Title:

“Responding to tobacco cravings using acceptance and/or reappraisal: Results from an experimental study employing an online craving induction lab.”

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Submitted in part fulfillment of the requirements for the Doctorate in Clinical Psychology
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1. Portfolio Abstract

Despite recent advances in smoking cessation outcomes, a significant number of people in the UK continue to smoke. Currently available psychological treatments for tobacco addiction include Cognitive Behaviour Therapy (CBT) and Acceptance and Commitment Therapy (ACT), with research evidence suggesting that both approaches may be effective treatments for tobacco addiction. Nevertheless, relapse rates remain high and there is scope for further improvements in clinical outcomes.

The present study examined the effectiveness of two psychological strategies (acceptance and reappraisal) primarily with regard to the regulation of tobacco cravings and secondarily with regard to increasing adult smokers’ self-efficacy in abstaining from smoking. Reappraisal is hypothesised to be the mechanism of change within CBT, while acceptance is a key process associated with the ACT literature.

This research project was designed to include three inter-related components, all of which were carried out online. The principal component consisted of an experimental study of the effectiveness of reappraisal and acceptance in decreasing cravings to smoke and increasing abstinence self-efficacy. This component involved the online recruitment of adult smokers, their random allocation to one of four groups (control group, acceptance, reappraisal, both acceptance and reappraisal), provision of training to the three experimental groups in their respective strategy (or strategies) using videos embedded in an online survey, subjecting participants to an online craving induction lab, and testing the effectiveness of these strategies in relation to the examined variables. Results showed that reappraisal was associated with the greatest gains with regard to cravings and self-efficacy. Acceptance was associated with better outcomes compared to the control group in relation to self-efficacy, but not in relation to craving intensity. Training participants in both groups was not associated with improved outcomes compared to the single-strategy conditions.
As part of the same online survey correlational data were collected pertinent to a secondary research aim. This collection of data aimed at providing an insight into how craving intensity and appraisals of cravings were related. Results showed that as craving intensity decreases, appraisals of cravings as intolerable and as threatening to one’s well-being also diminish, while self-efficacy to cope with current cravings increases. These patterns of relationships were shown to be consistent across the acceptance and reappraisal groups. Implications in terms of mechanisms of change associated with reductions in cravings are discussed.

Another secondary, adjunct component consisted of a short Ecological Momentary Assessment (EMA) study that attempted to collect ‘real-life’ data from participants who had completed the online survey and who wished to put what they had learnt in use and engage in a 24-hour, ‘practice attempt to quit smoking’. Low recruitment and high attrition rates rendered group comparisons impossible. However, useful learning points are discussed which may aid future attempts at conducting EMA designs following online recruitment.
2. Statement of contribution

The project was designed by E. Stephanopoulos with the support of his primary supervisor Dr M. Gresswell, while Dr D. Dawson also contributed to relevant discussions. E. Stephanopoulos completed the ethics form which was sent to Lincoln University’s ethics committee signed by Dr M. Gresswell. Dr A. Hart’s experience with ethical approval procedures and his advice throughout this process were valuable.

The review of the relevant literature was carried out by E. Stephanopoulos, who was also responsible for the recruitment of participants, development of the interventions, data collection and all stages of data analysis. Dr Gresswell and Dr Hart offered valuable feedback related to the content of the video interventions. Findings from analysed data were discussed between E. Stephanopoulos, Dr Gresswell and Dr Dawson who all contributed to their interpretation.

Dr Gresswell was also involved with the coding of approximately a quarter of participant responses with regard to which strategies they used during the craving induction lab. E. Stephanopoulos was involved with the coding of all responses. Dr Gresswell read manuscripts of the journal and extended papers and provided valuable feedback. He was also involved in pilot testing the online survey.
3. Journal Paper

**Title:** Responding to tobacco cravings using acceptance and/or reappraisal: Results from an experimental study employing an online craving induction lab.

The article will be submitted for publication to the peer-reviewed journal *Behaviour Research and Therapy.*

Guidelines for authors can be found at: [http://www.elsevier.com/journals/behaviour-research-and-therapy/0005-7967/guide-for-authors](http://www.elsevier.com/journals/behaviour-research-and-therapy/0005-7967/guide-for-authors)
Abstract

Aim: This online study investigated the effectiveness of acceptance and reappraisal strategies in regulating tobacco cravings and their impact on other smoking-related processes. Method: Following random allocation to one of four conditions (control group, \( n = 34 \); acceptance, \( n = 35 \); reappraisal, \( n = 22 \); both acceptance and reappraisal, \( n = 19 \)), adult smokers watched condition-specific intervention videos and took part in an online craving induction lab. Levels of cravings, self-efficacy to abstain from smoking and current affective states were assessed at baseline and post-intervention and craving induction. Baseline comparisons on key variables associated with smoking were performed. Results: Reappraisal was associated with greater reductions in cravings and increases in self-efficacy compared to the control group. Reappraisal was also associated with greater craving intensity reductions and self-efficacy increases compared to acceptance in a 'per protocol' analysis. In comparison to the control condition, acceptance was associated with greater increases in self-efficacy, but not with reductions in craving intensity. Teaching both strategies was not associated with additional benefits. Conclusions: Reappraisal was shown to be the most effective strategy for reducing cravings and increasing self-efficacy. Acceptance may be associated with better outcomes in relation to self-efficacy compared to habitually employed strategies. Future research recommendations are discussed.

3.1 INTRODUCTION

Despite decreases in smoking prevalence rates over the past few decades, nearly 1 in 5 adults in the UK continue to smoke (Office for National Statistics [ONS], 2016). Relapse rates remain high with the majority of smokers trying to quit relapsing within a few days and four in five quit attempts lasting less than a few
These figures suggest that despite the recent advances in smoking cessation treatments, there is scope for improvements in smoking cessation outcomes.

3.1.1. Cravings and negative affect (NA)

Cravings are reported by smokers as the hardest withdrawal symptom to cope with during quit attempts and 12% of smokers who unsuccessfully try quitting cite cravings as the main reason for their relapse (ONS, 2009; West, Hajek, & Belcher, 1989). Cravings may be understood as emotional states with cognitive, behavioural and physiological correlates (Baker, Morse, & Sherman, 1986; Sayette, Martin, Hull, Wertz, & Perrot, 2003; Shiffman, 2000). Although some theorists have proposed making a distinction between the terms ‘cravings’ and ‘urges’ (Marlatt, 1987), it is generally accepted that the two terms can be considered as synonyms and may be used interchangeably (for a review see Skinner & Aubin, 2010). The role of cravings in precipitating and predicting smoking relapses has been demonstrated through several prospective studies (Killen & Fortmann, 1997; O’Connell, Schwartz, Gerkovich, Bott, & Shiffman, 2004; Shiffman et al., 1997) and in recent reviews (Gass, Motschman, & Tiffany, 2014; Wray, Gass, & Tiffany, 2013). These findings suggest that future developments in the smoking cessation arena may benefit from the development and inclusion of strategies aiming to help smokers manage their cravings when attempting to quit.

Some conditioning models of addiction have suggested that as drugs are often used to alleviate emotional distress, negative affective states become conditioned stimuli that elicit cravings (e.g. Baker, Piper, McCarthy, Majeskie, & Fiore, 2004; Carmody, 1989; Niaura et al., 1988). It has been shown that most smokers believe that smoking helps them cope with negative affective states (Brandon & Baker, 1991), that abstinence from smoking leads to increases in NA (e.g. Gilbert et al., 1998; Hughes, 2007), and that these increases give rise to cravings and act as predictors of smoking relapse (Brandon, Tiffany, Obremski, &
Baker, 1990; Delfino, Jamner, & Wallen, 2001; Shiffman et al., 1996, 2007). These findings highlight the importance of taking NA into consideration when studying smoking-related processes.

3.1.2. Available psychological treatments for smoking cessation

A frequently employed psychological treatment in cessation studies is Cognitive Behavioural Therapy (CBT), which has been shown to be an effective treatment for tobacco addiction (Hofmann, Asnaani, Vonk, Sawyer, & Fang, 2012). The hypothesised mechanism of change within CBT is reappraisal, which may be defined as the process by which the person changes the way they think about an emotion-eliciting stimulus in order to change the form of emotional response experienced in the presence of that stimulus (Beck, 1976).

With regard to smoking, reappraisal strategies have focused on modifying the form of craving-related cognitions that contain appraisals of smoking as pleasurable (‘positive outcome expectancies’) and of cravings as undesirable (Beck, Wright, Newman, & Liese, 1993; Marlatt & Gordon, 1985). By changing the way smokers think about smoking and their cravings CBT clinicians try to reduce the intensity of cravings and thus decrease their influence on their clients’ behaviour. Additional emphasis is given to increasing a person’s self-efficacy in coping with cravings (see Marlatt & Gordon, 1985). It has been shown that self-efficacy in coping with cravings may mediate the effectiveness of counselling for smoking cessation (Schuck, Otten, Kleinjan, Bricker, & Engels, 2014) and may predict successful abstinence (Baer, Holt, & Lichtenstein, 1986; Gwaltney, Metrik, Kahler, & Shiffman, 2009; Schnoll et al., 2011; Shiffman et al., 2000).

Acceptance and Commitment Therapy (ACT; Hayes, Strosahl, & Wilson, 2012) is another psychological approach that has been applied to the treatment of tobacco addiction with promising results (Bricker, Wyszynski, Comstock, & Heffner, 2013; Gifford et al., 2004; Hernandez-Lopez, Luciano, Bricker, Roales-Nieto, & Montesinos, 2009). According to ACT theory, all attempts at modifying the form of unpleasant private events belong to the operant class of experiential avoidance,
which is hypothesised to be associated with a rigid adherence to overlearned behavioural patterns (‘behavioural inflexibility’) that may hinder the person’s efforts to reach personally valued goals (Hayes et al., 2012). Individuals who score high in experiential avoidance measures have been shown to be more likely to smoke in response to experiential distress when attempting to quit (Minami, Bloom, Reed, Hayes, & Brown, 2015).

ACT promotes itself as a model of psychological flexibility that is achieved via the willingness to “actively embrace” aversive private experiences and the development of an attitude of acceptance toward them. With regard to smoking cessation, ACT clients are instructed to “change what they can” (e.g. remove ashtrays from the environment) and accept what they cannot change (i.e. the presence of cravings and NA) (see Gifford et al., 2004). To this end, various strategies are used to help them notice, accept and let go of their craving-related thoughts (Gifford et al., 2004; Hernandez-Lopez et al., 2009). The aim of these techniques is to change the function of these private events (rather than their form) and encourage the development of psychological flexibility that will enable individuals to experience cravings without the need to get rid of them that may lead to smoking.

Although ACT proponents have proposed that ‘acceptance’ represents a radically different way to respond to private events in comparison to CBT-based cognitive change strategies (Hayes, 2004), some authors have suggested that similar mechanisms may underlie both therapies (Arch & Craske, 2008) and that there is a considerable degree of overlap between ‘reappraisal’ and ‘acceptance’ (Liverant, Brown, Barlow, & Roemer, 2008; Wolgast, Lundh, & Viborg, 2013).

Despite the demonstrated effectiveness of CBT and ACT in helping smokers quit, relapse rates remain high even among individuals who receive such formal interventions (Fiore et al., 2008). One problem in understanding how these models exert their effectiveness (and why their success is only modest) relates to the fact that these approaches represent multi-component interventions that have originally been developed for treatment of other clinical populations and whose key mechanisms of change have not been tested empirically at least in relation to
smoking cessation. A recent meta-analysis of CBT-informed smoking cessation studies found that very few of the studies reviewed reported data on process variables and that treatment protocols typically comprised of several interacting components associated with different theories (Song, Huttunen-Lenz, & Holland, 2010). Similarly, although ACT promotes itself as trans-diagnostic approach (Hayes et al., 2012), it is possible that hypothesised key processes operate differently when applied in different clinical contexts.

An alternative approach to the adaptation of multi-component treatments involves the ‘bottom-up’ development of interventions on the basis of findings from experimental “micro-studies” investigating key processes and mechanisms of change in controlled laboratory settings (Hayes, Luoma, Bond, Masuda, & Lillis, 2006). Applied in the context of smoking cessation research, such an inductive approach to theory building could help explicate how key mechanisms such as reappraisal and acceptance affect cravings and other smoking-related processes (e.g. NA and self-efficacy).

3.1.3. Experimental ‘micro-studies’ on cravings and smoking behaviour

Over the past few years a number of experimental, ‘micro-studies’ have examined the effectiveness of various strategies in reducing the intensity of tobacco cravings, increasing participants’ perceived self-efficacy to resist temptation to smoke and changing smoking behaviours (e.g. Beadman et al., 2015; Bowen & Marlatt, 2009; Litvin, Kovacs, Hayes, & Brandon, 2012; Rogojanski, Vettesse, & Antony, 2011; Szasz, Szentagotai, & Hofmann, 2012). These studies have produced mixed results. For example, some researchers found acceptance and suppression to be equally effective in decreasing craving intensity (Litvin et al., 2012; Rogojanski et al., 2011), and more effective than a no-strategy control group (Litvin et al., 2012). Bowen and Marlatt (2009) found no significant differences with regard to craving intensity between an acceptance-based, mindfulness group and a no-instructions control group. Szasz et al. (2012) compared reappraisal, acceptance and suppression and found that acceptance and suppression were
equally effective in reducing craving intensity, and less effective than reappraisal which was shown to be the most effective strategy. Beadman et al. (2015) compared defusion, reappraisal and suppression and found that reappraisal resulted in lower craving intensity than the other two groups, but defusion resulted in lower smoking-specific experiential avoidance. Overall, these findings suggest that reappraisal may be the most effective strategy in reducing craving intensity. However, they provide no conclusive evidence in regards to the differential effectiveness of acceptance and suppression interventions for achieving this goal.

These findings are not inconsistent with the proposals made by ACT proponents who suggest that acceptance-based interventions do not specifically target the form of emotional experiences but aim to change the way the person relates to these events to increase behavioural flexibility in the presence of cravings (Hayes et al., 2012). Nevertheless, the evidence pertinent to changes in smoking behaviour also seems to be inconsistent. Some studies have found acceptance to be associated with increased short-term abstinence rates compared to suppression (Beadman et al., 2015; Bowen & Marlatt, 2009), while others have found no significant differences between their acceptance and suppression groups (Rogojanski et al., 2011; Litvin et al., 2012).

In regards to abstinence self-efficacy, Rogojanski et al. (2011) found no significant differences between the acceptance and suppression groups, with participants in both conditions reporting higher self-efficacy at follow-up compared to their baseline scores. Similarly, Litvin et al. (2012) found that acceptance and suppression were equally effective and resulted in greater self-efficacy compared to their no-instructions control group.

The discrepancies in findings highlight the need for further research into this area in order to clarify the inter-relationships between the studied variables. These discrepancies can partly be explained by methodological differences, for example involving the way that the various strategies were operationalised and taught to participants. Most studies included short, written instructions of how to implement the strategies employed (e.g. Bowen & Marlatt, 2009; Rogojanski et al., 2011; Szasz et al., 2012). Given that acceptance-based interventions are often
considered as counter-intuitive (Hayes et al., 2012), it is possible that participants in the acceptance conditions had more difficulty understanding and implementing the instructions they were given (e.g. Litvin et al., 2012). Additionally, in order to learn to respond to unpleasant private events with an attitude of acceptance it has been suggested that one needs to develop skills in distancing oneself from the contents of these events (defusion), in noticing such events dispassionately, and in developing a sense willingness with regards to approaching their content (Hayes et al., 2012). To this end, Levin, Hildebrandt, Lillis and Hayes (2012) have recommended that experiential exercises need to be included when teaching acceptance skills. A more comprehensive intervention strategy that includes these diverse components is more likely to be consistent with conceptualisations of acceptance as promoted within the ACT model.

Furthermore, the choice of comparison group for evaluating the effectiveness of the interventions may be problematic. If the study aim is to arrive at clinically useful conclusions, it would be preferable to compare the effectiveness of interventions to that of strategies smokers already use; only two studies (Bowen & Marlatt, 2009; Litvin et al., 2012) did so.

Overall, these studies show that different strategies can be effective in regulating cravings to smoke and increasing smoking abstinence rates, at least in the short-term. However, the small number of ‘micro-studies’ available and methodological differences between them have contributed to a lack of clarity in terms of the differential effectiveness of the strategies employed and further research is needed.

3.1.4. The present study

The present study aimed to test the effectiveness of acceptance and reappraisal in managing cravings to smoke and to expand scientific understanding of how these two strategies affect craving-related processes (i.e. smoking self-efficacy and negative affect) that have been shown to impact on smoking cessation outcomes. This study aimed to capitalise on the widespread availability of the
internet, teaching participants the use of different strategies for managing their cravings through presentation of white board animation videos embedded in an online survey. The effectiveness of these interventions was tested in an online craving induction lab involving the presentation of videos that have been shown to effectively elicit cravings (Tong, Bovbjerg, & Erblich, 2007).

The main research question of this study regarded whether or not training in acceptance, reappraisal or both acceptance and reappraisal would result in significant reductions in intensity of cravings to smoke compared to a control group condition in which participants were instructed to use any strategy they have found helpful in the past. On the basis of the previously reviewed literature, we expected that participants in the reappraisal and in the both interventions conditions would report greater reductions in cravings compared to both the acceptance and control conditions.

Collecting pre- and post- intervention data on abstinence self-efficacy also allowed us to determine how participants' perceived self-efficacy to resist temptation to smoke compared across these conditions. On the basis of current findings, we hypothesised that all experimental groups would show similar increases in self-efficacy and greater self-efficacy compared to the control group. Furthermore, a one-item Subjective Units of Distress Scale (SUDS) was used to test for any differences between the four groups in regards to affect experienced before and after the interventions and the craving induction lab. Since ACT-based acceptance does not aim to alter the form of emotional responding, we hypothesised that participants using reappraisal would exhibit greater improvements in affect compared to the other groups. We also expected that acceptance and control group participants would present with similar SUDS scores at the end of the craving induction procedure.

The craving induction experimental component was part of a wider research project that included a correlational component and an Ecological Momentary Assessment (EMA) component. Data collected in relevance to these components will inform further publications and are not reported here (see Extended Paper, sections 4.1-4.4).
3.2 METHOD

3.2.1. Participants

The study was promoted via flyers, posters, online advertisements (including the creation of a relevant website), word of mouth and via the Lincoln University’s Sona Experiment Management System which recruits undergraduate students for research participation credit. In order to take part in the study participants had to be over 18 years old, regular smokers, fluent in English, and not using any other smoking cessation treatments or nicotine products (e.g. nicotine replacement therapy, e-cigarettes). At the end of the study participants were given the option to take part in a prize draw for £100 in the form of gift vouchers. The study was advertised as ‘an opportunity to learn two psychological techniques for managing tobacco cravings’ and it was explicitly stated that it was not a smoking cessation study.

The initial pool of participants included 612 respondents who consented to taking part in the study. Over a third of these participants \( n = 260 \) dropped out before or during completion of baseline measures, 20.9% \( n = 128 \) dropped out at or during the intervention videos, and 12.5% \( n = 75 \) dropped out during the craving induction lab. A further 34 responses were excluded from the final analysis for being ‘rushed’, and 5 responses were excluded because participants reported smoking during the craving induction lab. As a basis for classifying responses as ‘rushed’, we identified the quickest respondent to answer correctly all quiz questions on their respective strategy and we consequently included for analysis all same group responses completed in greater length of time. A total of 110 responses were included in the final analysis of the results (see Figure 1).
3.2.2. Outcome measures

Demographic information was gathered including age, gender, nationality and employment status.

Smoking history and behaviour. For the purposes of our study three questions from the Smoking History Questionnaire (SHQ; Brown, Lejuez, Kahler, & Strong, 2002) were adopted. The SHQ is a frequently used, self-report questionnaire that assesses smoking history in detail. Participants were asked how long they had been daily smokers, how many cigarettes per day they smoked (on average over the past three months), and how much of a cigarette they smoked.

Memory and Understanding Quizzes. Four multiple-choice items testing memory and understanding of interventions’ content were administered to the three experimental groups following presentation of the intervention videos. These
Manipulation Check. Following each of the four craving induction videos participants were asked to provide a qualitative response to “describe the strategy they used to respond to their cravings”. Participant responses were coded using Content Analysis (see Krippendorf, 2013). The coding frame (see Appendix) was developed on the basis of the pre-existing literature on emotion regulation strategies (Gross, 1998). Two coders (first and second author) scored a random set of responses from 28 participants (25.5% of the sample). Cohen's kappa for the agreement between the two raters was .91, \( p < .001 \), indicating that the coding frame was highly reliable. The remaining responses were coded only by the first author.

Credibility and Expectancy. To ensure that participants perceived both reappraisal and acceptance videos as credible interventions, an adapted version of the Credibility/Expectancy Questionnaire (CEQ; Devilly & Borkovec, 2000) was administered following presentation of the intervention videos to the three experimental groups. The CEQ is a six-item self-report scale that consists of a credibility factor and an expectancy factor that reflect cognitive (e.g. ‘how logical do these instructions seem?’) and affective processes (e.g. ‘by the end of the course, how much improvement in your functioning do you really feel will occur?’). The scale has been shown to have good test-retest reliability and high internal consistency for the two factors (Devilly & Borkovec, 2000), and it has been used in other tobacco craving regulation studies (e.g. Beadman et al., 2015; Rogojanski et al., 2011). The wording of the items was changed (e.g. from “this therapy” to “this video”) in accordance to the characteristics of the study.

