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Effectiveness of Coping Strategies at Alleviating Cue-Induced Craving: a Pilot Study

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Introduction: Results from observational studies suggest that smoking-related cues play a role in triggering relapse. Coping strategies are among the most commonly used cessation strategies, but little is known about how they aid quitting.

Aims: The aim of this pilot study was to evaluate the effect of a suite of selected coping techniques on alleviating cue-induced cravings.

Methods: Thirty-seven daily smokers (Intervention: 20; Control: 17) participated in two laboratory cue-reactivity sessions, separated by approximately one week, during which craving was assessed before and after exposure to smoking-related cues. Following the first session, participants in the Intervention Group were taught a suite of coping strategies. During the second session, participants in the Intervention Group were encouraged to use these strategies.

Results: Participants in the Intervention Group reported a slight decrease in craving following the acute exposure manipulation at the second session, compared to an increase in craving among participants in the Control Group. Intervention Group participants also reported a decrease in craving following prolonged exposure to the smoking cues (compared to an increase in craving among Control Group participants). In both cases, the difference between groups was more pronounced among smokers who responded to the cue-reactivity manipulation. The observed differences were not significant.

Conclusions: The results of this pilot study suggest that coping techniques may be beneficial in alleviating both the initial spike in craving observed following acute cue exposure, and aid recovery during prolonged exposure. These findings need to be replicated in a larger study.

Introduction
Helping smokers to quit will reduce the death and disease caused by tobacco (Jha & Chaloupka, 1999), however, despite decades of clinical investigation, reliably assisting smokers to successfully quit remains a challenge. Numerous studies have reported that craving intensity is positively associated with relapse (e.g., Ferguson & Shiffman, 2013; Ferguson, Shiffman, & Gwaltney, 2006; Killen & Fortmann, 1997). While craving and relapse are often associated with nicotine deprivation as a result of smoking abstinence, observational studies have found that during a quit attempt, smokers can experience periods of intense craving – and lapses – following exposure to smoking-relevant situations and stimuli (Abrams, Monti, Carey, Pinto, & Jacobus, 1988; Niaura, Abrams, Monti, & Pedraza, 1989; Wray, Gass, & Tiffany, 2013). Such effects – commonly attributed to learned associations between stimuli and smoking – have also been observed experimentally under laboratory conditions (Carter & Tiffany, 1999). The key finding from the cue-reactivity literature is that exposing smokers to smoking-related environmental stimuli reliably provokes cigarette cravings (termed cue-induced cravings; Carter & Tiffany, 1999; Niaura et al, 1988; Sayette & Tiffany, 2013). Together, the findings from both laboratory and clinical settings provide compelling evidence that environmental cues can provoke craving and relapse. Developing effective methods for resisting cue-induced craving is, therefore, an important therapeutic objective (Ferguson & Shiffman, 2009).

At present there are few treatments that have demonstrated efficacy at aiding recovery from cue-induced cravings. While pharmacological treatments such as nicotine patches and bupropion have been shown to be both efficacious and to reduce background craving and withdrawal...
severity (Fiore et al., 2008), they do not appear to either prevent cue-induced cravings (that is, to prevent the spike in craving associated with cue-exposure), or to aid recovery from them (that is, to reduce the duration of the craving event itself; see Ferguson & Shiffman, 2009 for a review). In contrast to steady-state nicotine patches, acute administration of nicotine via gum and lozenge has been shown to reduce the duration of cue-induced cravings (Durcan et al., 2003; Niaura et al., 2005). Varenicline also, has been shown by some studies to alter cue provoked responses (Brandon et al., 2011; Franklin et al., 2011). However, acute nicotine replacement and/or the prescription of varenicline are not acceptable options for all quitters, as many smokers prefer to attempt to quit without medication (see Shiffman, Brockwell, Pillitteri, & Gitchell, 2008).

