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Craving effect of smoking cues in smoking and antismoking stimuli in light smokers

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HIGHLIGHTS

- Smoking stimuli increase cravings in light and intermittent smokers.
- Smoking cues in antismoking stimuli are not associated with cravings.
- Impulsivity does not moderate the relationship between cue exposure and cravings.

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ABSTRACT

Cue-reactivity models may be able to inform light and intermittent smoking patterns not yet explained by withdrawal models. For instance, smoking cues in smoking and antismoking advertisements may elicit cravings in smokers at equal rates, which may promote smoking maintenance. Moreover, smoking has been associated with impulsivity, but has not been explored in light and intermittent smokers (LITS). Aims of this study included the assessment of the impact of smoking and antismoking advertisements on post-exposure cravings in LITS and assessment of impulsivity as a moderator between cue exposure and cravings. Data from 155 LITS were analyzed. Participants were exposed to one of three stimuli conditions (i.e., smoking, antismoking, and neutral) and completed measures of demographics, tobacco use and history, impulsivity, and cravings. Univariate analysis demonstrated that smoking stimuli produced higher cravings relative to antismoking and neutral stimuli, whereas no differences between antismoking and neutral stimuli were observed. Impulsivity did not moderate the relationship between stimuli condition and cravings. Implications stemming from these findings include the further regulation of smoking advertisements and future exploration of smoking and smoking cessation in the context of cue-reactivity.

1. Introduction

Even though there is a wide body of research on smoking, there is limited research on light and intermittent smokers (LITS; Shiffman, 2009). Interest in LITS has increased because withdrawal models of addiction have difficulty explaining low-level smoking patterns (Zhu, Pulvers, Zhuang, & Báezconde-Garbanati, 2007), although studies have been inconsistent as to whether dependency and withdrawal symptoms may be associated with light and intermittent smoking (DiFranza & Ursprung, 2008; Doran, McChargue, & Cohen, 2007; Shiffman et al., 2012). Alternatively, cue-reactivity may be able to inform LITS' smoking patterns. By exposing smokers to smoking cues (i.e., cigarettes or smoking paraphernalia), cue-reactivity paradigms have effectively elicited cravings (Carter & Tiffany, 1999) that have been further associated with smoking behavior (Rohsenow, Childress, Monti, Niaura, & Abrams, 1990). However, there is limited research on cue exposure cravings and LITS or on the effect of smoking cues present in antismoking advertisements.

1.1. Light and intermittent smokers

Historically, research on low levels of smoking has defined individuals who smoke one to five cigarettes per day as chippers (e.g., Shiffman, Paty, Kassel, Gnys, & Zettler-Segal, 1994). More recent studies have defined light smokers as people who consume fewer

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than 10 cigarettes per day (e.g., Ahluwalia et al., 2006; Okuyemi et al., 2002), and intermittent smokers as people who smoke weekly, but not daily (e.g., Trinidad et al., 2009). Recent studies have noted differences between light and intermittent smokers. For instance, studies using representative samples have found that intermittent smokers are more likely to have higher education and income, to be Hispanic, to be female, to be younger, to smoke in social situations, to report later smoking initiation, to have less nicotine addiction levels, and to report more recent attempts to quit smoking relative to light smokers (Ackerson & Viswanath, 2009; Levy, Biener, & Rigotti, 2009). Furthermore, a recent study assessed distinctions between individuals who have a stable intermittent pattern (i.e., native intermittent smokers or NITS) and individuals who transition from daily smoking to intermittent patterns of smoking (i.e., converted intermittent smokers or CITS) (Shiffman et al., 2012). Notably, intermittent smokers and NITS were younger, smoked on fewer days, smoked fewer cigarettes per day, reported more days of abstinence, shorter smoking history, and less nicotine dependence relative to light and CITS respectively (Shiffman et al., 2012). Although the field is far from conceptual clarity with regard to low level smoking definitions and patterns associated with them, multiple recent studies have defined daily light and intermittent smoking (e.g., Cooper et al., 2010; Trinidad et al., 2009) as we do presently and have combined them in cessation efforts (Ahluwalia et al., 2006; Cabriales, Cooper, Salgado-Garcia, Naylor, & Gonzalez, 2012).

Whereas heavy smoking rates have decreased, light and intermittent smoking rates are increasing (Pierce, White, & Messer, 2009) with previous studies suggesting that 48% (Trinidad et al., 2009) of current smokers are LITS. Even though LITS smoke less than heavy smokers, health consequences associated with light smoking are non-trivial. Intermittent smoking has been related to cough, sore throat, shortness of breath, and fatigue (An et al., 2009). More concerning is that light smoking increases the risk for myocardial infarction (Prescott, Scharling, Osler, & Schnohr, 2002), has been related to increased risk of death from ischemic heart disease, any type of cancer (Bjartveit & Tverdal, 2005), and a higher mortality rate relative to non-smokers (Luoto, Uutela, & Puska, 2000).