Questionnaire of Smoking Urges – Brief (QSU-B; Cox, Tiffany, & Christen, 2001). The QSU-B was the primary measure of cravings used in the study. It is a self-report scale containing 10 items scored on a seven point scale, with higher scores
indicating higher intensity of cravings. The QSU-B consists of two clearly
distinguishable factors, one capturing positive expectancies related to smoking
(e.g. “A cigarette would taste good right now..”) and one capturing the desire to
smoke to relieve nicotine withdrawal symptoms and negative affect (e.g. “Smoking
would make me less depressed…”). Cronbach’s alpha for the scale in our sample
was $a = 0.95$ (10 items).

*Urge Visual Analogue Scale (VAS).* Intensity of cravings was also assessed using
a one-item VAS that comprised of a 0-100 mm horizontal line with ‘0’ representing
“absolutely no urge to smoke at all” and ‘100’ standing for “the strongest urge to
smoke you have ever experienced” (Juliano & Brandon, 1998). Single item
questions and VASs have frequently been used to assess severity of cravings (e.g.
Litvin et al., 2012; Rogojanski et al., 2011) and it has been suggested that single
ratings of cravings may be as sensitive and reliable as the QSU-B (West & Ussher,
2010).

*Positive and Negative Affect Scale: State Version (PANAS; Watson, Clark, &
Tellegen, 1988).* The PANAS is a 20-item, self-report scale asking participants to
rate the degree to which they had experienced “in the past few hours” each of 10
positive and 10 negative emotions (e.g. “interested”, “distressed”) on a five-point
scale. The PANAS has repeatedly been shown to have good internal consistency
(e.g. Rogojanski et al., 2011; Szasz et al., 2012) and was administered to our
participants at baseline as a state measure to test for any pre-existing differences
related to their affective states. In our sample, Cronbach’s alpha for the positive
affect scale was $a = 0.90$ (10 items) and for the negative affect subscale it was $a =
0.91$ (10 items).

*Subjective Units of Distress Scale (SUDS).* A 0-100 mm VAS scale was adapted
from Wolpe and Lazarus (1966) and used as a measure of current affective states.
SUDS have been shown to be valid measures of global physical and emotional
discomfort (Tanner, 2012).
Acceptance and Action Questionnaire II (AAQ-II; Bond et al., 2011). The AAQ-II was used as a trait-measure of experiential avoidance to test for any differences between groups at baseline. The AAQ-II asks participants to rate on a seven-point scale the degree to which each of seven statements is true for them (e.g. "My painful memories prevent me from having a fulfilling life"). The scale has been shown to have satisfactory structure, reliability and validity with a mean alpha coefficient of 0.84 (Bond et al., 2011). In this study Cronbach’s alpha was a = .92 (7 items).

Fagerström Test for Nicotine Dependence (FTND; Heatherton, Kozlowski, Frecker, & Fagerström, 1991). The FTND is a widely used, six-item self-administered scale assessing gradations in tobacco dependence. It has been shown to have adequate internal consistency and high test-retest reliability (Pomerlau, Carton, Lutzke, Flessland, & Pomerlau, 1994). In our sample Cronbach’s alpha was estimated at a = .66 (6 items).

Smoking Self-Efficacy Questionnaire – 9-item version (SSEQ; Velicer, DiClemente, Rossi, & Prochaska, 1990). The SSEQ is a self-report questionnaire that was used as a measure of participants’ perceived self-efficacy in abstaining from smoking in a variety of tempting situations associated with negative affect (e.g. ‘When I am anxious or stressed’), positive affect or social situations (e.g. ‘With friends at a party’) and habitual situations (e.g. ‘When I first get up in the morning’). Cronbach’s alpha in our study for the full scale was a = .88 (9 items).

3.2.3. Cue induction procedure

Participants were shown four, high resolution, 30-sec videos which have been found to effectively elicit cravings (Tong et al., 2007). They were selected from a subset of 12 videos with the authors’ permission. The videos show two male and two female actors of different ages and ethnicities smoking cigarettes.
3.2.4. Interventions

*Control group.* Participants in the control group were shown a publicly available, 11 minute and 20 seconds-long nature documentary. This video was somewhat longer than the intervention videos to account for the fact that control group participants were not asked to complete credibility scales or memory quizzes at the end of it.

*Acceptance.* Participants in the acceptance condition were shown a 9 minute 48 seconds long, white board animation video (accessible at: https://youtu.be/D-U7DOHyU4A). The intervention components of the video were largely based on an ACT manual (Hayes et al., 2012) and ACT protocols used in smoking cessation studies (Gifford et al., 2004; Hernandez-Lopez et al., 2009). The core message of the acceptance video was that cravings do not cause the person to smoke and that in order to become a non-smoker, one needs to learn to notice, accept and let go of his/her craving-related thoughts and associated bodily reactions. Strategies and / or phrases that could be targeting the form or content of craving-related thoughts (e.g. in suggesting that acceptance would reduce the intensity of cravings and / or make cravings more tolerable) were avoided to minimise the overlap between the acceptance and reappraisal interventions.

*Reappraisal.* Participants in the reappraisal condition were shown a 10 minute 18 seconds long, white board animation video (accessible at: https://youtu.be/0wB5BdxMlh4). The intervention components of the reappraisal video were largely based on CBT manuals for the treatment of addiction (Beck et al., 1993; Marlatt & Gordon, 1985). The core message of the reappraisal video was that craving-related cognitions are either “biased” or “incorrect” and that it was possible to change the way one thinks about smoking by constructing less biased or more accurate appraisals. Overall, the emphasis was to use techniques aimed at changing the content or form of craving-related appraisals in order to reduce the intensity of cravings. Metacognitive appraisals (e.g. how helpful it is to hold onto certain ways of thinking in one’s effort to quit smoking) were avoided (although
consistent with CBT literature) in order to minimise the overlap between the two interventions.

**Both interventions condition.** Participants in this condition watched both acceptance and reappraisal videos. Although this meant that participants would receive a “double dose of treatment”, this choice was preferred to creating a new video as doing so would mean that neither intervention would be presented with a similar degree of detail and depth as in the single-intervention conditions.

### 3.2.5. Procedure

Upon agreeing to take part in the study, participants were asked to complete baseline measures, randomly allocated to one of four conditions (‘control group’, ‘acceptance’, ‘reappraisal’, or ‘both interventions’) and shown their respective condition intervention videos (the two videos in the both interventions condition were shown in random order). Participants in the three intervention conditions were then administered the memory and understanding quizzes as well as the Credibility/Expectancy Questionnaire. Participants were then subjected to the online craving induction lab and were shown the four craving eliciting videos. Participants in the three experimental conditions were asked to use the strategies they were taught to respond to any emerging cravings while those in the control group were instructed to use “any strategy they have found useful in the past”. In-between each of the craving induction videos participants were asked to provide a qualitative response to describe the strategy they used to respond their cravings as part of the manipulation check. In-between each of the craving induction videos they were also administered a set of five VASs (Urge VAS, SUDS and three single-item VASs assessing content of craving-related appraisals) as part of a separate study with findings not reported here (see Section 4.2.2.5.). At the end of the survey participants were re-administered the QSU-B, SSEQ, the Urge VAS and the SUDS.
3.3. RESULTS

3.3.1. Demographics and baseline comparisons.

Comparisons between participants who dropped out after completing baseline measures, those who dropped out during the craving induction lab and those whose responses were included in the final analysis revealed that these groups did not differ in any key variables (craving intensity, negative affect, experiential avoidance, self-efficacy, level of nicotine dependence, number of cigarettes smoked per day, gender). However, it was shown that there was a significant difference in terms of age, \( H(2) = 18.99, p < .01 \), with participants completing the study being younger (\( Mdn = 3 \)) than those who only completed baseline measures (\( Mdn = 4 \)), \( U = 4797, z = -4.32, p < .01 \).

Additionally, there was a significant association between employment status and progress made toward completion of the study, \( \chi^2(12) = 24.93, p < .05 \). Examination of standardised residual scores on the cross tabulation table revealed that the only z score exceeding \( \pm 1.96 \) was for disabled individuals not completing the study. Based on the odds ratios, “disabled, not able to work” individuals were 6.63, 7.66 and 13.5 times less likely to complete the study compared to those in full-time employment, those in part-time employment and to full-time students respectively.

Out of the 110 participants whose responses were included in the final analysis 34 completed the control group condition (8 male, 26 female), 35 the acceptance condition (11 male, 24 female), 22 the reappraisal condition (13 male, 9 female), and 19 the both interventions condition (9 male, 10 female). Our final sample consisted of participants with 19 different nationalities, with nearly half of participants (42.7%) being British. In addition, 46.3% of participants were 35-54 years old and most participants reported being in full-time or part time employment (47.3% and 17.3% respectively). Our sample had been smokers on average for 22.5 (\( SD = 14.11 \)) years and smoked 15.3 (\( SD = 11.16 \)) cigarettes per day. The mean FTND score of our sample (\( M = 4.55, SD = 2.22 \)), suggested moderate
levels of nicotine dependence (Heatherton et al., 1991). Demographic characteristics of the four groups are included in Table 1.

Attrition analysis. Two-sample z-tests for population proportions were carried out on the assumption that 88 participants were allocated and able to watch the intervention videos in each group. Results revealed that for $a = .013$ following a Bonferroni correction, both interventions group participants were statistically more likely to drop-out compared to the acceptance group ($z = 2.62, p = .01$) and the control group ($z = 2.46, p = .01$). No significant differences were found when comparing reappraisal to the acceptance and control groups. A Chi-squared test showed that the proportions of participants included in the final analyses did not statistically differ between groups, $\chi^2(3) = 7.31, p = .06$.

Baseline comparisons. Between-groups comparisons of baseline scores showed that there were no significant differences between the four groups with regard to craving intensity, positive and negative affect, self-efficacy, experiential avoidance, levels of nicotine dependence, number of years smoking, or number of cigarettes smoked per day. Furthermore, there were no significant differences between the four groups in demographic variables, with the exception of gender, $\chi^2(3) = 8.57, p < .05$. Participants in the reappraisal condition were more likely to be males compared to the other groups (odds ratios: 4.69, 3.15 and 1.6 compared to control, acceptance and both interventions groups respectively).

Table 1

<table>
<thead>
<tr>
<th>Gender</th>
<th>Control (N=34)</th>
<th>Acceptance (N=35)</th>
<th>Reappraisal (N=22)</th>
<th>Both interventions (N=19)</th>
</tr>
</thead>
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<tr>
<td>Male</td>
<td>8 (23.5%)</td>
<td>11 (31.4%)</td>
<td>13 (59.1%)</td>
<td>9 (47.4%)</td>
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<td>Female</td>
<td>26 (76.5%)</td>
<td>24 (68.6%)</td>
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</table>

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<th>Age</th>
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<td>5 (14.3%)</td>
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<td>1 (5.3%)</td>
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<tr>
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<td>7 (20.6%)</td>
<td>6 (17.1%)</td>
<td>3 (13.6%)</td>
<td>5 (26.3%)</td>
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<tr>
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<td>11 (31.4%)</td>
<td>6 (27.3%)</td>
<td>4 (21.1%)</td>
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<tr>
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<td>6 (17.1%)</td>
<td>7 (31.8%)</td>
<td>4 (21.1%)</td>
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<td>4 (11.8%)</td>
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<td>Australian</td>
<td>3 (8.8%)</td>
<td>3 (8.6%)</td>
<td>-</td>
<td>-</td>
<td></td>
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</tr>
<tr>
<td>Greek</td>
<td>7 (20.6%)</td>
<td>8 (22.9%)</td>
<td>4 (18.2%)</td>
<td>3 (15.8%)</td>
<td></td>
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<tr>
<td>Other European</td>
<td>5 (14.7%)</td>
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<td>3 (13.6%)</td>
<td>3 (15.8%)</td>
<td></td>
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</tr>
<tr>
<td>Other</td>
<td>2 (5.9%)</td>
<td>-</td>
<td>2 (9.1%)</td>
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</table>

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<tr>
<th>Employment</th>
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<th>Employed, working part-time</th>
<th>In full-time education</th>
<th>Not employed, looking for work</th>
<th>Not employed, NOT looking for work</th>
<th>Retired</th>
<th>Disabled, not able to work</th>
</tr>
</thead>
<tbody>
<tr>
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<tr>
<td>Full-time</td>
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<td>4 (11.8%)</td>
<td>4 (11.8%)</td>
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<td>4 (11.8%)</td>
<td>1 (2.9%)</td>
</tr>
<tr>
<td>Part-time</td>
<td>19 (54.3%)</td>
<td>5 (14.3%)</td>
<td>5 (14.3%)</td>
<td>3 (8.6%)</td>
<td>1 (2.9%)</td>
<td>2 (5.7%)</td>
<td>-</td>
</tr>
<tr>
<td>Education</td>
<td>8 (36.4%)</td>
<td>6 (27.3%)</td>
<td>3 (13.6%)</td>
<td>1 (4.5%)</td>
<td>2 (9.1%)</td>
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</tr>
<tr>
<td>Looking</td>
<td>10 (52.6%)</td>
<td>3 (15.8%)</td>
<td>2 (10.5%)</td>
<td>2 (10.5%)</td>
<td>1 (2.9%)</td>
<td>2 (9.1%)</td>
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</tr>
<tr>
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</tr>
<tr>
<td>Retired</td>
<td>4 (11.8%)</td>
<td>2 (5.7%)</td>
<td>2 (9.1%)</td>
<td>1 (5.3%)</td>
<td></td>
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<tr>
<td>Disabled</td>
<td>1 (2.9%)</td>
<td>-</td>
<td>-</td>
<td>1 (5.3%)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<p>| Years of smoking | 22.18 (15.24) | 20.51 (13.95) | 23.16 (13.26) | 25.79 (13.69) |</p>
<table>
<thead>
<tr>
<th>Number of cigarettes per day</th>
<th>14 (11.62)</th>
<th>14.8 (11.69)</th>
<th>18.77 (12.63)</th>
<th>14.53 (6.56)</th>
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</thead>
<tbody>
<tr>
<td>FNTD baseline</td>
<td>4.15 (2.27)</td>
<td>4.31 (2.19)</td>
<td>5.09 (2.41)</td>
<td>5.11 (1.88)</td>
</tr>
</tbody>
</table>

Note. FTND = Fagerström Test of Nicotine Dependence. Values are N (%) for all demographic variables and Mean (SD) for smoking characteristics (number of years smoking, estimated number of cigarettes per day over the past three months and FTND baseline scores). None of the group comparisons across these variables were significant with the exception of gender for which there was a significant difference (p < .05).

3.3.2. Independent variable manipulation and participant understanding checks.

Credibility and Expectancy (SEQ). Participants in the three conditions appraised the interventions given as credible (acceptance: $M = 16.63, SD = 4.05$; reappraisal: $M = 18.64, SD = 3.27$; both interventions: $M = 19.21, SD = 5.08$). There were no significant differences between the three groups with regard to credibility, $F(2,73) = 2.95, p = .06$, or expectancy, $F(2,73) = 0.10, p = .91$.

Memory and Understanding Quizzes. Participants showed good understanding of the content of intervention videos answering correctly most quiz questions (acceptance: 76.4% correct answers; reappraisal: 86.4%; both interventions: 81.6%). A Kruskal-Wallis test found no significant differences between the three groups in terms of memory and understanding of the video content, $H(2) = 2.86, p = .24$.

Manipulation check. When participants’ responses suggested they experienced cravings and that they used some strategy to regulate these cravings, it was shown that control group participants relied on the use of distraction techniques (41.1% of the time), reappraisal (19.6%) and acceptance (6.25%). Participants in the acceptance group used acceptance-based techniques 63.8% of the time when
experiencing cravings, but also used reappraisal (20.7%) and distraction (9.5%). Participants in the reappraisal condition relied heavily on reappraisal (82.4% of the time), but also used distraction (4.7%) and acceptance-based strategies (4.7%). Finally, participants in the both interventions condition reported similar frequencies of using reappraisal and acceptance (40.3% and 36.1% respectively), while they also reported using distraction 12.5% of the time.

3.3.3. Group comparisons.

Group scores were compared: a) ‘by allocation’, i.e. looking at the effectiveness of the interventions without taking into account the potential effects of the observed strategy diffusion, and b) ‘per protocol’, i.e. following removal from the reappraisal and acceptance groups of responses belonging to participants that did not faithfully adhere to the experimental instructions, as well as removal of acceptance and reappraisal responses from the control group. This ‘per protocol analysis’ excluded: a) nine participants from the control group who reported using reappraisal or acceptance strategies on two or more occasions during the craving induction lab (i.e. using reappraisal or acceptance 50% or more of the time), b) 10 participants from the acceptance condition who reported using reappraisal or distraction on two or more occasions, c) three participants from the reappraisal condition who reported using on two or more occasions strategies coded as acceptance or distraction, and d) one participant from the both interventions group who reported using distraction on more than one occasion.

With regard to craving scores assessed by QSU-B and Urge VAS, within-between groups ANOVAs were carried out with Time as the within-groups factor and Strategy as the between-groups factor\(^1\). Time had two levels (Time 1: baseline scores; Time 2: post-intervention and cue induction scores) and Strategy four levels (‘control group’, ‘acceptance’, ‘reappraisal’, ‘both interventions’) for all

\(^1\) The distributions of scores on these variables were shown to be normal and variances equal. Due to the unequal sample sizes sensitivity tests were carried out examining significant interactions using non-parametric tests for Time 1 – Time 2 group differences. Results are not reported because findings were not different to those from the ANOVAs.
analyses. Where a significant Time x Strategy interaction was found, the interaction term was examined further by computation of 'difference scores' (i.e. scores derived at by subtracting Time 2 scores from Time 1 scores) and carrying out one-way independent groups ANOVAs and post-hoc tests on these difference scores (see Gollwitzer, Christ, & Lemmer, 2014; Rogosa & Willett, 1983). Gabriel’s procedure was used for all post-hoc testing due to the different sample sizes. With regard to craving scores, a series of paired t-tests were also performed for all groups to get an estimate of the magnitude of change from Time 1 to Time 2.

Where parametric assumptions were violated\(^2\) (i.e. SSEQ, SUDS) non-parametric Kruskal-Wallis tests were conducted to test for group differences: a) between Time 2 scores, and b) for Time 1 – Time 2 difference scores. Where significant differences were found in difference scores comparisons, Mann-Whitney tests were carried out to identify which groups significantly differed.

**Analysis ‘by allocation’**.

Descriptive statistics for the four groups on all under comparison variables are shown on Table 2.

**Cravings assessed by the QSU-B.** A within-between groups ANOVA on QSU-B scores showed there was a significant main effect for Time, \(F(1,106) = 20.72, \ p < .001, \ \eta^2 = 1.6,\) a significant Time x Strategy interaction, \(F(3,106) = 3.15, \ p < .05, \ \eta^2 = 0.08,\) and no main effect for type of strategy, \(F(3,106) = 0.79, \ p = .50, \ \eta^2 = 0.02\) (see Figure 2). A one-way independent groups ANOVA for Time 1 – Time 2 difference scores and post-hoc testing using Gabriel’s procedure revealed that the only significant difference was between reappraisal and control group participants (\(p < .05\)).

\(^2\) I.e. when other than the unequal group sizes we also found that distributions were non-normally distributed and/or that homogeneity of variances could not be assumed.
Fig. 2. Changes in craving (QSU-B) mean scores from baseline (Time 1) to post-intervention and craving induction lab (Time 2).

Paired t-tests comparing QSU-B scores from Time 1 to Time 2 for each group found a high effect size for the reappraisal group, $t(21) = 5.67, p < .001, r = .78$, a moderate effect size for the acceptance group, $t(34) = 1.95, p = .06, r = .32$, a moderate effect size for the both interventions group, $t(18) = 1.29, p = .21, r = .29$, and a small effect size for the control group, $t(33) = 0.84, p = .41, r = .14$.

Table 2

Baseline and post-intervention and cue induction descriptive scores for the four groups.

<table>
<thead>
<tr>
<th></th>
<th>Control (n=34)</th>
<th>Acceptance (n=35)</th>
<th>Reappraisal (n=22)</th>
<th>Both interventions (n=19)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Time 1</td>
<td>Time 2</td>
<td>Time 1</td>
<td>Time 2</td>
</tr>
<tr>
<td>QSU-B</td>
<td>36.85 (14.09)</td>
<td>34.82 (17.54)</td>
<td>33.29 (13.05)</td>
<td>28.37 (15.33)</td>
</tr>
<tr>
<td>SSEQ (Short Form)</td>
<td>21.00 (7.86)</td>
<td>20.71 (8.76)</td>
<td>18.94 (7.27)</td>
<td>22.49 (7.61)</td>
</tr>
</tbody>
</table>

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Cravings assessed by the Urge VAS. A within-between groups ANOVA revealed a significant main effect for Time, \( F(1,106) = 43.39, p < .001, \eta^2 = 0.29 \), a trend for a significant Time x Strategy interaction, \( F(3,106) = 2.52, p = .06, \eta^2 = 0.07 \), and no significant main effect for type of Strategy, \( F(3,106) = 1.41, p = .25, \eta^2 = 0.04 \). Paired t-tests between Time 1 and Time 2 Urge VAS scores for all groups found a high effect size for reappraisal, \( t(21) = 5.25, p < .001, r = .75 \), a high effect size for acceptance, \( t(34) = 3.80, p = .001, r = .55 \), a moderate effect size for the both interventions group, \( t(18) = 2.05, p = .06, r = .43 \), and a moderate effect size for the control group, \( t(33) = 2.13, p < .05, r = .35 \).