While a majority of quitters attempt to do so unassisted, when aids are used, 1-in-4 of these include some form of behavioural intervention (e.g., counselling, web-based support programs etc.) and are, thus, among some of the most commonly used smoking cessation strategies utilized (Shiffman et al., 2008). These interventions—which typically focus on providing advice for either avoiding or overcoming high-risk smoking situations (Civljak, Sheikh, Stead, & Car, 2010; Lancaster & Stead, 2005) – have consistently been shown to improve the odds of quitting (Fiore et al., 2008). However, despite being a mainstay in assisted quit attempts, the components of which can be clearly identified and defined (Michie, Hyder, Walia, & West, 2011), very little is known about how behavioural interventions actually work (Shiffman, 1993). Further, there are a variety of programs available, with diverse, unevaluated content. One plausible mechanism is that they may help smokers to either avoid or cope with cue-induced cravings, thereby increasing the likelihood of maintaining abstinence. This has not been comprehensively evaluated. Data from a small number of observational studies (Curry & Marlatt, 1985; Merchant, Pulvers, Brooks, & Edwards, 2013; O’Connell, Hosein, & Schwartz, 2006; O’Connell & Martin, 1987; Shiffman, 1982, 1984) have suggested relapse can be avoided when participants use coping strategies during temptation episodes, but as participants were not randomized it is not possible to determine whether the effect was due to the coping strategies themselves, or whether the intervention itself was effective. This pilot study was conducted to evaluate the effect of selected coping techniques on alleviating cue-induced cravings in a laboratory cue-reactivity setting.

**Method**

**Participants**

Participants were recruited to take part in a multi-site randomized cue reactivity study. Adult smokers (≥10 cigarettes per day [CPD] for ≥3 years) who were not currently interested in quitting smoking, but were interested in learning ways to cope with smoking temptations, were recruited across three University of Tasmania campuses and surrounding districts. Participants were recruited between March and August 2013 using flyers and targeted advertising on Facebook® (see Frandsen, Walters, & Ferguson, 2014). Interested smokers were told that the study was designed to investigate the use of coping strategies to help smokers deal with cigarette cravings. A total of 37 (Control Group: 17 [45.9%], Intervention Group: 20 [54.1%]) participants were recruited and completed the study. [An additional participant was recruited and enrolled but failed to complete the second experimental session and hence has been removed from the analyses.] The average participant was 32 years of age, female, smoked 14.4 CPD, and 67.6% smoked their first cigarette of the day within 30 minutes of waking. There were no significant differences between groups for ethnicity, education, marital status, number of years smoking, prior quit attempts, or partner’s smoking behaviour. Participants gave informed written consent to partake in the study, which was approved by the Human Research Ethics Committee (Tasmania) Network.

**Procedure**

Interested individuals who met the initial screening criteria were invited to take part in the study, comprising two sessions. Participants were asked to abstain from smoking for three hours prior to each of the two study sessions (verified by self-report). Following the completion of a baseline survey gathering basic background information, participants undertook a cue-reactivity task.

The cue-reactivity task followed a standardized procedure (Ferguson & Shiffman, 2009; Niaura et al., 2005; Shiffman et al., 2003), by pre-recorded computer-delivered instructions, and lasted approximately 25 minutes. After 5 minutes of acclimatisation, participants were instructed to complete a craving assessment (pre-exposure) [to obtain an ‘uncued’ baseline measure of abstinence-based craving (Sayette & Tiffany, 2013)]; craving was assessed using the Questionnaire of Smoking Urges – Brief (10 items, range 10–70; Cox, Tiffany, & Christen, 2001). Next, participants were asked to open a grey box containing a packet of cigarettes, an ashtray and a lighter. They were instructed to handle the items: to remove and smell a cigarette and flick the lighter. After 3 minutes of this acute cue exposure, a second craving assessment took place (post-exposure). Participants were then asked to remain in the laboratory for an additional 10 minutes. The smoking cues were visible during this period and participants were instructed not to touch the stimuli but to imagine handling these items as they previously had been. Following this prolonged visual cue exposure, participants completed a final craving assessment (prolonged exposure). [Since the purpose of this pilot study was to determine the potential treatment effect of coping strategies on cue induced-cravings, and not to measure the level of cue-reactivity invoked, the inclusion of a control or ‘neutral’ stimuli was deemed unnecessary.]
Following the cue-reactivity task, participants were randomized to either the control or intervention group using a pre-determined sequence. Participants in the intervention group received detailed instructions and training in a range of cognitive and behavioural coping strategies believed to help to alleviate, or to resist, cue-induced cravings. This training was provided in-person by one of two trained research assistants, following a standardized training procedure. Each participant engaged only with one researcher. The coping strategies discussed were drawn from the smoking literature (Fiore et al., 2008) and included thinking about short-term positive consequences of not smoking (e.g., health benefits) or the long-term negative consequences associated with smoking. The use of distraction (e.g., counting backwards from 100 to 1) and a deep breathing exercise for relaxation were also discussed. Participants were provided with instructions on using the strategies they had been taught and were encouraged to practice these before their second and final study session.

