokers than male smokers. Finally, we explored the relationship between expectancy endorsement and expectancy accessibility by gender.

2. Materials and methods

2.1. Participants

The participants and procedures for this study have been described previously (Weinberger & McKee, 2012). Eligible participants had to be current smokers between the ages of 18 and 60 without significant medical and psychiatric disorders. The study was approved by the Yale Human Investigation Committee and was carried out in accordance with the Declaration of Helsinki.

2.2. Procedures

2.2.1. Laboratory session

Participants completed one 3-hour laboratory session (+0 to +180 min). Randomization to one of three mood induction conditions (Negative Mood Induction, Positive Mood Induction, Neutral Mood) was stratified by gender.

Following baseline assessments, participants smoked a cigarette using the topography equipment (+60 min) then completed a computerized Lifestyle Questionnaire (+60 to +90 min; questions related to smoking, mood, and other domains such as alcohol and caffeine consumption). Participants in the Negative and Positive Mood Induction conditions listened to music through headphones for the 10-minute mood induction (+90 to +100 min) and the 50-minute mood maintenance period (+100 to +150 min). All participants completed computer-administered measure of explicit (i.e., likelihood ratings) and implicit expectancies (i.e., expectancy accessibility) (+100 to +110 min) and an ad-lib smoking period using the smoking topography equipment (+120 to +150 min). Participants completed measures of mood before and after the mood induction (+90, +100 min), after the smoking expectancy measure (+120 min), and during the ad lib smoking period (+130, 140, 150 min).

2.3. Measures

2.3.1. Demographics and baseline smoking

Information was collected on demographics and history of cigarette use. Smoking levels were biochemically verified by expired breath carbon monoxide levels (Vitalograph, Inc.; Lenexa, KS) and urine cotinine.

2.3.2. Current affect

Current affective state was rated on VAS scales using bipolar adjectives assessing positive affect (i.e., cheerful, happy) and negative affect (i.e., sad, depressed; Mongrain & Tramabakoulos, 1997).

2.3.3. Mood induction

Mood was induced using pre-recorded cassettes of classical, contemporary, and New Age instrumental pieces (Pignatiello, Camp, & Rasar, 1986) previously modified for a college sample (Mongrain & Tramabakoulos, 1997) to induce either a positive mood (e.g., Yanni's "Aria") or negative mood (e.g., Pink Floyd's "Shine on You Crazy Diamond").

2.3.4. Smoking expectancies

Both explicit expectancies (i.e., expectancy endorsement assessed as likelihood ratings) and implicit expectancies (i.e., expectancy accessibility assessed as reactions times) were assessed using a single administration of a computerized adaptation of the Smoking Consequences Questionnaire (SCQ; Brandon & Baker, 1991). Two domains of expectancies were assessed: 1) Negative Reinforcement/Negative Affect Reduction expectancies (e.g., reduction of sadness and anxiety) and 2) Positive Reinforcement expectancies (e.g., taste, relaxation). Participants were instructed to use computer keys reflecting a 10-point Likert response scale (0 = Completely Unlikely to 9 = Completely Likely) to respond as quickly as possible as to whether each item applied to their experience with smoking. Participants were also asked to respond as quickly as possible to a number of items listing traits that they were to judge as "applicable" or "not applicable" to themselves as an internal control for speed of response (see Palfai, Monti, Colby, & Rohsenow, 1997). Consistent with prior studies (e.g., McKee, Wall, & Hinson, 1998; Palfai et al., 2000), accessibility of smoking expectancies was determined as the differences in latencies to respond to expectancy items compared to self-items.

2.3.5. Smoking topography equipment

A table-top Clinical Research Support System (CreSS; Plowshare Technologies, Richmond, VA) was used to assess smoking topography (e.g., puff frequency, puff volume, puff duration, inter-puff interval, depth of inhalation, inter-cigarette interval).

2.4. Statistical analyses

Hierarchical linear regressions were used to examine the primary research question of whether explicit (likelihood ratings) and implicit (reaction times) smoking expectancies interacted with affect and gender in predicting smoking topography (time to first cigarette, puff duration, number of puffs, puff volume, inter-puff internal, peak puff, and total number of cigarettes). Preliminary data analysis revealed significant overlap in individual positive and negative affect ratings across mood conditions and the evaluation of mood condition × expectancies × gender showed no significant effects associated with the mood conditions. As a result, the reported analyses focused on individual differences in post-prime affect (assessed at +100 min), irrespective of the original mood assignment. The first set of analyses examined main and interactive effects of post-induction negative affect ratings, expectancies for negative reinforcement, and gender (dummy coded) predicting measures of smoking topography with post-induction positive affect ratings included as a covariate. Main effects were entered on the first step and then all two and three-way interactions were entered on second and third steps, respectively. Analyses were repeated with the measure of implicit expectancies (expectancy accessibility measured by reaction times) replacing the explicit expectancy measure (likelihood ratings). Baseline smoking topography measures, age, and CPD were entered as control variables. Statistical analyses were performed using SPSS v.16.0 software for PC (SPSS Inc., Chicago, IL). Statistical tests were two-tailed and differences were considered significant when $p<0.05$.

3. Results

3.1. Sample characteristics, baseline smoking and smoking topography, and manipulation check

Ninety participants completed the study (50% female; 80% Caucasian; mean age = 25.66 years, SE = 0.96; mean CPD = 17.38, SE = 0.65). Analyses reported in Weinberger and McKee (2012) determined that there