Self-efficacy assessed by the SSEQ (9-item version). A Kruskal-Wallis test found no significant differences between the Time 2 SSEQ (Short Form) scores of the four groups, \( H(3) = 7.51, p = .06 \). A second Kruskal-Wallis on Time 1 – Time 2 difference scores found that the four groups significantly differed in the amount of change over time in terms of their self-efficacy, \( H(3) = 22.89, p < .001 \). Pairwise comparisons using a series of Mann Whitney tests with a adjusted at .008 following a Bonferroni correction, showed that there were significant differences between the control group (\( Mdn = 0 \)) and the acceptance group (\( Mdn = 3 \)), \( U = 370.5, p = .007, r = -.33 \), between control group and the reappraisal group (\( Mdn = 7 \)), \( U = 128, p < .001, r = -.55 \), and between control group and the both interventions group (\( Mdn = 5 \)), \( U = 145.5, p = .001, r = -.45 \). The comparisons between the three experimental groups did not reach the adjusted \( a \) levels of significance (see Figure 3).

<table>
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<td>[68]</td>
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<td></td>
</tr>
</tbody>
</table>

Note. Scores on the table are means (standard deviations) while for SSEQ (Short Form) and SUDS [medians] are also reported. QSU-B: Questions of Smoking Urges – Brief; Urge VAS: Single item, visual analogue scale assessing current cravings; SSEQ: Smoking Self-Efficacy Questionnaire (9-item version); SUDS: Single-item, Subjective Units of Distress VAS.
**Fig. 3.** Changes in self-efficacy mean scores from baseline (Time 1) to post-intervention and craving induction lab (Time 2) for the four groups.

*Fig. 4.** Changes in affect SUDS scores from baseline (Time 1) to post-intervention and cue induction (Time 2) for the four groups.

*Affect assessed by SUDs.* A Kruskal-Wallis test on Time 2 SUDS scores found no significant differences between the four groups, $H(3) = 1.24$, $p = .74$. A second Kruskal-Wallis test on difference scores (Time 1 – Time 2) revealed no significant differences in degree of change between the four groups, $H(3) = 2.66$, $p = .45$ (see Figure 4).
‘Per protocol analysis’.

Descriptive statistics for the four groups on all under comparison variables after removal of responses associated with other conditions are shown on Table 3.

Cravings assessed by the QSU-B. A within-between groups ANOVA on QSU-B scores showed a significant main effect for Time, \( F(1,83) = 20.55, p < .001, \eta^2 = 0.20 \), a significant Time x Strategy interaction, \( F(3,83) = 5.56, p < .001, \eta^2 = 0.17 \), and no significant main effect for type of Strategy, \( F(3,83) = 0.99, p = .40, \eta^2 = 0.03 \). Post-hoc tests on Time 1 – Time 2 difference scores using Gabriel’s procedure showed a significant difference between the reappraisal group and the control group \((p = .001)\) and a significant difference between reappraisal and acceptance \((p < .05)\). Within-group comparisons between Time 1 and Time 2 QSU-B scores of the four groups using paired t-tests found a very high effect size for the reappraisal group, \( t(18) = 6.21, p < .001, r = .83 \), a moderate effect size for the both interventions group, \( t(17) = 1.25, p = .23, r = .29 \), a small effect size for the acceptance group, \( t(24) = 1.76, p = .09, r = .11 \), and a very small effect size for the control group, \( t(24) = 0.02, p = .99, r = .004 \).

Table 3

Baseline (Time 1) and post-intervention and craving induction (Time 2) scores for the four groups (total N=87) after removal of responses associated with the other groups.

<table>
<thead>
<tr>
<th></th>
<th>Control (n=25)</th>
<th>Acceptance (n=25)</th>
<th>Reappraisal (n=19)</th>
<th>Both interventions (n=18)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Time 1</td>
<td>Time 2</td>
<td>Time 1</td>
<td>Time 2</td>
</tr>
<tr>
<td>QSU-B</td>
<td>36.72</td>
<td>36.68</td>
<td>32.04</td>
<td>27.76</td>
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<tr>
<td>Urge VAS</td>
<td>51.84</td>
<td>43.52</td>
<td>38.60</td>
<td>24.20</td>
</tr>
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</table>
### Table 1

<table>
<thead>
<tr>
<th></th>
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<th></th>
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<tr>
<td>SSEQ (Short Form)</td>
<td>21.96</td>
<td>20.88</td>
<td>19.28</td>
<td>23.56</td>
<td>17.26</td>
<td>25.58</td>
<td>17.11</td>
<td>23.56</td>
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<tr>
<td></td>
<td>(8.49)</td>
<td>(8.02)</td>
<td>(7.21)</td>
<td>(7.53)</td>
<td>(7.01)</td>
<td>(7.52)</td>
<td>(5.51)</td>
<td>(6.33)</td>
</tr>
<tr>
<td></td>
<td>[19]</td>
<td>[20]</td>
<td>[18]</td>
<td>[23]</td>
<td>[15]</td>
<td>[25]</td>
<td>[16]</td>
<td>[23.5]</td>
</tr>
<tr>
<td>SUDS</td>
<td>60.40</td>
<td>53.52</td>
<td>62.68</td>
<td>61.32</td>
<td>58.05</td>
<td>59.00</td>
<td>60.00</td>
<td>64.33</td>
</tr>
<tr>
<td></td>
<td>(17.93)</td>
<td>(24.66)</td>
<td>(20.84)</td>
<td>(25.90)</td>
<td>(16.94)</td>
<td>(23.47)</td>
<td>(16.94)</td>
<td>(29.14)</td>
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<td>[51]</td>
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<td>[58]</td>
<td>[60]</td>
<td>[66]</td>
<td>[60]</td>
<td>[60.50]</td>
</tr>
</tbody>
</table>

**Note.** Scores on the table are means (standard deviations) while for SSEQ and SUDS [medians] are also reported. QSU-B: Questions of Smoking Urges – Brief; Urge VAS: Single item, visual analogue scale assessing current cravings; SSEQ: Smoking Self-Efficacy Questionnaire (9-item version); SUDS: Single-item, Subjective Units of Distress VAS.

### Cravings assessed by the Urge VAS.

A within-between groups ANOVA found a significant main effect for Time, $F(1,83) = 35.32$, $p < .001$, $\eta^2 = 0.30$, a significant Time x Strategy interaction, $F(3,83) = 3.31$, $p < .05$, $\eta^2 = 0.11$, and a significant main effect for type of Strategy, $F (3,83) = 2.94$, $p < .05$, $\eta^2 = 0.10$. Post-hoc testing using Gabriel’s procedure showed that this significant difference was between the control group and the acceptance group ($p < .05$). A one-way between groups ANOVA and post-hoc tests using Gabriel’s procedure were carried out comparing the difference scores (from Time 1 to Time 2) among the four groups. Results showed a significant difference only between the control group and the reappraisal group ($p < .05$). Paired t-tests examining the magnitude of change from Time 1 to Time 2 for the four groups found a high effect size for the reappraisal group, $t(18) = 5.03$, $p < .001$, $r = .76$, a high effect size for the acceptance group, $t(24) = 3.19$, $p < .01$, $r = .55$, a moderate effect size for the both interventions group, $t(17) = 1.87$, $p = .08$, $r = .41$ and a moderate effect size for the control group, $t(24) = 1.57$, $p = .13$, $r = .30$.

### Self-efficacy assessed by the SSEQ (9-item version).

A Kruskal-Wallis test found no significant difference between the groups’ post-intervention scores, $H(3) = 6.48$, $p = .09$. However, a Kruskal-Wallis test on the difference scores (Time 1 – Time 2)
found a highly significant difference, $H(3) = 24.47$, $p < .001$, suggesting the four groups’ self-efficacy increased differentially among the four groups. Mann-Whitney tests found a significant difference between the control group ($Mdn = 20$) and the acceptance group ($Mdn = 23$), $U = 161.00$, $p < .01$, $r = -.42$, a significant difference between the control group and the reappraisal group ($Mdn = 25$), $U = 58.50$, $p < .001$, $r = -.64$, a significant difference between the control group and the both interventions group ($Mdn = 23.5$), $U = 87.00$, $p = .001$, $r = -.52$, and a significant difference between the acceptance and the reappraisal group, $U = 132.50$, $p = .01$, $r = -.38$. No significant differences were found between the acceptance group and the both interventions group, or between the reappraisal group and the both interventions group.

**Affect as assessed by SUDS.** Between-groups comparisons revealed no significant differences between the four groups when looking at Time 2 SUDS scores, $H(3) = 2.47$, $p = .48$, and when examining Time 1 – Time 2 SUDS difference scores, $H(3) = 3.00$, $p = .39$.

### 3.4. DISCUSSION

3.4.1. Cravings

In line with our predictions and previous research findings (Beadman et al., 2015; Szasz et al., 2012), our ‘by allocation’ analysis suggested that the reappraisal intervention video was associated with greater reductions in cravings among reappraisal group participants compared to participants in the control group who did not receive any formal intervention. Reappraisal was also shown to be associated with greater reductions in cravings compared to acceptance for scores on our primary cravings measure for participants who most faithfully adhered to experimental instructions. The effectiveness of reappraisal as a strategy to regulate cravings was further demonstrated in the high or very high effect sizes found in all
analyses of within-groups change from baseline to post-cue induction, both before and after removal of condition-inconsistent responses.

Our results provided no evidence to suggest that training participants in both reappraisal and acceptance may lead to further benefits in terms of craving intensity. Although these ‘both interventions’ participants received a ‘double dose of treatment’ their scores were not shown to statistically differ significantly from control group participants receiving no formal intervention.

None of the analyses provided evidence to suggest that our acceptance intervention was associated with greater reductions in cravings compared to the control group condition. Within-group comparisons of acceptance responses in both types of analyses found significant decreases in cravings from baseline to post-cue induction (with high effect sizes) on our secondary measure of cravings. This suggests that acceptance may be effective in reducing cravings, albeit not more effective than other strategies typically employed by smokers such as distraction. These findings, however, were not replicated in analyses of scores on our primary cravings measure. Overall, in line with previous findings (Beadman et al., 2015; Rogojanski et al., 2011; Szasz et al., 2012) we found no evidence to suggest that use of acceptance may be associated with greater reductions in cravings compared to other strategies.

3.4.2. Self-efficacy

In terms of abstinence self-efficacy, the results confirmed our predictions that all experimental groups would show improvements in self-efficacy compared to the control group. This was evidenced in both types of analyses carried out, suggesting that acceptance and reappraisal may be effective strategies to improve abstinence self-efficacy, and that the reappraisal and acceptance interventions employed in this study may be effective in achieving this goal. In addition, the per protocol analysis of the most instructions-adherent responses revealed that reappraisal may be more effective than acceptance in increasing self-efficacy to
abstain from smoking. Similarly to our findings in regards to craving intensity, we found no evidence to suggest that receiving training on both strategies may involve greater benefits in improving self-efficacy.

### 3.4.3. Affect

In contrast to our predictions, there were no significant differences between the four groups in terms of changes in their affective states before and after the intervention and the craving induction procedure. This finding may suggest that neither experimental intervention helped improve participants’ experienced affect. However, another potential explanation may be that global affect is determined by various factors not addressed by our intervention, i.e. that cravings are one among many determinants of current affective experiences and that relying on a global measure of affect may not enable the detection of such differences. Future research need to ask more precise questions to evaluate affect and use measures with greater construct validity in answering similar research questions.

### 3.4.4. Attrition and acceptability of the interventions

The final sample included in the analysis contained fewer participants in the reappraisal group than the acceptance and control groups. Although differential attrition analyses showed that the proportion of participants dropping out from the reappraisal condition did not reach statistical significance compared to the other conditions, this finding needs to be considered with extreme caution. By virtue of our design (i.e. of using an online software platform as our ‘experimental lab’) we had no way of knowing to which group each participant had been allocated before their completion of the condition-specific memory quizzes. Since these quizzes were administered after the intervention videos, we had no means of estimating the exact numbers of participants in each group who had completed the baseline measures and dropped out at or during the videos. Consequently, we based these analyses on the assumption (which may or may not hold true) that due to
randomisation the individuals dropping out following completion of baseline measures had been equally spread among groups.

In any case, the observation that approximately a third less participants completed the reappraisal and both interventions conditions merits discussion. The reappraisal video intervention was shown to be effective and it was appraised as credible by participants who seemed to have no greater difficulty in understanding its content compared to the acceptance video. Taking into account the widespread use of reappraisal by participants in all conditions, a possible explanation for the lower completion rates among reappraisal group participants may be that the reappraisal intervention lacked ‘novelty’. Some participants may have felt that they were not learning anything ‘new’ and may have found the video as less interesting (and thus less engaging) compared to the acceptance video. This hypothesis, combined with the extra taxation on cognitive resources required for watching both videos, may also explain dropout rates in the both interventions group. On the other hand, the control group participants may have found the documentary shown as interesting and not especially taxing in terms of cognitive resources.

3.4.5. Limitations of the current study and recommendations for future research

The major limitation of the current study regards the lack of smoking behaviour measures at periods of follow-up. Such measures would help examine the effectiveness of the interventions on more clinically significant dimensions that are also more relevant to ACT theory which predicts that acceptance may lead to reductions in smoking albeit not in craving intensity. In addition, the nature of our design limits generalisability of our findings to the context of an ‘online craving induction lab’. Future research can address these issues by the collection of measures of smoking behaviour and by collection of ‘real-life’ data, e.g. through the employment of Ecological Momentary Assessment designs. Future research may also address questions raised by discrepancies in our findings relevant to the construct validity and sensitivity of different measures of cravings.
Nevertheless, this study was the first study to our knowledge that attempted to use the wide availability of the internet to answer experimental research questions regarding cravings in an online cue induction paradigm. The demonstrated effectiveness of the reappraisal video intervention compared to a no-intervention control group suggested that this online design may adequately teach effective craving regulation strategies to participants and may adequately capture differences in the effectiveness of different strategies. Crucially, this effectiveness was demonstrated despite the high degree of variability inherent in the design (e.g. not controlling levels of distraction or mediums on which the videos were viewed) and the high heterogeneity of participants recruited (e.g. in regards to demographic characteristics and smoking behaviours). This increases the external validity of our findings compared to previous similar studies that looked to recruit more homogeneous groups by selecting participants with very similar smoking behaviours and by excluding participants on the basis of age (e.g. Beadman et al., 2015).

The unexpectedly high attrition rates found in our study point toward the need for future studies wishing to employ a similar, online experimental design to carefully consider ways of reducing attrition (e.g. reducing number of scales used and assessment points; shortening interventions), as well as ways of ensuring attrition rates could be subjected to in-depth analyses where appropriate.

Finally, since participants not receiving any formal intervention were found to habitually rely mainly on distraction to manage their cravings, it may be important that future studies opt to use a ‘distraction’ group as a more meaningful comparison group against any intervention conditions, since this approach may lead to more clinically relevant findings.
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Fagerstrom test for nicotine dependence: A revision of the Fagerstrom tolerance

Hernández-López, M., Luciano, M. C., Bricker, J. B., Roales-Nieto, J. G., &


Appendix

Coding Frame

1) Antecedent-focused, disengagement strategies (AD)

Definition: All strategies aimed at avoiding approach of the craving-related distressing thoughts before these thoughts are experienced and distress is elicited.

These include:

a) **Situation selection (ADa)**: taking action to influence the probability of ending up in a potentially emotion-eliciting situation. For example, a smoker may choose to avoid spending lunch time with other colleagues who smoke in order to avoid experiencing cravings. Or a participant may indicate that they chose to minimize the window showing the video and looked at another screen on their computer while the video was playing.

b) **Situation modification (ADb)** involves attempts to change the external features of a situation in order to alter its emotional impact. For example, a participant may indicate that they removed ashtrays or lighters from their view while watching the videos.

c) **Distraction (ADc)** involves changing which aspects of a situation will be allocated attentional resources and will thus be the focus of cognitive processing. It involves replacing emotional with neutral information by moving attention away from a situation, focusing on certain aspects of a situation, or by changing internal focus.

Examples:

-“I focused on drinking my cup of tea”
-“I focused on what else was going on in the video rather than the act of smoking”
d) **Any other AD strategies** not identified in the literature (ADd).

2) **Antecedent-focused, engagement strategies (AE)**

*Definition:* Strategies that involve approach of emotional stimuli (craving-related thoughts) to change their form / topography and reduce the level of distress.

These include:

a) **Reappraisal (AEa):** Change the way one thinks about smoking, cravings and/or one’s capacity to cope with cravings to alter the emotional impact of craving-related thoughts. Any cognitive strategy aimed to change the form of craving-related thoughts in order to reappraise how desirable or appetitive smoking is and/or how unpleasant cravings are.

Examples:
- “I thought of the impact on others”
- “I thought of health consequences of smoking”
- “I imagined myself as a non-smoker”
- “I thought of past times where I coped with cravings”
- “Reappraisal”
- “thinking rationally”
- “thinking that these videos don’t affect me”

b) **Any other AE strategy** that may be identified in participants’ responses, such as rumination (AEb).
Example: “I kept thinking of how hard it is to cope with cravings”

3) **Response-focused, engagement strategies (RE)**

*Definition:* All strategies that involve approach of emotional information / stimuli without trying to change their content or reduce the distress.

a) **Acceptance (REa):** Changing the way one relates to cravings rather than trying to change the form or content of craving-related thoughts per se.

Examples:
- “I noticed my thoughts and let them go”
- “Acceptance”
- “Accepting and letting go”
- “Thought I do not have to ‘buy’ what these thoughts are telling me”
- “Ignore my cravings”
- “Cold turkey”

b) **Any other RE strategy (REb) which does not involve the willing embrace or active acceptance of cravings (e.g. “I try tolerate them”)**

4) **Response-focused, disengagement strategies (RD)**

*Definition:* All strategies that occur after the emotional response is fully generated and which aim to avoid its experience or expression.

These include:

a) **Suppression (RDa)** may be defined as the conscious inhibition of expressive and/or experiential aspects of emotional responses when emotionally aroused. Suggestions that people try not to think of or to get rid of craving-related thoughts. Responses suggesting focusing on other thoughts or activities should be coded as distraction, whereas responses merely suggesting “trying not to think of cravings” or trying to “push away” cravings
without suggestions of allocating attentional resources to another activity should be coded as suppression.

Examples:
- “I try to get cravings out of my mind”
- “Push these thoughts away”

b) **Smoking (RDb):** Suggestions that participants resorted to smoking to get rid of their cravings.

c) **Any other RD strategies (RDc).**

5) **No strategy (NS):** Suggestion that the participant did not do anything to regulate cravings when cravings are experienced.

Examples:
- “Nothing”
- “I have decided to smoke after this”

6) **No cravings (NC):** Suggestions that the person did not experience cravings so there was no cravings to be regulated.

Examples:
- “I have no cravings”
- “No cravings – video did not work”

7) **Other (O):** Any strategy that does not seem to fit in any other category within this coding frame.
4. EXTENDED PAPER

4.1. Background literature

4.1.1. Tobacco Smoking

History of tobacco smoking

Tobacco smoking refers to the burning and inhaling of smoke of the processed leaves of plants in the *Nicotiana* genus. The practice of tobacco smoking has a long history dating back to 5000-3000 BC when the plant was cultivated in Mesoamerica and South America (Gately, 2003). In its earliest usages tobacco was burnt and/or smoked not only for pleasure, but also as part of shamanistic rituals, as a social tool and as a medicine (Balls, 1962; Burns, 2007; Robicsek, 1979).

Tobacco use became popular among European settlers in the Americas, who engaged in heavy trade of the product. The tobacco industry met an enormous growth following the industrial revolution and the manufacturing of machines that could speed up cigarette production (Burns, 2007). This growth continued until the mid-20th century when scientific studies revealed the negative consequences of tobacco use (Doll & Hill, 1956).

Psychoactive properties of nicotine

Cigarette smoke contains over 4,000 chemicals including nicotine, tar, carbon monoxide, formaldehyde, ammonia, hydrogen cyanide and arsenic (U.S. Food and Drug Administration, 2012). Although nicotine is not the only addictive substance in tobacco, it is generally accepted that it is the main ingredient that causes addiction to smoking (U.S. Department of Health and Human Services [USDHHS], 1988).
Nicotine use is experienced as rewarding via its moderating properties on dopaminergic activities in the mesolimbic system (Clarke, 1990; Di Chiara, 2000; USDHHS, 1988). Nicotine stimulates nicotinic cholinergic receptors that facilitate neurotransmitter release leading to an alleviation of dysphoric mood and the production of pleasurable feelings while boosting memory and alertness (Balfour & Ridley, 2000; Benowitz, 2008; Pomerlau & Rosencrans, 1989). On the other hand, nicotine withdrawal has been linked to decreased brain reward function and to experiences of negative affect, anxiety, irritability, and craving (Benowitz, 2008; Epping-Jordan, Watkins, Koob, & Markou, 1998; Hughes, 2007; Piper & Curtin, 2006).