During the second study session (scheduled for ~7 days after the initial session; mean = 7.3, SD = 1.9) participants in both groups repeated the cue-reactivity task. Participants in the Intervention Group were encouraged to utilize the coping strategies they had been taught in the previous session during exposure to the cues. At the completion of the second study session participants in the Control Group were provided with the same coping training as had been given to the Intervention Group participants at the end of the first session.

Analytic Plan
To determine the effect of intervention on craving, we first assessed the effect of the intervention on reducing the spike in craving associated with initial exposure to smoking cues. To do this, we calculated the difference between the pre-exposure (baseline) and post-exposure measures. Next, we assessed the effect of the intervention on prolonged craving. To do this, we calculated the difference between craving pre-exposure and that reported at the end of the prolonged-exposure.

While overall results are also presented, analyses focus on the subset of participants who were shown to be responsive to the cue reactivity procedure. Participants were split into groups based on their response to the cue-reactivity procedures during the first study session. Similar to previous studies (e.g., Shiffman et al., 2003; Weinberger, McKee, & George, 2012), participants whose craving increased following exposure (based on the difference between pre-exposure and post-exposure craving scores) were classified as responders (n = 19 [Intervention n = 9; Control n = 10]; mean increase = 6.2, range: 1 to 17); all other participants were considered to be non-responders (n = 18 [Intervention n = 11; Control n = 7]; mean change = −9.4, range: −25 to 0).

Results
Figure 1 shows the difference between the pre-exposure and post-exposure craving measures by group assignment. Among responders, participants in the Intervention Group reported a slight decrease in craving following the acute exposure manipulation, compared to an increase in craving (as would be expected) among participants in the Control Group; however this difference was not significant (p = .38; d = −.42, 95% Confidence Intervals [CI]: −1.33, 0.49).

Next, we assessed the effect of the intervention on prolonged craving. Among responders, Intervention Group participants reported a decrease in craving following prolonged exposure to the smoking cues compared to an increase in craving among Control Group participants (Figure 2); again, however, this difference was not significant (p = .087; d = −.65, 95% CI: −1.57, 0.27).

All participants in the Intervention Group reported practicing at least one of the coping strategies between Session 1 and Session 2 and 85% (n = 17) reported using at least one of the coping strategies during the second cue-reactivity session (Session 2). The most popular strategies practiced and used by participants were distraction and relaxation (n = 12; 60% each). Thinking about the positive consequences of not smoking or the negative consequences of smoking were the least popular, with only two participants reporting using either strategy.

Discussion
This pilot study evaluated the effect of using a suite of selected coping techniques to alleviate cue-induced cravings in a laboratory setting. There were no significant
differences between the groups but the pattern of results suggests that a larger trial is warranted to examine the effect of coping techniques on both the initial spike in craving observed following acute cue exposure, and on recovery from such spikes. Participants in the Intervention Group actually reported slight decreases in craving following initial cue-exposure, as opposed to the more typical increase in craving seen among Control Group participants. Consistent with previous cue-reactivity studies (e.g., Conklin, Robin, Perkins, Salkeld, & McClernon, 2008; Shiffman et al., 2003), we observed substantial variation in craving response to the cue-exposure manipulation. Indeed, just under half of our participants could be classified as non-responders to the cue manipulation; a rate consistent with earlier studies that have reported subject-level differences in susceptibility to smoking cues, or, perhaps more likely, to the artificial way in which cues are presented in laboratory conditions. In either case, as would be expected, the observed effect of the intervention appeared more pronounced among participants who responded to the cue-exposure manipulation.