LITS demonstrate unique smoking patterns. For example, LITS typically do not experience withdrawal symptoms, latency between cigarettes is longer, they smoke more often in the presence of other smokers, they report positive affect when smoking, and smoke more frequently on the weekends relative to heavy smokers (Shiffman, Paty, et al., 1994). In addition, Taylor and Cooper (2010) suggest that drinking and later times of the day are associated with light smoking. Generally, low-level smoking patterns are stable over time (Shiffman, Paty, et al., 1994; Shiffman et al., 2012). According to traditional models of addiction, smokers may be unable to abstain from smoking to avoid withdrawal symptoms (Rohsenow et al., 1990). Negative reinforcement models posit that individuals smoke to avoid unpleasant feelings while abstinent (Baker, Piper, McCarthy, Majeskie, & Fiore, 2004). This model predicts that low-level smokers do not experience negative feelings that require avoidance, unlike smokers who are addicted to nicotine (Baker et al., 2004). In addition, cognitive models may inform LITS' expectations that promote smoking, social models could explore how the environment and self-efficacy affect smoking in LITS, and cultural models may examine the shared and cultural views that elicit smoking in LITS (see Shadel, Shiffman, Niaura, Nichter, & Abrams, 2000 for a review of these models). Withdrawal symptoms often may not affect LITS (Ahluwalia et al., 2006), and LITS' reasons to smoke have been related to environmental cue exposure (Shiffman, Kassel, Paty, Gnys, & Zettler-Segal, 1994). Therefore, cue-reactivity paradigms and their ability to measure post-exposure cravings may appropriately inform LITS's cravings and unique smoking patterns (i.e., smoking in the presence of smoking cues).

1.2. Cue-reactivity and post-exposure cravings

Cue-reactivity is the physiological or subjective experience of craving after being exposed to appetitive stimuli (i.e., post-exposure cravings) such as cigarettes, smoking paraphernalia, or other individuals smoking due to repeated association between cues and the reinforcing effects of nicotine (Rohsenow et al., 1990). Even though there is little evidence of a significant relationship between cue-reactivity and smoking patterns (Perkins, 2009), some research suggests that physiological and subjective cravings are related to relapse (Siegel, 1999) and maintenance of drug use (Miyata & Yanagita, 2001) across several substances (e.g., Herrmann, Weijers, Wiesbeck, Böning, & Fallgatter, 2001; Sinha, Fuse, Aubin, & O'Malley, 2000). In vivo (Carpenter et al., 2009), video exposure (Upadhyaya, Drobes, & Thomas, 2004), and other methods have been used to present stimuli in cue-reactivity. Consistently, substance cues elicit cravings regardless of the type of stimuli presentation. Even though in vivo cues seem to produce the highest smoking craving scores (Shadel, Niaura, & Abrams, 2001), pictorial stimuli can effectively elicit cravings (Warthen & Tiffany, 2009). Additionally, physiological and self-report instruments have been used to measure post-exposure cravings. Nevertheless, self-reports measuring subjective post-exposure cravings have shown larger effects than physiological measurements (i.e., skin conductance and heart rate) (Carter & Tiffany, 1999).

Research on post-exposure cravings is also relevant outside laboratory settings. Even though the FDA has strongly regulated tobacco advertisements (James & Olstad, 2009), exposure to smoking cues is still frequent in the United States. For instance, tobacco is advertised in different media (e.g., TV, billboards, magazines, and movies), and past and current smokers perceive smoking advertisement exposure as highly prevalent (Peters et al., 2006). Furthermore, exposure to smoking advertisements is associated with smoking behavior (Choi, Ahluwalia, Harris, & Okuyemi, 2002; López et al., 2004). In contrast, antismoking campaigns' effectiveness in reducing smoking is inconclusive (Leshner & Cheng, 2009) perhaps due to unintentional depiction of smoking cues. Indeed, there is evidence that antismoking videos that depict smoking cues can elicit cravings in smokers (Kang, Cappella, Strasser, & Lerman, 2009). Hence, it is important to examine the unintentional effects of smoking cue depiction in antismoking advertisements. Even though cue-reactivity has been extensively researched, there has not yet been a study that compares smoking pictures with antismoking pictures to assess subjective post-exposure cravings in LITS.

1.3. Possible moderator of LITS smoking patterns

In addition to cue-exposure, impulsivity has been closely related to smoking behavior and a relevant construct in smoking research. For instance, impulsivity has been associated with cigarette rewards (Doran, Spring, & McChargue, 2007), smoking initiation and maintenance (VanderVeen, Cohen, Cukrowicz, & Trotter, 2008), smoking relapse (Doran, Spring, McChargue, Pergadia, & Richmond, 2004), cravings and light smoking (Billieux, Van der Linden, & Ceschi, 2007), and younger age (Granö, Virtanen, Vahtera, Elovianio, & Kivimäki, 2004). Similar to smoking cues, impulsivity has been related to increases in post-exposure cravings (VanderVeen et al., 2008). However, the relationship between impulsivity and post-exposure cravings is complex. Research suggests that impulsivity is a moderator in cue-reactivity (Doran, Cook, McChargue, & Spring, 2009); however, the role impulsivity plays in cue-reactivity for LITS has not been explored.

1.4. Aims and hypotheses

One purpose of this study was to explore if smoking pictorial cues promote cue-reactivity in LITS measured with subjective post-exposure cravings using a between-subjects design. A second purpose was to assess whether impulsivity serves as a moderator between smoking stimuli exposure and cravings as previous studies in heavy smokers have