4.1.2. Smoking as an addiction

The most recently updated psychiatric diagnostic manual (American Psychiatric Association [APA], 2013) includes a chapter for “Substance-Related and Addictive Disorders” which is devoted to addiction or dependence related to 10 separate classes of drugs, including nicotine.

Over recent decades several definitions of the term ‘addiction’ have been proposed, reflecting the multifaceted nature of the phenomenon and the diverse theoretical perspectives it has been approached from. Some organisations prefer to use the term ‘dependence’ over the term ‘addiction’ because of its potentially pejorative use and connotations (e.g. World Health Organization [WHO], 1994). Nevertheless, the two terms will be used hereby interchangeably, in line with the US Department of Health and Human Services (1988) suggestion that ‘dependence’ and ‘addiction’ describe similar physiological and psychological processes that sustain drug use (USDHHS, 1988).

In a recent review of several proposed definitions for the term ‘addiction’, West (2013) concluded that most definitions involve: a) a description of addiction as involving a repeated powerful motivation to engage in a given activity, b) an understanding that this motivation has been acquired through prior learning, c) an acknowledgement that this activity has no survival value, and d) an
acknowledgement that substance use continues despite the harm (or risk of harm) it produces.

According to DSM-5 (APA, 2013), substance use disorders produce cognitive, physiological and behavioural symptoms as the individual engages in ongoing use despite significant substance-related problems. The DSM-5 has suggested four main clusters of symptoms relevant to the diagnosis of a substance-use disorder. These clusters relate to broad areas that involve impaired control over use of the substance, impairment in social functioning, pharmacological criteria (including cravings), and health risks associated with the use of the substance. Table 4 lists all criteria for the diagnosis of a tobacco-use disorder according to the DSM-5. As can be seen on Table 4, although the presence of cravings is assessed as part of the diagnostic process, it is not necessary for cravings to be reported in order for someone to be diagnosed as suffering from a tobacco use disorder.

Table 4

*Tobacco use disorder diagnostic criteria according to DSM-5.*

<table>
<thead>
<tr>
<th>Diagnostic Criteria</th>
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<tbody>
<tr>
<td>A pattern of tobacco use that results in at least two of the following symptoms, occurring within a 12-month period:</td>
</tr>
<tr>
<td>1. Tobacco is used in larger amounts or for longer periods than originally intended.</td>
</tr>
<tr>
<td>2. The smoker reports a strong desire to quit or regulate tobacco use, or unsuccessful efforts at doing so.</td>
</tr>
<tr>
<td>3. The smoker spends considerable amounts of time in obtaining or using tobacco.</td>
</tr>
<tr>
<td>4. The smoker reports cravings, i.e. a strong desire or urge to use tobacco.</td>
</tr>
<tr>
<td>5. Continued use of tobacco results in failure to fulfil role obligations at work, school or home.</td>
</tr>
<tr>
<td>6. The smoker continues to smoke despite ongoing interpersonal problems stemming from the use of tobacco.</td>
</tr>
<tr>
<td>7. Important or previously valued occupational, social and/or recreational activities are dropped or reduced because of tobacco use.</td>
</tr>
<tr>
<td>8. Tobacco is frequently used in situations where it is physically hazardous (e.g. smoking in bed).</td>
</tr>
<tr>
<td>9. Tobacco is recurrently used despite knowledge of a physical or</td>
</tr>
</tbody>
</table>
psychological problem that is likely to have been caused or exacerbated by its use.

10. Tolerance, as defined by either:
   a) The need to used markedly increased amounts of tobacco to achieve the desired effect.
   b) A diminished effect with continued use of the same amounts of tobacco.

11. Withdrawal, as manifested by either:
   a) The characteristic withdrawal syndrome of tobacco.
   b) Tobacco use or use of other similar products such as those containing nicotine to relieve withdrawal symptoms.

Specifiers:

A. Severity: Mild (two or three symptoms), Moderate (four or five symptoms), or Severe (six or more symptoms).

B. In early remission: criteria are no longer met for a period of 3-12 months following quitting (with the exception of ‘Cravings’ which may still be experienced).

In sustained remission: Criteria are no longer met for more than 12 months (with the exception of ‘Cravings’ which may still be experienced).

On maintenance therapy: The individual uses long-term maintenance medication (e.g. nicotine replacement therapy), and no criteria are met with the possible exception of Criteria 10 (Tolerance) and 11 (Withdrawal).

In a controlled environment: To be used if the person is in an environment where access to tobacco is not allowed.

To distinguish between symptoms associated with continued use of tobacco and symptoms experienced as a consequence of prior use during periods of abstinence or reduced use, the DSM-5 includes the separate diagnostic category of Tobacco Withdrawal disorder (DSM-5 Code: 292.0). It is reported that withdrawal symptoms begin within 24 hours of stopping or cutting down on tobacco use, reach their peak at two to three days after abstinence, and last two to three weeks. According to the DSM-5, approximately 50% of tobacco users who abstain for two or more days are expected to meet criteria for tobacco withdrawal disorder.

A note on the use of diagnostic manuals.

Although diagnostic manuals such as the DSM-5 are helpful in providing a comprehensive description of a clinical phenomenon by listing the various
symptoms associated with its presentation, their use needs to be considered with care when attempting to understand addictive behaviours (and mental health difficulties in general). Diagnostic manuals have not only been criticised for potentially contributing to stigmatisation and social exclusion (Conrad, 2007; Honos-Webb & Leitner, 2001), but they have also been shown to suffer from poor reliability and validity in regards to many of the diagnostic categories they propose (see Division of Clinical Psychology [DCP], 2013). In relation to addictive behaviours, psychiatric diagnostic manuals adopt a view of addiction as a biological disease, which—as will be shown below— is one among many approaches to understanding addiction in general and nicotine addiction in particular. Such an approach may contribute to a disempowering construal of addicted individuals, who may be viewed as ‘helpless’ victims of biological processes over which they have little or no control.

4.1.3. Smoking prevalence

A recent survey from the Office for National Statistics survey (ONS, 2016) showed that 19% of adults (20% of men and 17% of women) in the UK currently smoke. This figure represents a significant decrease compared to an average of 46% in 1974. The average cigarette consumption among smokers today is 11.4 cigarettes per day, which is also remarkably lower than the 16.8 cigarettes per day reported in 1974. Young adults were found to be more likely to smoke, with nearly a quarter of 16 to 34 year olds being current smokers compared to 11% of those 60 years old or older (ONS, 2016).

Those less likely to be smokers have been shown to be married adults (12%) and adults with a higher level of qualification such as a university degree (9%). Socio-economic status has also been found to be related to smoking with 30% of routine and manual workers reporting to be smokers (ONS, 2014). The Health Survey for England for 2013 (Health and Social Care Information Centre [HSCIC], 2014) revealed that adults living in the most deprived areas of the country
and those in the lower income quartiles were also more likely to be current smokers.

Most smokers start smoking during adolescence with two thirds of adult smokers reporting having started before the age of 18 and 83% reporting having started before the age of 20 (HSCIC, 2015a; Public Health England, 2015). Furthermore, 18% of secondary school children report having tried smoking on at least one occasion and 3% report being regular smokers (HSCIC, 2015a). While smoking among adolescents increases with age (HSCIC, 2015a), it has been shown that around 90,000 11 to 15 year olds report being regular smokers. Children are more likely to start smoking if they live with people who are smokers (HSCIC, 2015a). Each year more than 200,000 young people in the UK start smoking and between one-third and one-half of those who try smoking will become regular smokers (HSCIC, 2015a).

4.1.4. Health consequences of smoking

Smoking is the leading cause of preventable illness and premature death globally with approximately six million people around the world dying every year as a consequence of tobacco use or exposure to second hand smoke (World Health Organization [WHO], 2012). In England 17% of all deaths of people over 35 years old in 2014 were estimated to be attributable to smoking (Office for National Statistics [ONS], 2014).

Smoking, which affects nearly every organ of the human body, can cause cancer almost anywhere in the body, cardiovascular disease, lung disease (e.g. COPD), tooth decay and loss, type 2 diabetes mellitus, male infertility and decreased immune function. Smoking can also negatively affect female fertility and potentially impair a baby’s health before and after birth (USDHHS, 2014). Smoking costs to the National Health Service (NHS) in England approximately £2 billion per year (Action on Smoking and Health [ASH], 2014), with 4% of all hospital admissions in 2014/2015 estimated to be attributable to smoking (HSCIC, 2015b).
4.1.5. Quitting smoking

Approximately two-thirds of smokers report they would like to quit smoking and a quarter to half of them attempt to do so in a given year (ONS, 2009; West & Brown, 2012). Furthermore, 75% of smokers in the UK report having tried to quit at least once in the past and 21% of them report having made three or more attempts (ONS, 2009).

The most frequently reported reason why people want to quit smoking relates to present and/or future health concerns (62%), followed by social reasons (22%; including pressure from family/friends, advice from doctor, setting an example for children, effects on others and a conceptualisation of smoking as a ‘dirty habit’), financial cost (9%) and lost desire to smoke (5%) (Gilprin, Pierce, Goodman, Burns, & Shopland, 1992). Gilprin et al. (1992) also found that smokers who report both health and social reasons for wanting to quit smoking had a higher success rate at quitting (defined as abstinence for over one year) than those reporting only social or cost reasons, but not higher success rates than those reporting only health reasons for wanting to quit. In addition, smokers with intrinsic (i.e. health related) motivations have been shown to be more likely to successfully quit compared to smokers with extrinsic motivations such as social influence (Curry, Wagner, & Grothaus, 1990).

Although Gilprin et al. (1992) found no age differences in relation to social reasons cited for wanting to quit smoking, others have shown that social factors are more important among younger adults (e.g. Ho, 1998). In contrast to Gilprin et al.’s (1992) suggestion that different social factors all contribute (to a smaller or larger extent) to smoking cessation, Halpern and Warner (1993) found that among social reasons, setting a good example for children was related to successful smoking cessation but pressure from others was associated with a decreased likelihood of successful quitting. Despite the discrepancies in findings among the aforesaid studies, which can be explained partly due to methodological differences, they all show that both health and social factors need to be taken into account in the design and delivery of smoking cessation interventions.
Despite the evidence showing that most current smokers desire to quit, 60% of them report they would find it hard to last a whole day without smoking (ONS, 2013). The majority of smokers are likely to experience a lapse within a week of quitting, while four in five quit attempts are destined to fail (i.e. not last for more than a few weeks) (Japuntich, Piper, Leventhal, Bolt, & Baker, 2011; Public Health England, 2015; Zhu et al., 1996). Quitting success rates have been shown to be lower among those most addicted, younger smokers, and those who are less educated, with a lower income or with a mental health difficulty (Caponnetto & Polosa, 2008; Osler & Prescott, 1998; West & Brown, 2012). The chances of a smoker successfully quitting increase when important others also try quit smoking. More specifically, those chances increase by 67% when a spouse quits, 36% when a friend quits, 34% when a co-worker quits, and 25% when a sibling quits (Public Health England, 2015).

These figures suggest that although UK smoking prevalence is at an all-time low, there is scope for further improvements in smoking cessation outcomes. The present study aims to inform currently available smoking cessation treatments by understanding key processes associated with managing cravings to smoke.

The following section offers a working definition of cravings and reviews the evidence for cravings’ role in precipitating smoking lapses. The discussion on cravings will be followed by a review of the different treatments available to smokers and of how this study aims to make a contribution to the smoking cessation literature.

### 4.1.6. Cravings

**Definition of Cravings**

Similarly to ‘addiction’, the term ‘cravings’ has attracted considerable debate over the past seven decades (for a review see Skinner & Aubin, 2010). The
ambiguity surrounding the use of the term and lack of agreement with regard to its
definition has led some authors to question the value of maintaining its usage (e.g.
Hughes, 1987). Nevertheless, others have argued that the fact that cravings have
attracted so much attention suggests that it is an indispensable construct in the
study of addictive behaviours (Skinner & Aubin, 2010).

Among those who have argued in favour of retaining the use of the term is
Marlatt (1987), who conceptualised cravings as a form of psychological attachment
to the use of a substance, and defined it as “[T]he grasping quality of the mind as it
attempts to pursue its attachments” (p. 47). Marlatt (1987) proposed a distinction
between the terms ‘cravings’ and ‘urges’, suggesting that ‘cravings’ can be used to
describe the subjective desire for the pleasure effects of a drug and that ‘urges’
can be used to describe the intention to consume which may or may not occur
following craving. Nevertheless, Marlatt is the only theorist to have proposed such
a distinction, and hereby we will adopt Skinner and Aubin’s (2010) suggestion that
cravings and urges can be considered as synonyms that may be used to describe
the same processes.

Despite long-standing disagreements between different theorists, it is
generally accepted that craving is context dependent and is modulated by
individual differences (Skinner & Aubin, 2010). In line with the view of most
researchers, craving is understood as the conscious experience of a desire to use
a drug that is measurable by self-report (Drummond, 2001; Gass, Motschman, &
Tiffany, 2014; Mezinskis, Honos-Webb, Kropp, & Somoza, 2001; Sayette et al.,
2000). Support for this view has come from a recent meta-analysis (Gass et al.,
2014) which provided evidence in favour of Tiffany’s (1990) suggestion that drug
use becomes automatic over repeated administrations. Tiffany (1990) proposed
that cravings represent the activation of non-automatic cognitive processes which
come to the fore when tobacco is not available or when automatised smoking is
blocked during attempts to quit. Cravings are also conceptualised as emotional
states which have a motivational significance for the organism and which activate
response patterns with cognitive, behavioural and physiological correlates (Baker,
Morse, & Sherman, 1986; Sayette, Martin, Hull, Wertz, & Perrot, 2003; Shiffman, 2000).

**Cravings as predictors of smoking relapse**

Cravings are a common reason smokers report to account for their failure to abstain from smoking, with 12% citing cravings as the main reason for their relapse (ONS, 2009). The severity of craving for tobacco has been shown to increase prior to relapse (Allen, Bade, Hatsukami, & Center, 2008; Shiffman, Paty, Gnys, Kassel, & Hickcox, 1996) and several prospective studies have shown cravings to be predictive of relapse (Killen & Fortmann, 1997; O’Connell, Schwartz, Gerkovich, Bott, & Shiffman, 2004; Shiffman, Gnys et al., 1996; Shiffman et al., 1997). Cigarette cravings are reported to be the hardest withdrawal symptom to cope with during the initial weeks after quitting (West, Hajek, & Belcher, 1989) and although cravings decrease in intensity and frequency over time, successful quitters report that they continue to experience cravings for months or even years after quitting smoking (Daughton et al., 1999; Gritz, Carr, & Marcus, 1991).

In a recent meta-analysis of laboratory studies, Gass et al. (2014) found a significant (yet modest) association between cravings and tobacco use, which was stronger for smokers who were less dependent (i.e. those whose smoking behaviour may be assumed to be less automatised). In a review of the relationship between craving and tobacco use in smoking cessation studies, Wray, Gass and Tiffany (2013) found that 82 out of 117 analyses of this relationship were significant. Both reviews found considerable variation in findings among the included studies which were attributed to methodological differences. For example, Wray et al. (2013) found that the span of time between assessed craving and relapse in smoking cessation studies varied considerably (up to 12 months). Furthermore, the association between cravings and smoking was stronger when craving was assessed more closely in time to the relapse outcome. In regards to laboratory studies, Gass et al. (2014) suggested that findings varied on the basis of outcome measures used and that the relationship was stronger when
nonautomatic measures of tobacco seeking (as opposed to measures of tobacco consumption *per se*) were used.

On the basis of their findings, both Wray et al. (2013) and Gass et al. (2014) concluded that there is considerable evidence to suggest that although cravings cannot be considered as the sole determinants of smoking behaviours, there is ample support in favour of the notion that cravings play a significant role in smoking relapses. These findings point toward the necessity for future research to shed light into the relationship between cravings and tobacco use, as well as the importance for including craving regulation strategies as part of smoking cessation interventions.

4.1.7. Smoking cessation interventions, the importance they attribute to cravings and a review of their effectiveness

The following section reviews some of the major models of addiction, considers the smoking cessation interventions that stem from their theoretical premises, and discusses how cravings are conceptualised (and in some cases targeted) within each of these approaches. Models of addiction that attempt to understand the phenomenon at the individual level (i.e. in terms of the people involved and their circumstances) have been classified into ‘automatic processing theories’ and ‘reflective choice theories’, while other theories are described as representing attempts to adopt an integrative stance between these two extremes (for a review see West, 2013). Although this section reviews several models which have contributed to our understanding of cravings and their management, two integrative, psychological models (CBT and ACT) will be considered in greater depth due to: a) the particular emphasis they place on the regulation of cravings, and b) the reliance on their theory for the development of the interventions employed in this study.
4.1.7.1. Automatic processing theories

Automatic processing theories conceptualise addictive behaviour as the outcome of mechanisms that shape human behaviour, and they do not consider conscious decision-making as relevant to the development and maintenance of addictions. Two prime examples that are reviewed here include drive theories (such as the ‘disease model’ of addiction and the ‘serotonin theory of nicotine addiction’) and learning theories (such as those utilising the literature on classical and operant conditioning).

Drive theories

Drive theories are generally based on the assumption that addictive behaviours are linked to the operation of homeostatic mechanisms aimed at keeping physiological parameters within specified limits (West, 2013). For example, the serotonin theory of nicotine addiction emphasises that symptoms of nicotine withdrawal such as increased appetite for carbohydrates, depressed mood and aggression, resemble those of low serotonin concentrations in the central nervous system (Hughes, 2007).

Drug withdrawal theory, one of the most commonly cited theories of addiction, places emphasis on physical dependence, i.e. the process by which following physiological adaptation to the presence of a substance there is a physiological rebound that leads to aversive symptoms such as cravings when this substance is absent (e.g. Koob, Sanna, & Bloom, 1998). As the brain adapts to the effects of chronic use of nicotine, a state of homeostasis is created that requires the continued use of the substance in order to be maintained (De Biasi & Dani, 2011). Cravings are thus seen as arising out of withdrawal processes and as representing a signal to the brain that something important for its function is missing.
Other biological theories of addiction include inhibition dysfunction theories which maintain that addiction is associated with the impairment of mechanisms responsible for impulse control (e.g. Lubman, Yucel, & Pantelis, 2004).

The central idea behind all drive theories is that addiction involves impairments in brain structure or function which are responsible for experiencing cravings. Thus, cravings are at the heart of drive theories, and are understood as representing an urgent and overpowering desire to use the substance which stems from biological processes (Jellinek, 1960).

Although proponents of these theories do not regard counselling for cravings as irrelevant to the treatment process, it is generally assumed that medication (e.g. nicotine replacement therapy) is needed to treat withdrawal symptoms (e.g. Cahill, Stead, & Lancaster, 2011).

Nicotine Replacement Therapy (NRT) has been shown to significantly increase smoking cessation success compared to placebo and no NRT, irrespective of the form of administration (patch, inhalers, etc.; Silagy, Lancaster, Stead, Mant, & Fowler, 2004). NRT has also been associated with decreases in withdrawal levels and background craving (see Ferguson & Shiffman, 2009) but not for cue induced cravings (Morissette, Palfai, Gulliver, Spiegel, & Barlow, 2005; Tiffany, Cox, & Elash, 2000). Little evidence exists to suggest that NRT is equally effective for smokers of fewer than 10-15 cigarettes per day (Valery, Anke, Inge, & Johannes, 2008).

Other pharmacological treatments include the use of antidepressants (e.g. bupropion and nortriptyline) which have been shown to significantly increase the odds of smoking cessation compared to no treatment, but which have been associated with unpleasant side effects and are thus not generally recommended as frontline treatments for smoking cessation (Hughes, Stead, Hartmann-Boyce, Cahill, & Lancaster, 2014).

Counselling and medication have both been shown to be effective treatments and the majority of smoking cessations programs combine pharmacological treatments with some form of psychological therapy, as it has
been suggested that the combined effect of these methods may lead to better outcomes than either approach on its own (Fiore et al., 2008).

The focus of ‘disease models’ of addiction on the substance and its pharmacological effects has led to the medicalisation of addictive behaviours. Although this approach may explain why smokers continue to smoke despite their reported desire and efforts to quit, it does not explain why many people experience cravings and report relapsing due to cravings long after the withdrawal period (West, 2013). Furthermore, these approaches contain an implicit conceptualisation of the addicted individual as being out of control in regards to his/her drug-seeking behavior due to the overpowering influence of physiological processes and their cognitive and emotional correlates (such as cravings).

Such a conceptualisation of addicts as passive victims may be especially problematic as it may contribute to their disempowerment during the recovery process. For example, Fisher and Farina (1979) showed that alcoholics who are given a social learning explanation for their drinking addiction are less likely to use alcohol and/or other drugs to reduce emotional distress compared to those given a medical (e.g. genetic) explanation. It has also been suggested that the medical model may be especially problematic after an initial lapse, since its rationale for lapses could enhance the belief that someone is out of control, leading to a total relapse (Marlatt, 1985a).