Moving on, pragmatically, our results also demonstrate that it is feasible to train participants to utilize common coping strategies, and that these strategies can be utilized in the context of a laboratory cue-reactivity study. In this study, distraction and relaxation techniques were in fact ‘non-therapeutic’. Additionally, one could consider including measures of craving that do not rely on self-report (Sayette et al., 2000) to guard against socially desirable responding.

Figure 2
Change in craving from pre-exposure to the end of the study session (prolonged exposure), stratified by treatment group and responder status.

In conclusion, the present pilot study suggests that cognitive and behavioural coping strategies may provide
tions as to the relative effectiveness of these techniques. Determining the relative effectiveness of individual coping strategies would require randomizing strategies across participants; a consideration for future studies. Future larger trials should also develop and use a formal training manual to both ensure consistency of participant training and to aid future teams to replicate their intervention (Michie et al., 2011).

The primary limitation of the study was the sample size: although the relatively modest cue-reactive effect size observed in this study is comparable to recent similar studies (e.g., Shiffman et al., 2013), our pilot study was under-powered to detect differences in treatment effects. Additionally, while larger effect sizes are typical of cue-reactivity studies (Carter & Tiffany, 1999), many of these studies use more intense cues such as having smokers actually light and/or sham smoke a cigarette (i.e., thus combining tactile, olfactory, and visual stimuli) (e.g., Niura, Abrams, Pedraza, Monti, & Rohsenow, 1992, 1999). Due to the pilot nature of the study and site regulations, the use of such cues was not possible in this case. Additional larger studies, potentially utilizing more complex stimuli, will be necessary to confirm the patterns observed here.

Another important limitation was that we recruited smokers who were not currently interested in quitting; a fact that may have influenced smokers’ responses to smoking related cues (although previous studies have successfully elicited craving in smokers uninterested in quitting – e.g., Wilson, Sayette, & Fiez, 2012), or, more likely, the effectiveness of the strategies themselves (e.g., our smokers may not have been motivated to use the strategies, knowing that the ‘cost’ of the failure to cope – increased craving – could be easily managed after the manipulation by smoking a cigarette). If this is the case, however, the effectiveness of the intervention may actually be stronger in smokers who are currently attempting to quit and hence our results would underestimate the true effect of the intervention. Further studies with smokers actually undertaking a quit attempt, and those combining laboratory monitoring with real-world observations to determine effectiveness in actual relapse crisis situations, are worth considering. A final limitation of our study is the possibility that participants deduced their group allocation (i.e., assumed they were in the control group after not receiving coping training in the first study session), thus potentially influencing their responses in the second study session. Future studies may consider providing control group participants with alternative ‘non-therapeutic’ activities to practice before the second session. Researchers would have to ensure, however, that these control activities were in fact ‘non-therapeutic’. Additionally, one could consider including measures of craving that do not rely on self-report (Sayette et al., 2000) to guard against socially desirable responding.

In conclusion, the present pilot study suggests that cognitive and behavioural coping strategies may provide
a promising strategy for reducing cue-induced cravings. The pattern of findings observed here warrant a larger study, and, if successfully replicated, would support the continued use and promotion of such strategies among smokers attempting to quit (Borland et al., 2012; Fiore et al., 2008). Future studies should also examine whether the types of cognitive and behavioural coping techniques commonly taught to smokers are effective in real-world quit attempts. Such studies would provide useful information for the future development of behavioural smoking cessation interventions.

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Conflict of Interest
The authors have no conflicts of interest to declare.

Ethical Standards
The authors assert that all procedures contributing to this work comply with the ethical standards of the relevant national and institutional committees on human experimentation and with the Helsinki Declaration of 1975, as revised in 2008.

References