**Conditioning models**

A common tenet of all conditioning models of addiction is that conscious decision-making is not an integral part of addiction-related processes. Conditioning models are based on learning theory and the principles of classical and operant conditioning as developed over the past century (for a book-length review see Martin & Pear, 2015). Within conditioning models, cravings are understood as unconditioned responses to nicotine withdrawal and / or as conditioned responses elicited by the presentation of stimuli that have been paired with the reinforcing effects of nicotine during past use (“withdrawal-related craving” and “cue-elicited
craving”; Drummond, 2000). Some conditioning models posit that drug use is maintained by the negative reinforcement associated with eliminating cravings (e.g. Wikler, 1948; Ludwig & Wikler, 1974), while within other models the emphasis is on the positive reinforcement associated with the rewarding effects of drug use (Stewart, de Wit, & Eikelboom, 1984).

In addition to the role of external cues in the elicitation of cravings to smoke, over the past few decades considerable attention has been allocated to the role of internal cues such as negative affect (NA). Negative affect has been defined as a “general dimension of subjective distress and unpleasurable engagement that subsumes a variety of aversive mood states, including anger, contempt, disgust, guilt, fear, and nervousness, with low NA being a state of calmness and serenity” (Watson, Clark, & Tellegen, 1988; p. 1063). Such mood states are considered ‘negative’ because they are experienced as unpleasant, typically motivating the individual experiencing them to engage at attempts to avoid or eliminate them (Carmody, Vieten, & Astin, 2007). The role of NA in smoking-related processes is reviewed in section 3.3.1.

Overall, conditioning models propose that smoking is reinforced via the rewarding effects of nicotine and/or the avoidance or elimination of aversive emotional and physiological states (such as cravings). Although the hypothesis that various stimuli elicit cravings due to past associations with smoking can explain why cravings persist long after withdrawal symptoms have subsided (Baker et al., 1986), cravings do not always lead to withdrawal symptoms or relapse (Gass et al., 2014).

The evidence-base in favour of interventions based on conditioning models is not extensive (Fiore et al., 2008; West, 2013). Nevertheless, several contingency management interventions and inpatient hospital programs have found increases in abstinence self-efficacy and rates (e.g. Hays et al., 2011; Higgins, Badger, & Budney, 2000; Higgins et al., 2006; Hodgkin et al., 2013).
4.1.7.2. Reflective choice theories

Reflective choice theories generally emphasise the role of conscious analysis of available options in a decision-making process that is assumed to determine behavioural outcomes. Although the operation of mechanisms outside of immediate awareness is not negated, ‘choice’ is still viewed as governing behaviour. Within these models, cravings are viewed as part of the decision-making context, i.e. as negative emotional states which affect or bias thinking.

This family of approaches includes models that consider choice as rational (e.g. Edwards, 1961) or as biased (e.g. Skog, 2003). Edwards’ (1961) Subjective Expected Utility Theory (SEU) proposes that when individuals consider their options they assign a ‘utility’ value to alternative courses of action. This process also involves weighing the probability of occurrence of each outcome before choosing the option with the highest sum of the weighed utilities. Becker and Murphy (1988) expanded the model by introducing the concept of ‘discounted utility’, i.e. the assignment of a lower value to events located further in the future. In support of this theory it has been shown that while some addicts perceive their lives as better with their addiction than without (Davies, 1997), providing incentives and disincentives may at least temporarily affect choices (Lussier, Heil, Mongeon, Badger, & Higgins, 2006). On the other hand, educational interventions have been shown to have little or no effect (Flay, 2009) and expected ‘utilities’ have not been shown to sufficiently predict relapse (Mooney, Fromme, Kivlahan, & Marlatt, 1987).

‘Biased choice’ theories such as Skog’s (2003) unstable preference theory posit that addicted individuals express different preferences in different contexts (e.g. Skog, 2000) influenced by an affect heuristic which leads to an underestimation of the risks/costs of using a substance due to the strong desire to use that substance. Preferences are seen as unstable over time and decision-making is considered to be subject to cognitive and emotional biases. Support for ‘biased choice’ theories comes from studies that have shown that emotional states affect choices (Pfister & Bohm, 2008) and that addicted individuals seem to be influenced by such biases that may promote addiction (Field & Cox, 2008).
Although these theories do not assign a central role to the understanding and management of cravings, they are discussed because of their treatment implications. More specifically, these models suggest that treatment should be aimed at mitigating the effect of biases, e.g. by teaching addicted individuals ways to reduce attentional biases and by developing techniques to reduce the tendency to irrationally discount contradictory information (Fadardi & Cox, 2009; Wiers, Rinck, Kordts, Houben, & Strack, 2010).

4.1.7.3. Integrative approaches

Integrative approaches include theories that combine elements from the above described models to describe “mechanisms in which factors and internal states and traits interact to generate conscious and unconscious motivations based on seeking pleasure or avoiding discomfort” (West, 2013; p. 61). One example is Baumeister and Vohs’ (2007) self-regulation model whose central tenet is that mental resources needed for self-control are finite and can be depleted (‘ego depletion’) leading to a subsequent reduction in the capacity for exercising self-control. According to this model, treatment should involve psychoeducation alongside interventions for developing self-regulation skills and combating sources of ego depletion such as stress and fatigue.

Another such theory is the excessive appetites model (Orford, 2001) in which addiction is viewed as an ‘appetite’ for certain experiences, with ‘appetitive consumption’ hypothesised to increase to the extent that incentives are great and disincentives are weak. The model proposes that conflict between engaging and not engaging in a specific addictive behaviour leads to poor information processing, demoralisation and to changes in social roles which amplify the addiction process.

These models suggest that when attempting to quit there is conflict which depletes the ego of its resources and which causes information processing biases that distort the person’s motivational system making it more likely for the person to smoke. The following sections describe in greater length two integrative,
psychological models that have been applied to smoking cessation and which place cravings at the heart of their theory.

Cognitive Behaviour Therapy (CBT) for smoking cessation

Cognitive Behavioural Therapy is an umbrella term used to describe a family of therapeutic approaches which emphasise the role of cognitive processes in the development and maintenance of mental health difficulties in general and addictive disorders in particular. These approaches are largely based on the work of A. Beck (1976) whose cognitive model proposes that emotional distress stems from the way events are appraised, i.e. the meaning they hold for the individual, rather than the nature of these events per se. Appraisals of events are hypothesised to be encased in cognitions (i.e. thoughts and images) which can be made accessible through therapeutic interventions. Advocates of the model employ a range of cognitive, behavioural and experiential techniques to help their clients reappraise the meaning of emotion-eliciting events and thus to restructure maladaptive / dysfunctional cognitions (for a book length review of CBT see Beck, 2011).

The role of appraisal in emotion

In line with appraisal theories of emotion (e.g. Lazarus, 1991; Lazarus & Folkman 1984; Folkman & Lazarus, 1985), Beck (1976) proposed that emotional responses elicited in a given situation are associated with the way that event is appraised. Cognitive appraisal has been defined as the “process through which the person evaluates whether a particular encounter with the environment is relevant to his or her well-being, and if so, in what ways” (Folkman, Lazarus, Dunkel-Schetter, DeLongis, & Gruen, 1986; p. 992). In that sense, appraisal theories of emotion conceptualise appraisals as inherently transactional processes and define them as the “…products of how people construe (appraise) their ongoing transactions with the environment” (Folkman & Lazarus, 1985; p. 152). Emotions are thus understood as adaptive responses to the environment which signify (via
the associated appraisals) the importance of environmental events for the organism’s well-being.

Beck (1976) suggested that appraisals are formed through *syllogisms*, a term originating in the study of logic. Each syllogism consists of a minor premise (often relating to the facts of a given situation), a major premise (often referring to a rule acquired in the past and that can be applied to make sense of a given situation), and a conclusion (the appraisal of a given situation, i.e. the sense-making of or personal meaning attached to a given person-environment encounter). Maladaptive appraisals, which may stem from erroneous premises or invalid conclusions drawn from the premises in a person’s syllogisms (Beck, 1976), are hypothesised to be at the core of all emotional as well as addictive disorders (Beck, Wright, Newman, & Liese, 1993).

According to Lazarus (1991) cognitive appraisals consist of *primary* and *secondary appraisals*. Primary appraisals refer to the evaluation of whether there is something important at stake within a given person-environment encounter, i.e. of whether there is a possibility of some harm or benefit to one’s self-esteem, values and/or goals. Secondary appraisals refer to evaluations of whether there is something that can be done to avoid harm or maximize benefits. Secondary appraisals involve an evaluation of strengths and resources to counter the threat and an evaluation of coping options (Folkman & Lazarus, 1985; Lazarus, 1991).

The combined consideration of primary and secondary appraisals determines whether a situation will be appraised as potentially harmful, beneficial or neutral to the person’s well-being. Many situations elicit contradictory emotions and appraisals, in that they are appraised as potentially harmful and beneficial at the same time (Folkman & Lazarus, 1985).

When a specific person-environment interaction is appraised to be potentially harmful, coping efforts ensue in order to change the external environment that was appraised as problematic (*problem-focused coping*) and/or to regulate one’s distressing emotions (*emotion-focused coping*; Folkman & Lazarus, 1980, 1985). Individuals are considered more likely to resort to emotion-focused
coping when the distress-eliciting situation is appraised as non-changeable (Folkman & Lazarus, 1980).

Although the attribution of such importance on appraisal processes may seem to suggest that these theories assume a causal role for appraisal in the generation of emotion, most appraisal theories of emotion assume that the relation between appraisal and emotion is more likely to be bidirectional (for a review see Moors, Ellsworth, Scherer, & Frijda, 2013). Emotions (or emotional episodes) are conceptualised as processes (rather than states), which involve changes in a number of subsystems or components. These components include cognitive appraisals, a motivational component (with associated action tendencies), a somatic component (with associated physiological responses), a motor component (with associated expressive behavior) and a feeling component that consists of the subjective experience (see Moors et al., 2013). Although changes in any component feed back to the other components, appraisals (which may be conscious or automatic) are thought to act as determinants of the intensity or quality of the other components and as mediators of the feeling component (Fridja, 2007; Lazarus, 1991).

Reappraisal

Reappraisal has often been used as a term to describe an overarching category of interventions aiming at the modification of emotion-eliciting cognitions (e.g. Denny & Ochsner, 2014). Others have described reappraisal as one of many cognitive strategies for achieving cognitive change (e.g. Gross, 1998a; Wolgast, Lundh, & Viborg, 2013). Reappraisal can be loosely defined as the process by which people change the way they think about something in order to change the way they feel about it. Since a stimulus is problematic on the basis of it being appraised as such, and since cognitive restructuring is considered to progress via identification and modification of these original appraisals (Beck, 1976), in the present study reappraisal will be used to describe all those techniques aimed at
cognitive restructuring. Therefore, reappraisal is conceptualised as the process and cognitive change as its outcome.

Within the CBT literature, various reappraisal strategies have been widely employed to challenge the validity and/or functionality of the way an emotion-eliciting stimulus is appraised (e.g. Beck, 1976; Blackburn & Twaddle, 1996; Clark, 1997). Indeed, various CBT proponents have emphasised the need to focus on metacognitive appraisals of how holding onto certain ways of thinking may impact a person’s efforts to reach important life goals (e.g. Flavell, 1979; Wells, 2000). In a recent review of the literature on reappraisal (Beck, 1976; Blackburn & Twaddle, 1996; Clark, 1997; Lazarus & Folkman, 1984; McRae, Ciesielski & Gross, 2012; Salkovskis, 1996; Wol gast et al., 2013), Stephanopoulos and Gresswell (manuscript in preparation) identified five main types of reappraisal, each of which may be divided into further subtypes (see Table 5).

Table 5

*Types of reappraisal identified by Stephanopoulos and Gresswell (manuscript in preparation).*

<table>
<thead>
<tr>
<th>Reappraisal Type</th>
<th>Reappraisal Subtype</th>
<th>Sample Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Facts-based reinterpretation</td>
<td>1) Facts-based reinterpretation</td>
<td>1) - Is this what I first made it out to be?</td>
</tr>
<tr>
<td>2) Situation-specific personal significance reappraisal</td>
<td>2a) Distancing reappraisal</td>
<td>2a) - Does this really affect me?</td>
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<tr>
<td></td>
<td>2b) Negative consequences reappraisal (present- and future-focused)</td>
<td>2b) - Is this bad for me?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Is it really as bad as I first made it out to be?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Is it likely to get better?</td>
</tr>
<tr>
<td></td>
<td>2c) Constructive reappraisal (present- and future-focused)</td>
<td>2c) - Are there any positives to this situation?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Is it likely there might any future gains as a result of this situation?</td>
</tr>
<tr>
<td>3) Coping reappraisal</td>
<td>3a) Coping self-efficacy reappraisal</td>
<td>3a) - Can I do something to cope with this?</td>
</tr>
<tr>
<td></td>
<td>3b) Availability of rescue factors reappraisal</td>
<td>3b) - Is there anyone who can help me cope?</td>
</tr>
<tr>
<td>4) Overall significance reappraisal</td>
<td>4a) Wider context reappraisal</td>
<td>4a) - Can I still reach my other life goals?</td>
</tr>
<tr>
<td></td>
<td>4b) Positive reappraisal</td>
<td>4b) - Am I better off overall, in spite what happened?</td>
</tr>
<tr>
<td></td>
<td>4c) Passive acceptance reappraisal</td>
<td>4c) - Given what has happened, is there a way to move forward?</td>
</tr>
<tr>
<td>5) Metacognitive reappraisal</td>
<td>5a) Functionality of cognitions reappraisal</td>
<td>5a) - Is thinking this way helping me?</td>
</tr>
<tr>
<td></td>
<td>5b) Reappraisal of the thinking process</td>
<td>5b) - Is thinking about this helping me?</td>
</tr>
<tr>
<td></td>
<td>5c) Decentering</td>
<td>5c) - Are my thoughts anything more than mere ideas?</td>
</tr>
</tbody>
</table>
As can be seen on Table 5, these reappraisal strategies may aim to change the form of the emotion-eliciting thought by changing primary or secondary appraisals related to how accurate one’s perception of events is (‘facts based reinterpretation’), how threatening a situation actually is (‘situation-specific personal significance reappraisal’) and how able one is to cope with that threat (‘coping reappraisal’). Furthermore, one may consider the degree of positive challenge an emotion-eliciting event holds for oneself (‘overall significance reappraisal’). Alternatively, one may engage in metacognitive reappraisals of how helpful it is to hold onto certain negative appraisals as well as how helpful it is to rely on thought processes to resolve a challenging situation (Stephanopoulos & Gresswell, manuscript in preparation).

Certain subtypes of these reappraisal strategies may be particularly relevant in terms of responding to cravings. For example, a smoker who might be thinking “a cigarette would taste good right now”, may reappraise how pleasurable smoking would be by thinking of it as a dirty habit, by thinking how bad his/her clothes and breath will smell, and that it will leave a bad taste in his/her mouth (‘facts-based reinterpretation’). In addition, a smoker who appraises cravings as terrible, may reappraise this thought by focusing on the short- and long-term consequences of smoking (and of not smoking), or by considering that cravings are not going to last long and their impact is likely to be short-lived (‘past-’ and ‘present-focused negative consequences’ and ‘constructive reappraisal’). Furthermore, when a smoker thinks he/she cannot cope with his/her cravings, he/she may consider past experiences of managing withstanding severe cravings (‘coping self-efficacy reappraisal’). A smoker may also consider how experiencing cravings relates to other important life goals, some of which may be within one’s reach despite or even in spite of cravings (‘wider context’ and ‘positive reappraisals’). Finally, one may question the value of thinking about cravings, and of thinking that one has to ‘figure their way out’ of the distress (‘functionality of reappraisal’ and ‘reappraisal of the thinking process’). As will be evident below, these subtypes of reappraisal are widely employed by CBT and ACT therapists in order to change the way smokers think about cravings and smoking.
CBT models of addiction in general and smoking addiction in particular

Two of the most influential CBT models of addiction have been Beck et al.’s (1993) cognitive therapy of addictions and Marlatt and Gordon’s (1985) relapse prevention model. Although not specifically developed for smoking, on the basis of their premise that common processes (such as common types of beliefs and thinking errors) underlie all addictions they have been used to inform many smoking interventions and they have inspired smoking-specific models (e.g. Perkins, Conklin, & Levine, 2008).

Both Beck et al. (1993) and Marlatt and Gordon (1985) conceptualise cravings as conditioned emotional responses (with cognitive, physiological, behavioural and subjective feeling components) that are strengthened by underlying dysfunctional beliefs regarding smoking. Cravings are seen as governed by their anticipated consequences and according to Beck et al. (1993), beliefs “help to form the expectation, which then moulds the urge” (p. 32). For Marlatt (1985b) exposure to smoking cues elicit craving responses that are appetitive in nature since cravings are thought to be developed under the sway of positive outcome expectancies, i.e. beliefs developed through past use that are centred on the pleasure associated with smoking. Positive outcome expectancies associated with smoking have been shown to hinder initiation of quit attempts and to predict relapse (Vangeli, Stapleton, Smit, Borland, & West, 2011).

Beck et al. (1993) maintain that addictive beliefs may present in clusters of ideas centred on both pleasure and relief seeking. Their content, therefore, may consist of ideas both about how one needs a substance to relieve tension as well as expectations of how smoking would improve one’s functioning. Thus, cravings may be expected to be accompanied by positive affect when the person anticipates a reward, or by negative affect associated with the anticipated unpleasantness of cravings.

Furthermore, both Beck et al. (1993) and Marlatt (1985b) suggest that decisions to abstain from smoking give rise to a conflict of motives. Beck et al. (1993) describe this conflict as originating in contradictory cognitions (e.g. “I should
quit smoking” versus “I deserve a cigarette”) often operating at the same time. The ‘choice’ of relapse represents a decisional conflict between the desire for immediate gratification and the fear of delayed negative consequences (see Ainslie, 1975). In essence, the decision to smoke represents an approach-avoidance conflict (for reviews see Corr, 2013; Elliot & Covington, 2001) for a smoker who wishes to quit, and it involves both desirable and undesirable consequences associated with smoking and abstaining. Janis and Mann’s (1977) conflict model of decision making proposes that this conflict causes psychological stress inherent in making decisions that have important consequences. The conflict creates extra distress which may tip the balance in favour of smoking (Beck et al., 1993; Marlatt, 1985b).

Emotional distress biases information processing and both models propose that several cognitive distortions or defensive patterns are employed to reduce this distress by ‘giving permission’ to smoke. Marlatt (1985b) suggested that decisions involving emotionally arousing thoughts (‘hot cognitions’) may be associated with simplified or shallow thinking and the consideration of fewer alternatives. Attentional resources are focused on certain desired outcomes and are not devoted to the negative consequences of smoking (“tunnel vision”; see Beck, 1993). According to Marlatt (1985b), under the influence of cravings maladaptive coping patterns may occur that involve ‘bolstering’ the least objectionable alternative through rationalisations and denial. For example, the smoker may exaggerate the reward value of smoking, may minimise the extent of loss (“one cigarette won’t hurt”), may be in denial of aversive feelings and/or of negative outcomes associated with smoking, and he/she may construct a number of excuses to rationalise their indulgence (e.g. “I deserve a cigarette”). In support of the idea that information processing is biased when evaluating the benefits and disadvantages of drug use, it has been shown that under the influence of cravings some individuals become oblivious to the negative consequences of drug-use (Gawin & Ellinwood, 1988). It has also been suggested that individuals are more likely to be influenced by expected immediate effects and neglect the potential delayed negative effects (Ainslie, 1975).
Alongside cognitive distortions, another presumed factor increasing the chances of relapse is decreased self-efficacy in coping with cravings (Marlatt, 1985b). Marlatt (1985b) defined self-efficacy as a cognitive process which “…deals with perceived judgments or evaluations people make about their competency to perform adequately in a specific task situation” (p. 129). Self-efficacy is thus conceptualised as a situation-specific and context-dependent process which affects the effort expended in certain situations: “In the face of difficulties people who entertain serious doubts about their capacities slacken their efforts or give up altogether, whereas those who have a strong sense of efficacy exert greater effort to master the challenges” (Bandura, 1981; p. 201). Self-efficacy in coping with cravings and quitting smoking has been shown to mediate the effectiveness of counselling for smoking cessation (Schuck, Otten, Kleinjan, Bricker, & Engels, 2014) and to predict successful abstinence for periods up to 12 months (Baer, Holt, & Lichtenstein, 1986; Gwaltney, Metrik, Kahler, & Shiffman, 2009; Schnoll et al., 2011).

A person’s sense of self-efficacy in coping with cravings is threatened when he / she finds himself / herself in a ‘high-risk situation’, which Marlatt (1985a) broadly defined as “any situation that poses a threat to the individual’s sense of control and increases the risk of potential relapse” (p. 37). Such high-risk situations include negative affective states, cravings and interpersonal conflict which represent the most commonly cited determinants of relapse (Marlatt & Gordon, 1985). The probability of an initial lapse increases when the lack of adaptive coping skills in a high-risk situation is combined with positive outcome expectancies (Marlatt, 1985b). Shiffman (1984) found that individuals on the brink of relapse experience declines in self-efficacy that are comparable among those who go on to relapse and those who do not, suggesting it is not actual relapse that affects self-efficacy but rather the thoughts of relapsing.

According to CBT models of addiction, environmental context, underlying beliefs, automatic and permission giving thoughts, all interact as parts of maintenance cycles of distress that increase the chances of a lapse/relapse during quit attempts. According to Beck et al. (1993) certain situations (such as those
identified as ‘high risk’ by Marlatt, 1985c) may act as activating stimuli that by virtue of one’s learning history may elicit cravings. When the person comes across stimuli that have been associated with smoking, underlying beliefs about smoking are activated giving rise to smoking-related automatic thoughts (e.g. thoughts about wanting to have a cigarette or images of oneself smoking). The person may initially experience cognitions underlined by anticipatory beliefs about the rewards of smoking accompanied by pleasant sensations of anticipation of pleasure. These thoughts and feelings often give way to cognitions underpinned by relief-oriented imperative beliefs according to which the person is unable to cope with cravings and that smoking is necessary to relieve craving-related distress. The anticipation of pleasure or relief from smoking gives rise to conflict associated with concurrent, contradictory beliefs and behavioural tendencies. The craving intensifies out of this conflict leading to smoking-permissive thoughts (E.g. “I deserve it”) which legitimise smoking, to the development of instrumental plans (obtain cigarettes) and then smoking itself. This affects the person’s sense of self-efficacy in coping within such high-risk situations in the future (Marlatt, 1985c) and reinforces habit-maintaining underlining beliefs which thus act as self-fulfilling prophecies (Beck et al., 1993).

CBT approaches to smoking cessation attempt to intervene at various points to break such cycles of habit maintenance. In regards to the management of cravings these interventions range from stimulus control strategies (e.g. avoidance of places where people smoke, getting rid of ashtrays, etc.) in order to reduce the frequency of cravings, to direct cognitive interventions targeting the form of problematic cognitions with an aim to reduce the craving-related distress. Clients are taught to identify and distance themselves from the content of craving-related appraisals and smoking-relevant beliefs, and to reappraise their content or functionality using various reappraisal techniques as described in the previous section. As cravings tend to be automatic, therapy seeks to create a delay between cravings and smoking, and to use that delay as an opportunity window for therapeutic interventions (Beck et al., 1993). Imagery techniques such as saying ‘Stop’ and imagining a ‘stop’ sign may help in creating this distance and could be used to stop craving thoughts as they develop (Beck et al., 1993). Next, in order to
identify smoking-related thoughts the person is instructed to consider “what is going through their minds”, which has been described as the cardinal question of CBT (Beck, 2011).

Once automatic thoughts regarding how pleasurable smoking is or how unpleasant cravings are have been identified, the person is instructed to examine their validity by considering all the available evidence, often through a cost-benefits analysis of smoking (Marlatt, 1985c). The person is taught to answer back to craving-related thoughts by use of positive self-talk and/or flashcards which summarise the contents of this analysis. Similar attempts at 'neutralising' such thoughts involve countering them with thoughts or images related to the negative consequences of smoking: “To help remind clients of the delayed negative reactions, a 'referenting' procedure can be employed. Each time they think of the immediate positive outcomes, clients are instructed to immediately use that as a referent for the long-range negative consequences… In order for referenting to be effective, the association between the immediate and delayed effects must be continuously repeated, like paired associates in a verbal learning task” (Marlatt, 1985c; p. 242). In addition, CBT clients are also taught to identify and correct cognitive distortions. Techniques targeting permission giving thoughts often take the form of a debate during which arguments are countered with counterarguments (Beck et al., 1993).

Effectiveness of CBT for smoking cessation

In a recent review, CBT was shown to be an effective treatment for tobacco addiction (Hofmann, Asnaani, Vonk, Sawyer, & Fang, 2012) and U.S. Public Health Service clinical guidelines recommend it as the choice psychological treatment (Fiore et al., 2008). CBT models are the most frequently used psychologically-informed approaches in smoking relapse intervention studies (see Hajek, Stead, West, Jarvis, & Lancaster, 2009; Song, Huttunen-Lenz, & Holland, 2010). Nevertheless, this success is only modest since relapse rates remain high among those who receive such formal interventions (Fiore et al., 2008).
It has been suggested that traditional, CBT-informed approaches that include elements of distraction, avoidance, etc., may have only modest success (abstinence rates 20-30%) because triggers are omnipresent and avoidance does not tackle the underlying problem (Brewer, Elwafi, & Davis, 2013). The addictive loops are thus not diminished, but remain dormant until activated at a later time (Brewer et al., 2013; Scott & Hiroi, 2010). In their meta-analysis, Song et al. (2010) identified very few studies reporting data on process variables and that programs typically comprised of several interacting components based in different theories (e.g. coping skills training, self-regulation, problem solving, abstinence violation effect, cue exposure, health beliefs, trans-theoretical model, contingency management, mood management and social support).

The inclusion of a variety of techniques which attempt to achieve different outcomes (e.g. reduction of the frequency of cravings via avoidance of triggers vs. approach strategies such as reappraisal) is problematic, especially without a coherent theory and clinical guide of when each of these strategies is most useful.

An alternative approach to developing and testing broad, multi-component treatments in the field of smoking cessation, would be to inductively build such intervention models on the basis of experimental “micro-studies” (Hayes, Luoma, Bond, Masuda, & Lillis, 2006) investigating the effectiveness and inter-relations of key techniques in controlled laboratory settings.

**Acceptance and Commitment Therapy (ACT)**

While traditional CBT models place emphasis on changing maladaptive or dysfunctional thought processes in order to reduce emotional distress, ACT proponents regard attempts at cognitive control as futile or even as counterproductive (Hayes, Strosahl, & Wilson, 2012; Hayes, Wilson, Gifford, Follette, & Strosahl, 1996). Attempting to achieve cognitive change via use of the cognitive, reason-giving apparatus is described as playing a “rigged game” (Hayes, 2004a; p.19) and fighting against one’s unpleasant internal experiences is considered as more harmful than the experiences themselves (Hayes, 2004b).
According to ACT theory, all attempts to avoid experiential distress belong to the functional response class of *experiential avoidance*. This operant response class includes all behaviours aiming to alter the form (or topography) of negatively appraised private events (thoughts, emotions and bodily sensations) and/or the contexts within which they occur in order to control their impact (Hayes et al., 1996). Experiential avoidance is assumed to be linked to behavioural inflexibility, i.e. to the rigid adherence to overlearned behavioural patterns which may hinder efforts at reaching valued goals. A smoking lapse may thus be conceptualised as a form of experiential avoidance, serving the function of reducing internal distress by eliminating cravings (Minami, Bloom, Reed, Hayes, & Brown, 2015). The role of experience avoidance with regard to smoking is discussed in section 3.1.2.

ACT promotes itself as a model of *psychological flexibility* that teaches individuals techniques to respond flexibly in the presence of aversive private events in order to achieve important life goals. In order to learn to respond flexibly, the person needs to develop an attitude of *acceptance*, which is conceptualised within ACT as one of six key processes that lead to psychological flexibility, alongside *defusion, self-as-context, flexible attention to the present, values* and *committed action* (see Hayes et al., 2012).

Within the ACT literature the concept of acceptance has been described both as a behaviour or strategy to promote psychological flexibility and as an attitude or stance which is a pre-requisite for responding flexibly and which may be developed through a range of experiential exercises and verbal techniques (e.g. mindfulness, metaphors and psychoeducation). For example, Hayes et al. (2012) defined acceptance as “the voluntary adoption of an intentionally open, receptive, flexible, and nonjudgmental posture with respect to moment-to-moment experience” (p. 272), before suggesting that acceptance is better conceptualised as a “STANCE”, i.e. as an outcome developed by various techniques that may foster an “open posture to psychological experiences” (p. 272). To avoid confusion in the reader, it may be helpful to clarify that acceptance is in the context of the present study conceptualised as a behavioural response class that involves an active *willingness* on clients’ behalf to “lean forward” and non-judgmentally “embrace the
very things they most dread” (Hayes & Wilson, 1994; p. 296). In the context of this study, acceptance is considered as the outcome of various techniques, similarly to the way that cognitive restructuring was described as the outcome of reappraisal strategies. For reasons of parsimony, ‘acceptance’ will be used to describe all these techniques that are described within ACT manuals as promoting an attitude of acceptance.

ACT proponents suggest that ‘acceptance’ represents a radically new way of responding to unpleasant private events which is a better alternative to cognitive control (Hayes, 2004a). The aim of acceptance is to reduce the contextual control of private events over one’s behaviour by changing the way one relates to those events rather than their content. Thus, acceptance is not seen as a goal in itself, but rather as a means to enhance one’s psychological flexibility allowing the individual to perform new or more adaptive responses in the presence of unpleasant private events. In relation to smoking cessation, acceptance interventions do not aim to reduce the intensity of one’s withdrawal symptoms and cravings, but to enable the individual to engage in new responses in the presence of cravings, which do not involve smoking (see Beadman et al., 2015; Gifford et al., 2004).

Closely linked to the concept of acceptance is that of cognitive defusion. Defusion is defined as the process through which the person’s attachment to the content of his/her thoughts is reduced in order to enable him/her to separate cognitive processes from their products and be able to relate to these thoughts dispassionately. Although acceptance and defusion are described as separate processes, Hayes et al. (2012) consider that “[a]cceptance and defusion work are so closely intertwined that they sometimes seem interchangeable during treatment. It is not always clear whether the client’s primary issue is one of a low acceptance or high fusion. Most of the time, low acceptance and low willingness signal that the client is fused with some unacceptable private material” (Hayes et al., 2012; p. 292). In other words, defusion strategies create the context for acceptance and low levels of acceptance may inhibit the client’s ability to engage with and learn defusion techniques. Defusion techniques include treating thoughts as ideas one is
experiencing (“I am having the thought I want to have a cigarette”) rather than non-critically identifying with their content (“I want to have a cigarette”), mindfulness exercises, and metaphors (e.g. stories helping the person make the distinction between ‘having thoughts’, ‘holding thoughts’, ‘buying thoughts’).

Mindfulness exercises used within ACT also aim to help clients increase their present-moment awareness: “[a]cceptance requires that the client stays present and not drift off as part of an avoidance manoeuvre. Therefore, many acceptance interventions begin by getting the client into the present moment” (Hayes et al., 2012; p. 293).

ACT approaches to smoking cessation initially involve the provision of psychoeducation to clients regarding external and internal triggers associated with smoking. Clients are instructed to change what they can change (e.g. getting rid of ashtrays) and accept what they cannot change (e.g. negative affect) (Gifford et al., 2004). Furthermore, ACT clients are engaged in values clarification exercises during which they examine how quitting serves their valued goals in life and they identify what sort of actions and relevant commitments would help them reach these goals (Gifford et al., 2004; Hernandez-Lopez, Luciano, Bricker, Roales-Nieto, & Montesinos, 2009). Mindfulness exercises are also typically employed to enhance clients’ awareness of problematic internal stimuli and to develop their ability to observe and accept their cravings (Gifford et al., 2004). Defusion exercises and metaphors are also utilised to change the way clients relate to their cravings and their rationalisations for smoking (Beadman et al., 2015; Gifford et al., 2004; Hernandez-Lopez et al., 2009). A frequently used exercise involves asking clients to describe their thoughts factually to themselves (e.g. “I notice I am having the thought that I want to have a cigarette”) and ‘separate’ themselves from their content (e.g. Beadman et al., 2015).

**ACT effectiveness for smoking cessation**

In preliminary studies that compared ACT with CBT or NRT, it was shown that ACT interventions may be at least as effective as these more established
treatments (Gifford et al., 2004; Hernandez-Lopez et al., 2009). However, these studies were not fully powered, which may be a possible explanation for not finding significant differences. In a pilot randomised controlled trial comparing internet-delivered ACT with the U.S. national standard for web-based smoking cessation interventions (WebQuit.org) developed on the basis of national guidelines (Fiore et al., 2008) it was shown that more than twice as many participants in the ACT arm had quit smoking at a three-month follow-up (Bricker, Wyszynski, Comstock, & Heffner, 2013).

As mentioned in section 3.1.2., the area of theoretical overlap between ACT and CBT has been the subject of debate. In addition to these comments, it may be mentioned that in a recent systematic literature review of ACT-based RCT protocols, Stephanopoulos and Gresswell (2015; manuscript in preparation) found that acceptance-based techniques relied heavily on the use of reappraisal in order to promote an attitude of acceptance. The authors of the review concluded that ACT therapists typically relied on reappraisal strategies to reduce the intensity of distress aiming to render an experience as “tolerable” (e.g. by trying to increase a person’s sense of self-efficacy in coping with a negatively appraised stimulus).

4.1.7.4. Emotion Regulation

The last two decades have seen a rapid development in the field of emotion regulation which today represents one of the fastest growing areas within the field of psychology (Koole, 2009; Gross, 2013; Tamir, 2011). The clinical utility of emotion regulation models is demonstrated by research showing that emotion dysregulation is integral to psychopathology in anxiety, mood and substance use disorders (for reviews see Campell-Sills, Ellard, & Barlow, 2014; Joorman & Siemer, 2014; Kober, 2014). Gross’ (1998a; 1998b; 2014) emotion regulation model, which has been developed on the basis of this accumulating body of evidence, can provide a theoretically coherent framework for the integration of clinical models such as CBT and ACT. It may therefore be used as a starting point for the development of new smoking cessation interventions. Such an inductive
approach to theory building could lead to a better understanding of how different strategies can be used in different contexts to help smokers manage cravings and quit smoking. Such an approach may also be able to answer questions that are left unanswered when applying multi-component models developed in other areas of clinical interest without an evidence-based understanding of how their components are linked to mechanisms of change in relation to smoking cessation. This section provides an overview of the emotion regulation literature, while findings from emotion regulation studies in the context of the management of cravings can be found in section 3.1.3.

Emotion regulation has been defined as “the processes by which people influence which emotions they have, when they have them, and how they experience and express these emotions” (Gross, 1998a; p.275). According to Gross’s (1998b) modal model, an emotion is generated via a sequence which involves presentation of a stimulus that compels attention, appraisal of that stimulus as personally significant and the production of multicomponent (experiential, behavioural, neurobiological) responses that stem from such appraisals. Emotion regulation involves the activation of a goal to consciously or unconsciously (i.e. automatically) modify the emotional response by intervening at any point in the emotion-generative process (Gross, Sheppes, & Urry, 2011). Emotion regulation efforts may involve a range of strategies aiming to affect changes in the experiential, cognitive, physiological and behavioural response systems that comprise emotion (Gross, 1999).

Strategies that operate early in the emotion generation process, i.e. before the emotion is fully generated, have been termed as antecedent strategies (Gross, 1998a). These strategies aim to divert the emotional trajectory early on, reducing the likelihood an emotion is experienced or changing its final form/topography. Situation selection involves taking action to influence the probability of ending up in a potentially emotion-eliciting situation. For example, a smoker may choose to avoid spending lunch time with other colleagues who smoke in order to avoid experiencing cravings. Situation modification involves attempts to change the external features of a situation in order to alter its emotional impact. For example, a
smoker may choose to get rid of ashtrays or lighters from the home environment. It is often difficult to know the boundaries between situation selection and situation modification because modifying some aspect of a situation may call into being a new situation (Gross, 2014). *Attentional deployment* is another antecedent-focused grouping which involves strategies that change which aspects of a situation will be allocated attentional resources and will thus be the focus of cognitive processing. One of the most common forms is distraction, which may involve replacing emotional information with neutral information by moving attention away from a situation, focusing on certain aspects of a situation, or by changing internal focus (Gross, 2014). A final major antecedent-focused grouping identified by Gross (1998a) is ‘cognitive change’. This is defined as “modifying how one appraises a situation so as to alter its emotional significance, either by changing how one thinks about the situation or about one’s capacity to manage the demands it poses” (Gross, 2014; p. 10). Reappraisal strategies as have been developed within CBT (see section 4.1.7.3.) fall under the ‘cognitive change’ umbrella within Gross’ (1998a) model.

In contrast to antecedent-focused strategies, *response-focused strategies* aim to alter emotional responding after the emotional response has been generated, and thus they are used to “intensify, diminish, prolong, or curtail ongoing emotional experience, expression, or physiological responding” (Gross, 1998b; p.225). Compared to antecedent-focused strategies, response-focused strategies are less likely to alter the experiential component of emotion (Gross & John, 2003). Suppression, a common strategy people resort to manage or control distressing thoughts (Wegner, 1994), is one of the most frequently investigated response-focused strategies. Suppression may be defined as the conscious inhibition of expressive and/or experiential aspects of emotional responses when emotionally aroused (Campbell-Sills et al., 2006; Feldner, Zvolensky, Eifert, & Spira, 2003; Gross & Levenson, 1993).

Suppression has often been contrasted to acceptance, which has been conceptualised as a response-focused strategy that does not aim to change the form of an emotional response, but the way individuals experience it and respond
in its presence (Hofmann & Asmundson, 2008). As described in the ACT literature, acceptance involves the willing embrace of emotional experience irrespective of its form (see section 4.1.7.3.).

Antecedent- and response-focused families of strategies have also been described as operating on an engagement-disengagement dimension, with engagement strategies involving approach of the emotional material and disengagement strategies leading to its avoidance (Sheppes et al., 2014). Sheppes et al. (2014) have shown that people usually rely on engagement strategies when the emotional intensity is low and disengagement strategies when emotional intensity is high. This relationship was shown to be moderated by cognitive and motivational determinants. When engagement strategies are facilitated, cognitive effort reduces and this increases the likelihood of engagement with emotional stimuli. In addition, when a long-term goal is in operation individuals are more likely to engage with distressing material. However, disengagement strategies might compromise long-term goals by preventing habituation to emotional stimuli (Wegner & Zanakos, 1994; Wenzlaff & Wegner, 2000). In a recent meta-analysis of emotion regulation strategies, Aldao, Nolen-Hoeksema and Schweizer (2010) found that some of these strategies (e.g. distraction, reappraisal and acceptance) seem to be more adaptive than others (e.g. suppression) and their use to be associated with less psychopathology. Sheppes et al. (2014) suggested that the ability to flexibly choose between different strategies may be the most adaptive strategy of all; depending on context, ‘maladaptive’ strategies may be useful and ‘adaptive’ strategies may be counterproductive. Indeed, suppression has been shown to be advantageous in extremely adverse situations (e.g. Bonanno & Keltner, 1997), while reappraisal may be counterproductive when dealing with high intensity emotional stimuli (Sheppes, Catran, & Meiran, 2009).

On the basis of the definition of the different strategies as discussed above, cognitive change may be understood as an antecedent-focused engagement strategy involving approach of emotional information to change the form of an emotional response. Acceptance may be understood as response-focused engagement strategy involving approach of the same material without cognitive
engagement with its content but aiming to change behavioural tendencies. Emotion regulation ‘micro-studies’ examining smoking related processes are reviewed in section 3.1.3.

4.1.8. The present study

The present study aimed to test the effectiveness of two contemporary, psychological techniques (acceptance and reappraisal) in managing cravings to smoke and to expand our understanding of craving-related processes that affect smoking and smoking cessation. To this end, this study involved three components: a) an experimental craving induction lab, b) a correlational component, and c) a short Ecological Momentary Assessment (EMA) component. The aims and research hypotheses relevant to the online craving induction lab have been described in section 3.1.4.

The correlational design of Part A was an adjunct component aimed to develop our understanding of how craving intensity is related to appraisals of cravings, and how the relationship between craving intensity and appraisals is affected by use of different strategies to respond to cravings. To this end, we assessed craving intensity and craving appraisals at six different points before, during and after the craving induction lab, and we examined how the strength of these correlations compared between all participants as a whole and between participants in the reappraisal and the acceptance groups. On the basis of the reviewed literature on appraisal theories of emotion (see section 4.3.3.1), we expected primary and secondary craving-related appraisals to be significantly correlated with craving intensity. On the basis of ACT theory, we also expected that compared to the reappraisal group, for those participants taught the use of acceptance as a way to respond to cravings there would be a weaker correlation between secondary appraisals of coping self-efficacy and the other three variables (craving intensity, appraisals of cravings as intolerable and appraisals of cravings as threatening to one’s well-being).
The short EMA component (Part B) of the study was an adjunct component to the craving induction lab, aimed at obtaining ‘real life’ data that would increase the external validity of findings from the online survey. Consequently, it aimed at investigating the same research questions as Part A and it involved an experimental and a correlational component. Participants who completed Part A were asked if they wished to be involved in Part B of the study and “put in practice what they had learned in a practice attempt to quit smoking”. Use of an EMA design was firstly aimed at enabling us to examine which intervention was more effective in managing cravings in real-life settings. We expected reappraisal and the both interventions conditions’ participants to report less intense cravings compared to both acceptance and control conditions. The EMA design was also intended to act as a ‘real-life’ replication of the correlational findings obtained through the online survey, with our hypotheses remaining the same as before (see above). Finally, the EMA design aimed at allowing the collection of behavioural measures of smoking abstinence 24 hours following completion of the lab, and test our prediction that although acceptance would not decrease craving-intensity, it would lead to similar behavioural gains with the other experimental groups and greater behavioural gains compared to the control group.

An additional aim of Part B of the study was to improve our understanding of how smokers choose between different approach and avoidance strategies that involve engaging with or disengaging from processing of craving-related thoughts. More specifically, we wished to investigate how craving intensity affects people’s choice of strategy and how this relationship is moderated by training in acceptance and reappraisal. Our hypothesis was that -consistent with previous findings in emotion regulation literature (e.g. Sheppes et al., 2014)-, participants would prefer engagement strategies (i.e. acceptance, reappraisal) in low intensity cravings, but would prefer avoidance strategies when experiencing high intensity cravings (and thus would choose to distract or suppress). We also expected that experimental groups’ participants would use engagement strategies more frequently than control group participants when experiencing high levels of cravings, due to the lesser cognitive load associated with the use of these strategies following training.
4.2. EXTENDED METHODS

4.2.1. Part A: Online survey

4.2.2.1. Design

In order to answer our experimental and correlational research hypotheses, the online survey included six points of assessment (see sections 3.2.2. and 4.2.2.5. for details of measures used and Figure 5 for details of the process). The first point of assessment (Time 1) involved the collection of demographic and baseline data at the beginning of the survey. Next, participants were shown condition-specific (intervention) videos, followed by a collection of craving- and affect-related data and administration of quizzes testing understanding of the video content (Time 2). Participants were then subjected to the craving-induction lab that involved being shown four videos each time followed by further points of assessment (Times 3-6). The final point of assessment (Time 6) also involved re-administration of our primary measures of craving intensity and abstinence self-efficacy.

In order to test the effectiveness of acceptance and reappraisal interventions in reducing cravings, improving affect in the context of experiencing cravings and increasing self-efficacy to resist temptation to smoke, a mixed-group design was utilised with participants being randomly allocated to one of four conditions. The between-groups independent variable was ‘condition’ (‘control group’, ‘acceptance’, ‘reappraisal’, both acceptance and reappraisal or ‘both interventions’) and the within-groups independent variable was ‘time’. Time had two levels for the experimental component of the study; ‘Time 1’ on Figure 5 refers to baseline scores and ‘Time 6’ refers to the measures completed at the end of the study (i.e. post-intervention and post-craving induction lab). For purposes of clarification, please note that ‘Time 2’ mentioned in the journal paper (sections 3.1-3.5), refers to Time 6 on Figure 5, i.e. data collected at post-intervention and post-
The correlational component of the study involved collection of data at all six points of assessment during the online survey.

**Fig. 5.** Part A times of assessment and measures used.

4.2.2.2. Ethics

The study was approved by the Lincoln University’s ethics committee (SOPREC) on 16th November 2016 (Project ID PSY1617141; see Appendix A). Further ethical approval was sought and given by SOPREC on two occasions to allow for more extensive advertising of the study (Appendix A).

Individuals interested in participating in the study were directed to the first page of the online survey upon clicking on the study’s link. In this page they were offered some basic information about the study (see Appendix B) and a link to a detailed Participant Information Sheet (see Appendix C). From the outset they
were informed that they could withdraw from the study at any point by closing the study window without having to give a reason. Prospective participants were informed that the researchers did not expect them to experience any significant discomfort as a result of taking part in the study. However, they were informed that they were expected to experience nicotine cravings during the craving induction procedure. Prospective participants were informed that their participation was anonymous, that it would not be possible to identify them on the basis of the data they would provide and that they could withdraw their data from the analysis within two weeks after taking part. Furthermore, prospective participants were informed of how the data collected would be used and handled and how our findings could be disseminated. They were also informed that they could choose to enter a prize draw for £100 in the form of gift vouchers. All data provided by participants were stored in password-protected computers.

On the bottom of the page prospective participants were asked to click on the appropriate button to provide their consent for taking part if they wished to do so. Participants were not asked to provide us with any contact details as part of participating in Part A. However, they were asked to create a Unique Participant Identification Number which they could use in order to take part in the prize draw and to withdraw their data from the analysis had they later decided to do so.

Following completion of the survey participants were given the options to: a) take part in the prize draw, b) be sent links to all intervention videos following completion of the study, and c) be sent with information relevant to our findings following completion of the study. Those who wished to do any of these things were given a link to a separate page which asked them to complete their contact details and their Unique Participant Identification Number. In the last page of the survey participants were also given a link to access a detailed Participant Debrief Sheet for Part A (see Appendix D).
4.2.2.3. Power calculation

In the absence of relevant, published meta-analyses, power calculations were largely based on findings from Beadman et al. (2015) and Szasz, Szentagotai and Hofmann (2012) who used the Questionnaire of Smoking Urges-Brief (QSU-Brief; Cox, Tiffany, & Christen, 2001) in samples of adult smokers to test the effectiveness of different emotion regulation strategies for reducing tobacco cravings. Beadman et al. (2015), who compared defusion, reappraisal and suppression, found a marginally non-significant \((p=.07)\) time x strategy interaction with a moderate to large effect size \(\eta^2 = 0.056\). Setting alpha at 5\% and desired power at 80\% the required sample size for detecting an interaction in a repeated measures ANOVA with an effect size of \(\eta^2 = 0.056\) (Beadman et al., 2015) was estimated at 52 participants in total, or 13 participants per group (using G*Power 3; Faul, Erdfelder, Lang, & Buchner, 2007). Szasz et al. (2012) compared acceptance, reappraisal and suppression and found a significant time x strategy interaction with a very large effect size of \(\eta^2 = 0.83\). For alpha set at 5\% and desired power at 80\% the required sample size for detecting an interaction in a repeated measures ANOVA with an effect size of \(\eta^2 = 0.83\) (Szasz et al., 2012) was estimated at 8 participants in total, or 2 participants per group (Faul et al., 2007). Due to the discrepancies in these power calculations and taking into consideration that our control group would be asked to use “any strategy proven useful in the past” instead of ‘suppression’ which is often considered as counter-productive (see Aldao et al., 2010), we decided to focus our recruitment strategy on obtaining similar group sizes as those used by Beadman et al. (2015) and Szasz et al. (2012) who recruited 23-25 participants and 31-32 participants per group respectively.

4.2.2.4. Participants

The initial pool of participants included 612 adult smokers recruited via online advertisements (Appendix E), flyers (Appendix F), posters (Appendix G),
word of mouth, and via the Lincoln University’s Sona Experiment Management System which recruits undergraduate students for research participation credit. The study was further promoted via the creation of a relevant website to attract participants (Appendix H). The advertisements sought volunteers to “participate in a 30-minute, online study” and specified the inclusion and exclusion criteria (regular smokers, over 18 years old, fluent in English and not currently using any smoking cessation treatments such as nicotine replacement therapy). The experiment was advertised as “an opportunity to learn two techniques for managing tobacco cravings” and it was explicitly stated that this was not a smoking cessation study. Smokers with some level of desire to quit smoking were targeted through relevant posts in quit smoking online forums and social media groups (Facebook). An attrition analysis and a description of our sample characteristics can be found in section 3.3.1.

4.2.2.5. Outcome measures

In addition to the scales described in section 3.2.2., Part A of the study also involved three craving appraisals visual analogue scales (VASs). These were used to assess threat appraisal of cravings (“How threatening to your well-being are your current cravings?”), appraisal of cravings as intolerable (“How intolerable are your current cravings?”) and coping self-efficacy appraisal (“How confident do you feel that you can cope with your current cravings without having a cigarette?”). These VASs were constructed to tap into the appraisal theory of emotions and primary and secondary appraisal processes as reviewed in the literature (e.g. Lazarus, 1991; Lazarus & Folkman, 1984). Single item scales have often been used for similar purposes within studies of cognition and appraisal (e.g. Dobson, 1983; Dobson & Neufield, 1981; Folkman & Lazarus, 1985; Forsythe & Compas, 1987).

4.2.2.6. Cue induction procedure

Information regarding the cue induction procedure can be found in section 3.2.3.
4.2.2.7. Interventions

This section offers information regarding the intervention videos further to the descriptions in section 3.2.4. Section 3.2.4. also includes the links for accessing the videos.

*Control group video.* In a pilot testing of the CEQ and memory quizzes, two fluent in English individuals (both holders of postgraduate degrees) were asked to “answer these questions in a quick manner”. The mean time of completion for these scales was 41.5 seconds for the reappraisal and 45 seconds for the acceptance conditions. These times were taken into account when choosing an appropriate, neutral video for the control group as this condition did not involve administration of memory quizzes or of the CEQ. The link to this video can be found in section 3.2.4.

*Intervention videos.* The two videos were matched in relation to overall duration (difference in terms of times less than 5%) and structure. Both videos started with an introduction (informing participants of their condition) and a definition of the respective conditions (21 seconds for the reappraisal and 24 seconds for the acceptance condition). Next, both videos contained a joint component (of 1 minute 10 seconds duration) which suggested that: a) cravings arise from external triggers, b) cravings involve different thoughts and feelings (some pleasant and some unpleasant), c) attempts to resist the urge to smoke results in the experience of conflict (between giving in and resisting the temptation to smoke), d) often people resort in rationalisations as ways to resolve the conflict, and that e) this sequence of events leads many people to hypothesise that craving-related thoughts cause the person to smoke. In addition, both videos contained an experiential exercise component and both videos ended up with a summary of the video content. The overall duration of the actual acceptance and reappraisal content was also similar for the two conditions (less than 5% difference in terms of time).
In general, it may be argued that the shorter experimental conditions are, the easier it is for them to be identically matched. For example, written instructions can be equally matched in terms of number of words (e.g. Litvin, Kovacs, Hayes, & Brandon, 2012). The longer the interventions the harder it is to identically match them. For example, the assessment of treatment fidelity to manualised interventions applied in therapeutic settings usually involves reviewing segments of these sessions and rating therapist behaviours against a scoring manual (e.g. Plumb & Vilardaga, 2010). In the present study, it was not possible or desirable to identically match the two intervention videos because: a) their overall duration was such that identical matching would be practically hard to achieve, and b) our focus was to create interventions that could be shown to have clinical relevance. Therefore, the quality of the videos and ensuring they were created to the best of our ability in a manner that would help participants effectively manage their cravings were our priorities. This practically meant that we could ‘tolerate’ small discrepancies in the overall timings and content of the videos, as long as the two interventions would be very similar (even if not identical) in respect to their duration and structure. This would ensure participants were taught what we thought were clinically useful strategies, while also minimising the possibility that ‘treatment dosage’ would present as a serious threat to the validity of our interpretations.

Acceptance. Initially, participants were informed that they would be watching a video on how to use acceptance to respond to their cravings and it was suggested to them that acceptance was a way to change the way they relate to their cravings and the degree to which cravings affect their choices. This introduction to the video lasted 24 seconds and it was followed by presentation of the 1 minute 10 seconds – long joint video component (situational triggers, emotional and behavioural reactions, hypothesis that craving-related thoughts lead the person to smoke). Next, a defusion exercise was used to introduce the rationale for acceptance. Participants were presented with a list of common intrusive thoughts (e.g. ‘hurting others’) upon which most people do not act (Purdon & Clark, 1993) in order to question the validity of the hypothesis that craving thoughts cause the person to smoke. Participants were told that “the
problem may not be in having certain thoughts, but in ‘buying these thoughts’; in identifying with them and doing as they say” (Hayes et al., 2012). The “flea market metaphor” was then used as an example of how people do not buy everything salesmen try to sell them at the flea market. This was compared to thoughts in general and craving-related thoughts in particular, with the video suggesting to participants that craving-related thoughts (e.g. about how pleasurable smoking is or how unpleasant cravings are) “will be there, but unless you believe what they tell you about smoking, they will not cause you to smoke”.

Following this defusion exercise participants engaged in a mindfulness exercise teaching them the skill of noticing their thoughts (adapted from Stanton & Dunkley, 2009). As part of the exercise they were instructed to focus their attention in the present moment and to simply “notice their thoughts passing through their mind”. They were also instructed to describe their thoughts factually (“I am having a thought about…”) and to gently bring their attention back to the present moment. Following this experiential exercise participants were told that noticing thoughts is the first step toward developing a stance of acceptance toward them. Participants were next introduced to the concept of “willingness”. They were told that in order to accept their thoughts they need to be willing to have them (“without buying what they tell you about smoking”). Participants were told that trying to get rid of their cravings will not work as cravings are a “normal part of their addiction”.

Next, participants were presented with the “clouds in the sky” metaphor and were asked to imagine their thoughts like clouds in the sky, “a natural phenomenon that will come and go regardless of any attempts they make to influence it”. This exercise allowed linking together all components of the video, as participants were asked to notice, accept and let go of craving-related thoughts, seeing themselves as having these thoughts and letting them go rather than identifying with them and ‘buying’ what these thoughts told them about smoking. The acceptance-based instructions lasted for a total of 7 minutes 21 seconds. Finally, a summary of the video content was presented (of 31 seconds duration).

Reappraisal. At the beginning of the video participants were informed they would be watching a video on “reappraisal” which was defined as a way to “change
the way we think about cravings in order to change the way we feel about them”. This section lasted 21 seconds. Next, participants watched the joint component which lasted 1 minute and 10 seconds. Participants were then taught a distancing exercise aiming at helping them identify craving-related thoughts (i.e. “stop” and think “what is going through your mind”). Next, it was suggested to participants that craving-related thoughts tended to fall into one of four major groups: a) positive thoughts about smoking (e.g. “a cigarette would taste good right now”), b) negative thoughts about cravings (e.g. “cravings are awful”), c) negative thoughts about one’s ability to cope with cravings, and d) smoking-enabling thoughts (e.g. “I deserve a cigarette”).

The first two categories were identified as examples of “biased appraisals”, since when experiencing such thoughts (e.g. “a cigarette would taste good right now”), participants were ignoring contradictory information (e.g. “smoking shortens life expectancy”) and were consequently appraising smoking as pleasurable (and not smoking as undesirable). Participants were then asked to participate in a ‘sentence completion exercise’ that involved constructing less biased appraisals by pairing the craving-related automatic thought (e.g. relevant to positive outcome expectancies) with their chosen reasons for wanting to quit smoking (e.g. health-related reasons) and using these craving-related cognitions as referents for the reasons for quitting. The aim was to provide a quick way for participants to construct less biased propositions (e.g. “a cigarette would taste good right now and it would contribute to my early death”) aiming to change the way smoking was appraised as pleasurable and reduce the intensity of the subjective feeling component of their cravings.

The other two categories of smoking related thoughts (i.e. thoughts regarding coping with cravings self-efficacy and smoking-enabling thoughts) were communicated to participants as examples of “incorrect appraisals”. Participants were asked to collect evidence for and against the validity of these thoughts in order to examine their “truthfulness” and thus construct “more realistic appraisals”. For example, participants were asked to identify occasions when they managed to
cope with cravings for long periods of time in order to reappraise their ability to cope with cravings in the present.

These reappraisal training components lasted for 7 minutes and 8 seconds. At the end of the video a 1 minute and 25 seconds summary of the teaching content was presented.

*Both reappraisal and acceptance conditions.* Please refer to section 3.2.4.

### 4.2.2.8. Procedure

Part A of the study was hosted on an online survey platform (Qualtrics). Once participants clicked on the study’s link, they were taken to the first page of the survey which contained some basic information regarding the study (e.g. purpose, inclusion criteria, information regarding ethical approval) and a link to access a detailed Participant Information Sheet. Participants were informed about being presented with cues to elicit cravings, but were not told what the cue induction procedure would look like (i.e. use of videos). The exact strategies taught (i.e. acceptance and reappraisal) were not named at this point.

At the end of the page participants were asked to provide consent for taking part in the study in order to continue. By doing so they were also confirming that they met the inclusion criteria for the study and that they had read and understood what the study entailed (i.e. “YES. I agree to participate in this study. I confirm I am over 18 years old, I am a current smoker, I am fluent in English and I do not currently use any smoking cessation treatments. I also confirm I understand what this study entails and I know where to ask for more information”).

Those who agreed to take part in the study where next asked to create a unique participant identification number. Participants were then administered the demographics questionnaire alongside other baseline measures (see 3.2.2.), were randomly allocated to one of four conditions (‘control group’, ‘acceptance’, ‘reappraisal’, or ‘both interventions’) and were shown the respective condition videos. Participants in the three intervention conditions were then administered the
quizzes testing for memory and understanding of the intervention content and the credibility and expectancy questionnaire. Next, all participants were administered the second set of visual analogue scales (1-Urge, content of craving appraisals, SUDS). They then participated in the craving induction lab as part of which they were shown the four craving eliciting videos, each time followed by the VAS assessment of cravings and affect (i.e. a further four points of assessment). At the end of the survey participants were administered the primary craving and self-efficacy scales (see Figure 5).

Upon completion of Part A, participants were given a link that took them to a survey page where they could enter their contact details and participant ID in case they wanted to take part in the prize draw. They were also shown a second link (also available in the prize draw page) which they could use to access Part B of the study that required participants to “put in practice what they had learnt in a 24-hour attempt to quit smoking”. Finally, they were given a third link which they could use to access the Debrief Sheet for Part A of the study (see Appendix D).

4.2.3. Part B: Ecological Momentary Assessment and 24-hour smoking measurement

Design

Part B was essentially an EMA study that was an adjunctive component to Part A which formed the core part of this study. The design was a mixed-group design with four levels of the between-groups independent variable (condition; ‘control group’, ‘acceptance’, ‘reappraisal’, ‘both interventions’) and three levels of the within-groups independent variable (time of measurement; 10am, 2pm, 6pm). Part B also involved a between-groups design assessing number of cigarettes smoked after a 24-hour period, comparing single-item responses of participants that had been assigned to one of the four conditions. Finally, Part B incorporated a correlational component which looked at the relations between craving intensity and craving-related appraisals.
**Ethics**

The study was approved by the Lincoln University’s ethics committee (SOPREC) on 16th November 2016 (Project ID PSY1617141; see Appendix A).

Participants who wanted to find out more about Part B of the study were given a link for doing so after completion of Part A. Upon clicking that link they were taken to the first page of Part B survey which provided them with some basic information (see Appendix I) and with a link for accessing a detailed Participant Information Sheet regarding this study phase (see Appendix J). Prospective participants were informed that they could withdraw from Part B at any point without having to give a reason. They were informed that they could choose to enter a prize draw for £100 in the form of gift vouchers for agreeing to take part. Prospective participants were also informed of what Part B entailed and what would be expected of them in case they agreed to participate (i.e. reply to four messages over the next 24 hours). They were informed that the data they would provide would be stored in password-protected computers.

On the bottom of the first page of Part B survey prospective participants were asked to indicate whether or not they wished to continue with taking part and provide their consent for doing so. They were then asked to create a Unique Participant Identification Number (which could be the same or different than Part A) and to provide us with either their phone number, their email address or their Facebook account name in order for the research team to be able to contact them. At the end of Part B data collection, participants were given a link to access the Part B Participant Debrief Sheet (see Attachment K).

### 4.2.4. Participants

In total, 26 participants consented to participating in Part B of the study, out of which 11 had completed the acceptance condition, 3 had completed the reappraisal condition, 8 had completed the both interventions condition and 4 had
completed the control group condition. Attrition was high with 11 participants (42.3%) not replying to any messages, 3 participants (11.5%) replying to only one message, 6 participants (23.1%) replying to two messages, and 6 participants (23.1%) replying to all three messages. As such, 33 out of a possible 78 Part B EMA responses were collected, bringing total attrition figures to 42.3%.

4.2.5. Outcome measures

**Cravings.** Urge VAS, Threat VAS, Intolerability VAS, Coping VAS as described in sections 3.2.2. and 4.2.2.5.

**Affect.** Single-item SUDS; see section 3.2.2.

**Strategy coding.** To categorise the strategies participants used the same coding frame as Part A was used (see Appendix, p. 46).

**Strategy effectiveness.** A single item on a 5-point scale (ranging from ‘extremely well’ to ‘not well at all’) was used for participants to rate the perceived effectiveness of the strategies they were using.

**Context coding.** Participants were asked to provide qualitative responses to three context-related questions (‘where are you’, ‘who are you with’, ‘what are you doing’) and to indicate how long ago (in hours and minutes) they last smoked (if they had smoked at all). A coding frame was inductively constructed to categorise participants’ responses (see Appendix L).

**Number of cigarettes smoked.** 24 hours following giving consent to participate in Part B, participants were asked how many cigarettes they had smoked in the past 24 hours.
4.2.3.6. Procedure

Following giving consent, participants were asked to generate their unique participant identification number and to provide us with their contact details. Over the next 24 hours they were messaged on three occasions and asked to respond to questions relevant to their whereabouts, their recent smoking behaviour, their craving intensity, the strategy they were using to respond to their cravings and how effective this strategy was. They were instructed to use “any strategy they may find helpful to manage their cravings”. Participants were all contacted at the same times (10am, 2pm, 6pm), although this information was not clarified for them in the information sheet they were given. Finally, participants were sent one more message 24 hours after consenting to participate in Part B asking them to indicate how many cigarettes (if any) they had smoked over the past 24 hours.

4.3. EXTENDED RESULTS

4.3.1. Part A

An attrition analysis can be found in Section 3.3.1.

4.3.1.1. Testing for violation of parametric tests’ assumptions and choice of statistical analyses

In order to decide which statistical analyses were more appropriate for group comparisons on the basis of the characteristics of our data, we first tested for any violations of assumptions of within-groups normality of distributions and between-groups homogeneity of variance. Despite the different sample sizes, where distributions of scores were normal and no evidence was found to suggest that variances were unequal, we carried out parametric tests as it has been suggested that these tests can still be considered in such conditions (Field, 2009).
The findings from these tests were checked against non-parametric alternatives. Non-parametric tests were run when more than one parametric assumption was shown to have been violated.

Our preferred method for examining the normality of distributions, which was employed for testing all assumptions of normality in the study, was to divide the skewness and kurtosis values by the standard error to ascertain z-scores for all the different variables for the under comparison groups, and then to consider these findings in conjunction with visual inspection of the histograms of the distributions (see Field, 2009). Since all three groups had large sample sizes, the critical value for determining violation of normality was set at ±2.58 (Field, 2009).

For example, in regards to negative affect as measured by the relevant PANAS subscale, z-score statistics for the skewness (5.89) and kurtosis (3.15) scores of the baseline only group and visual inspection of the histogram (Figure 6) suggested that the scores on this variable were significantly, non-normally distributed. Similarly, the skewness (3.19) and kurtosis (-0.64) z-scores of the craving induction drop-outs and examination of the histogram (Figure 7) suggested that this group’s scores on this variable were also significantly non-normally distributed. The same conclusion was drawn following review of the histogram (Figure 8) of successful completers’ negative affect scores taking into consideration z-scores statistics for skewness (5.14) and kurtosis (2.18). A Levene’s test indicated unequal variances among the three groups on negative affect, $F(2,310) = 3.09$, $p = .05$.

On the basis of these findings (non-normal distributions, unequal variances and unequal sample sizes) we concluded that basic assumptions for carrying out parametric tests were not met and that a non-parametric alternative was a more appropriate method for between groups’ comparisons of negative affect scores. A Kruskal-Wallis test showed that the three groups did not significantly differ in terms of negative affect, $H(2) = 1.64$, $p = .44$. 

Fig. 6. Distribution of PANAS negative affect subscale scores of participants completing only baseline data.

Fig. 7. Distribution of PANAS negative affect subscale scores of participants who dropped out during the craving induction lab (n=75).
Fig. 8. Distribution of PANAS negative affect subscale scores of ‘successful completers’ (n=110).

Demographic characteristics and baseline scores: please see section 3.3.1.

4.3.1.2. Further group comparisons

Analysis by strategy

In addition to the ‘by allocation’ and ‘per protocol’ analyses detailed in Section 3.3, a third, ‘by strategy’ analysis was carried out comparing differences in cravings and self-efficacy scores between participants who reported relying mainly (i.e. over 75% of the time) on distraction (n = 13), acceptance (n = 23) and reappraisal (n = 33) irrespective of original group allocation. The ‘by strategy’ analysis of craving scores (QSU-B, Urge VAS) involved a within-between groups ANOVA with Time as the within-groups factors (two levels as before), and Strategy as the between-groups factor that had three levels (‘distraction’, ‘acceptance’,
'reappraisal'). Non-parametric tests were conducted for SSEQ scores as parametric test assumptions were not met.

Baseline comparisons showed that the three groups did not statistically differ significantly in craving intensity, experiential avoidance, positive and negative affect, levels of nicotine dependence, self-efficacy, number of years smoking or number of cigarettes smoked per day.

Cravings assessed by QSU-B. The results showed a significant main effect for Time, $F(1,66) = 10.76, p < .01, \eta^2 = .14$, a significant Time x Strategy interaction, $F(2,66) = 12.36, p < .001, \eta^2 = .27$, and a non-significant Strategy main effect, $F(2,66) = 0.62, p = .62, \eta^2 = .02$. A one-way between groups ANOVA on Time 1 – Time 2 difference scores was carried out to examine the interaction term, and post hoc testing using Gabriel's procedure revealed a significant difference between distraction and reappraisal ($p < .001$) and a significant difference between acceptance and reappraisal ($p < .001$) suggesting that reappraisal was associated with greater decreases in cravings assessed by the QSU-B compared to distraction and acceptance (see Table 6 for group means and standard deviation scores).

Table 6

<table>
<thead>
<tr>
<th></th>
<th>Distraction (n = 13)</th>
<th>Acceptance (n = 23)</th>
<th>Reappraisal (n = 33)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time 1</td>
<td>Time 2</td>
<td>Time 1</td>
<td>Time 2</td>
</tr>
<tr>
<td>QSU-B</td>
<td>37.92 (15.90)</td>
<td>34.09 (12.81)</td>
<td>42.97 (13.07)</td>
</tr>
<tr>
<td></td>
<td>38.92 (20.57)</td>
<td>32.61 (15.68)</td>
<td>27.12 (13.46)</td>
</tr>
<tr>
<td>Urge VAS</td>
<td>54.62 (29.10)</td>
<td>40.09 (23.57)</td>
<td>55.61 (21.70)</td>
</tr>
<tr>
<td></td>
<td>42.08 (31.85)</td>
<td>32.04 (26.56)</td>
<td>26.36 (22.00)</td>
</tr>
</tbody>
</table>
Paired t-tests were carried out to examine the magnitude of change associated with the use of each strategy. These tests found a high effect size for reappraisal, $t(32) = 7.39, p < .001, r = .79$, and very weak effect sizes for acceptance, $t(22) = 0.49, p = .63, r = .10$, and for distraction, $t(12) = -0.33, p = .75, r = .09$.

**Cravings assessed by Urge VAS.** A within-between groups ANOVA found a significant main effect for Time factor, $F(1,66) = 21.22, p < .001, \eta^2 = .24$, a significant Time x Strategy interaction, $F(2,66) = 4.36, p < .05, \eta^2 = .12$, but no significant main effect for Strategy, $F(2,66) = 1.51, p = .23, \eta^2 = .04$. A one-way between groups ANOVA on Time 1 – Time 2 difference scores was carried out, and post hoc testing using Gabriel’s procedure identified that the significant difference was between reappraisal and acceptance ($p < .05$), with reappraisal participants experiencing greater reductions in cravings from baseline to post-cue induction (means and standard deviations are shown on Table 6).

**Self-efficacy assessed by SSEQ.** A Kruskal-Wallis test between Time 2 scores for the three groups found a significant difference, $H(2) = 7.22, p < .05$. A second Kruskal-Wallis test on Time 1 – Time 2 SSEQ difference scores also found a significant difference between the three groups, $H(2) = 17.16, p < .001$. Mann Whitney tests with a set at 0.017 following a Bonferroni adjustment found a significant difference between the control group and acceptance, $U = 64.50, z = -2.81, p < .001$, and between the control group and reappraisal, $U = 59.00, z = -$
3.80, \( p < .001 \). No significant difference was found between acceptance and reappraisal at the adjusted a level of significance \( (U = 255.50, z = -2.07, p = .04) \).

**4.3.1.3. Correlations among craving intensity and content of craving-related appraisals.**

In order to examine the nature of relationships between the intensity of cravings and the way these cravings were appraised, a series of two-tailed, Spearman rho tests were carried out looking at correlations between the relevant VAS scores: a) for responses of all participants \( (N = 660) \) collected at baseline, post-intervention videos and following each of the four craving induction videos (hereon referred to as ‘all responses’), b) for all responses of acceptance group participants during the craving induction lab \( (n = 140; \text{hereon referred to as ‘acceptance group responses’}) \), c) for all responses of reappraisal group participants during the craving induction lab \( (n = 88; \text{hereon referred to as ‘reappraisal group responses’}) \), d) for all responses suggesting the use of acceptance-based strategies irrespective of group allocation \( (n = 111; \text{hereon referred to as ‘all acceptance responses’}) \), and e) for all responses suggesting the use of reappraisal strategies irrespective of group allocation \( (n = 145; \text{hereon referred to as ‘all reappraisal responses’}) \). Following a Bonferroni correction to take into account the fact that we run 30 in total correlation tests, the significance level a to suggest a significant correlation was set at .002. Table 7 contains the correlation coefficients and significance probabilities for the variables examined for all five groups.

*Craving intensity and appraisals of cravings as intolerable.* Overall, cravings (as assessed by the 1-Urge VAS) and craving appraisals as intolerable (as assessed by the Intolerability VAS) were shown to be positively and significantly (all \( ps < .001 \)) correlated for all groups. The two variables were shown to be strongly related when looking at all responses \( (r_s = .76) \) and acceptance group responses \( (r_s = .71) \). Although the strength of this relation was moderate when looking at all acceptance
responses \((r_s = .61)\), the two variables were found to be very strongly related when examining reappraisal group responses \((r_s = .87)\) and all reappraisal responses \((r_s = .86)\). By using Fisher’s correlation-to-z scores transformation (see Field, 2009), it was shown that the strength of this relation was significantly greater for the reappraisal group compared to the acceptance group, \(z = -3.23, p = .001\). Similarly, it was shown that the relation between craving intensity and appraisals of cravings as intolerable was significantly stronger for all reappraisal responses compared to all acceptance responses, \(z = -4.58, p < .001\).

**Craving intensity and appraisals of cravings as threatening to one’s well-being.** Overall, cravings and appraisals of cravings as threatening to one’s well-being were significantly (all \(p_s < .001\)) and positively correlated across all groups. The two variables were shown to be moderately correlated when examining all responses \((r_s = .55)\), acceptance group responses \((r_s = .48)\), reappraisal group responses \((r_s = .56)\) and all acceptance responses \((r_s = .40)\). These variables were shown to be strongly correlated when examining all reappraisal responses \((r_s = .60)\). This observed relation was significantly stronger for all reappraisal responses compared to all acceptance responses \((z = 2.49, p = .01)\). The acceptance group and the reappraisal group responses did not differ significantly in terms of the degree of correlation between craving intensity and appraisal of cravings as threatening to one’s well-being \((z = 0.8, p = .42)\).

**Craving appraisals as intolerable and as threatening to one’s well-being.** Appraisals of cravings as threatening and appraisals of cravings as intolerable were positively and significantly (all \(p_s < .001\)) correlated for all groups. Results showing a strong relation among the two variables for all participants \((r_s = .72)\), a strong correlation for the acceptance group \((r_s = .78)\), a moderate to strong correlation for all acceptance responses \((r_s = .65)\), a moderate to strong correlation for reappraisal group \((r_s = .68)\), and a strong correlation for all reappraisal responses \((r_s = .78)\). The strength of this relation was shown to be similar for all acceptance responses and all reappraisal responses \((z = -1.69, p = .09)\), but it was
shown to be significantly greater for the acceptance group compared to the reappraisal group ($z = 1.96, p = .05$).

**Craving intensity and self-efficacy appraisals.** The relation between craving intensity and coping self-efficacy with regards to current cravings was shown to be negatively, significantly (all $p$s < .001) and moderately (all $r$s between -.40 and -.59) correlated across all groups. There were no significant differences in terms of the strength of this relation between the acceptance and reappraisal groups ($z = 1.49, p = .14$), or between all acceptance responses and all reappraisal responses ($z = 1.41, p = .16$).

**Intolerability appraisals and self-efficacy appraisals.** Intolerability and self-efficacy appraisals were shown to be negatively and significantly ($p$s < .001) correlated across all groups. Results showed a moderate relation between these two variables when examining the scores of all participants ($r = -.54$). The relation between these two variables was significantly stronger ($z = 3.16, p < .01$) for the acceptance group ($r = -.69$) compared to the reappraisal group ($r = -.39$). This relation was also significantly stronger ($z = 3.04, p < .01$) for all acceptance responses ($r = -.69$) compared to all reappraisal responses ($r = -.43$).

**Threat appraisals and self-efficacy appraisals.** Appraisals of cravings as threatening to one’s well-being and appraisals of coping self-efficacy were shown to be negatively, significantly (all $p$s < .001) and moderately (all $r$s between -.46 and -.62) correlated across all groups. There were no significant differences in respect to the strength of the relation between acceptance and reappraisal groups ($z = 0.98, p = .33$) or between all acceptance and all reappraisal responses ($z = -1.68, p = .09$).
Table 7
Correlations between craving intensity and craving appraisal scores.

<table>
<thead>
<tr>
<th></th>
<th>Urge</th>
<th>Intolerability</th>
<th>Threat</th>
</tr>
</thead>
<tbody>
<tr>
<td>All groups (N=660)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-Urges</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intolerability</td>
<td>.76</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Threat</td>
<td>.55</td>
<td>.72</td>
<td></td>
</tr>
<tr>
<td>Coping</td>
<td>-.52</td>
<td>-.54</td>
<td>-.48</td>
</tr>
<tr>
<td>Acceptance condition (n=140)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-Urges</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intolerability</td>
<td>.71</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Threat</td>
<td>.48</td>
<td>.78</td>
<td></td>
</tr>
<tr>
<td>Coping</td>
<td>-.59</td>
<td>-.69</td>
<td>-.56</td>
</tr>
<tr>
<td>Reappraisal condition (n=88)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-Urges</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intolerability</td>
<td>.87</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Threat</td>
<td>.56</td>
<td>.65</td>
<td></td>
</tr>
<tr>
<td>Coping</td>
<td>-.44</td>
<td>-.39</td>
<td>-.46</td>
</tr>
<tr>
<td>Acceptance responses (n=111)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-Urges</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intolerability</td>
<td>.61</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Threat</td>
<td>.40</td>
<td>.68</td>
<td></td>
</tr>
<tr>
<td>Coping</td>
<td>-.54</td>
<td>-.69</td>
<td>-.62</td>
</tr>
<tr>
<td>Reappraisal responses</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-Urges</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intolerability</td>
<td>.86</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
(n=145)

<table>
<thead>
<tr>
<th></th>
<th>Threat</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>.63</td>
<td>.78</td>
<td></td>
</tr>
<tr>
<td>Coping</td>
<td>-.40</td>
<td>-.43</td>
<td>-.47</td>
<td></td>
</tr>
</tbody>
</table>

Note. Urge: Single-item (0-100) Visual Analogue Scale (VAS) measuring intensity of cravings; Intolerability: Single-item (0-100) VAS measuring appraisals of current cravings as ‘intolerable’; Threat: Single-item (0-100) VAS measuring appraisals of current cravings as ‘threatening’ to one’s well-being; Coping: Single-item (0-100) VAS measuring self-efficacy to cope with current cravings. All correlations were significant with $p < .001$.

4.3.2. PART B

Most participants asked to be contacted by email (17 in total, 65.4%), while some chose to be contacted by phone (7 in total, 26.9%) and only 2 participants (7.7%) asked to be contacted via social media.

Attrition. Out of 7 participants who had asked to be contacted by phone text 3 participants (42.9%) did not reply to any texts, 2 replied to two texts and 2 (28.6%) replied to all three texts sent. Out of the 17 participants who had asked to be contacted via email, 7 participants (41.2%) did not reply to any messages, 3 (or 17.6%) replied to one message, 4 (23.5%) replied to two messages, and another 3 (17.6%) replied to all 3 emails. Out of the two participants who had asked to be contacted via social media, 1 did not reply to any messages and the other one replied to all 3 messages.

Completed responses. Out of the 33 collected responses, 5 were from participants in the control group (15.2%), 19 from acceptance group participants (57.6%), 2 from reappraisal participants (6.1%) and 7 from both interventions group participants (21.2%).

Context of responses. Participants most frequently responded to the research team’s messages while being at home (84.8% of collected responses) and when being alone (57.6% of responses). A total of 4 responses (12.1%) were completed.
while participants were at their workplace, with 8 responses (24.2%) being collected from participants working or studying. Table 8 summarises the information collected regarding who participants were with, where they were and what they were doing when replying to Part B messages.

**Table 8**

*Participants’ coded responses to questions asking them were they were (Place), who they were with (People), and what they were doing (Activity) when replying to experimental messages.*

<table>
<thead>
<tr>
<th>Place</th>
<th>People</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Home</td>
<td>28 (84.8%)</td>
<td>Working 8 (24.2%)</td>
</tr>
<tr>
<td>Workplace</td>
<td>4 (12.1%)</td>
<td>Socialising 3 (9.1%)</td>
</tr>
<tr>
<td>Outdoors</td>
<td>1 (3%)</td>
<td>Relaxing 5 (15.2%)</td>
</tr>
<tr>
<td></td>
<td>Colleagues 4 (12.1%)</td>
<td>Home entertainment 11 (33.3%)</td>
</tr>
<tr>
<td></td>
<td>Close family 8 (24.2%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Friends / Extended family 1 (3%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pets 1 (3%)</td>
<td>House chores 5 (15.2%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Outdoors entertainment 1 (3%)</td>
</tr>
</tbody>
</table>

*Time of last cigarette smoked.* On seven occasions participants reported having smoked within one hour before replying to the researchers’ message, on 12 occasions they reported having smoked 1-4 hours before replying, and on 14 occasions they reported not having smoked any cigarettes for over 4 hours before completing an EMA response.

*Choice of strategy.* Out of the 5 responses collected from participants that had completed the control group condition, 4 suggested the use of distraction for the regulation of cravings and 1 suggested the use of reappraisal. Out of the 19 responses from acceptance group participants, 6 reported relying on distraction (31.6%), 11 suggested the use of acceptance-based techniques (57.9%). Neither
of the two responses collected from reappraisal group participants reported using reappraisal for the regulation of cravings (one reported using suppression and the other response reported not experiencing any cravings). On the contrary, reappraisal was the most frequently reported strategy used among both interventions’ group participants, with 4 responses (or 57.1%) being reappraisal-consistent. The other three responses reported the use of distraction, suppression, or the use of no strategy.

*Strategy perceived effectiveness.* Out of the 11 responses describing the use of distraction, 2 responses reported this strategy to be working “extremely well”, 1 to be working “very well”, 4 reported distraction as working “averagely well” and 4 reported it to be working “slightly well”. When participants reported using reappraisal to manage their cravings \( (n = 5) \), they described the strategy as working “averagely well” \( (n = 3) \), “very well” \( (n = 1) \), or “extremely well” \( (n = 1) \). Out of the 11 responses suggesting the use of acceptance-based strategies, 2 times the strategy was reported as working “extremely well”, 3 times as working “very well”, 4 times as working “averagely well”, and 2 times as working “slightly well”. On two occasions participants reported using suppression to respond to their cravings; on one occasion suppression was described as working “very well” and on the other occasion it was described as working “not well at all”.

*Relations between cravings and content of craving appraisals*

Similarly to the findings from the craving induction lab, when looking at all 33 responses in the EMA design irrespective of group allocation, it was shown that there was a very strong, significant correlation between craving intensity and craving appraisals as intolerable, \( r_s=.80, \ p < .001 \), a strong and significant correlation between craving intensity and craving appraisals as threatening to one’s well-being, \( r_s=.64, \ p < .001 \), and a strong and significant correlation between craving intensity and self-efficacy to cope with current cravings, \( r_s=-.68, \ p < .001 \). Appraisals of cravings as intolerable and appraisals of craving as threatening to
one’s well-being were shown to be significantly and strongly related, \( r_s = .73, \ p < .001 \). Self-efficacy to cope with current cravings was moderately yet significantly related to appraisals of cravings as threatening to one’s well-being, \( r_s = -.54, \ p = .001 \), and strongly and significantly related to appraisals of current cravings as intolerable, \( r_s = -.61, \ p < .001 \).

The degree and direction of relationships among the same variables across the 19 responses collected by acceptance group participants was also examined. The same pattern of results emerged with intensity of cravings being shown to be:

a) significantly related to appraisals of cravings as threatening to one’s well-being, \( r_s = .64, \ p = .003 \), b) very strongly and significantly related to appraisals of cravings as intolerable, \( r_s = .86, \ p < .001 \), and c) very strongly and significantly related to self-efficacy in coping with current cravings, \( r_s = -.79, \ p < .001 \). Appraisals of cravings as intolerable were shown to be very strongly and significantly related to appraisals of cravings as threatening, \( r_s = .70, \ p < .001 \), and moderately, but not significantly for \( a = .004 \) following a Bonferroni adjustment, related to self-efficacy appraisals, \( r_s = -.54, \ p = .02 \). Finally appraisals of cravings as intolerable were shown to be significantly related to perceived ability to cope with current cravings, \( r_s = -.68, \ p = .001 \). Correlational values are summarised in Table 9.

Table 9

*Correlational values for the relations among craving intensity and craving-related appraisals across all responses and responses from participants that had completed the acceptance condition.*

<table>
<thead>
<tr>
<th></th>
<th>1-Urge</th>
<th>Intolerability</th>
<th>Threat</th>
<th>Coping</th>
</tr>
</thead>
<tbody>
<tr>
<td>All responses</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(N=33)</td>
<td>1-Urge</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intolerability</td>
<td>.80</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Threat</td>
<td>.64</td>
<td>.73</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coping</td>
<td>-.68</td>
<td>-.61</td>
<td>-.54</td>
<td></td>
</tr>
<tr>
<td>Acceptance</td>
<td>1-Urge</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1617, RPV, UofN: 4240578, UofL: 14500289, Thesis Portfolio_Volume_I 113
<table>
<thead>
<tr>
<th>Condition</th>
<th>Intolerability</th>
<th>Threat</th>
<th>Coping</th>
</tr>
</thead>
<tbody>
<tr>
<td>(n=19)</td>
<td>.86</td>
<td>.64</td>
<td>-.79</td>
</tr>
<tr>
<td></td>
<td>.70</td>
<td>-.68</td>
<td>-.54</td>
</tr>
</tbody>
</table>

Note. Urge: Single-item (0-100) Visual Analogue Scale (VAS) measuring intensity of cravings; Intolerability: Single-item (0-100) VAS measuring appraisals of current cravings as ‘intolerable’; Threat: Single-item (0-100) VAS measuring appraisals of current cravings as ‘threatening’ to one’s well-being; Coping: Single-item (0-100) VAS measuring self-efficacy to cope with current cravings.

Cravings and affect scores by group. Responses from control group (n = 5) participants had $M = 50.20$, ($SD = 10.26$) for cravings, and $M = 54$ ($SD = 30.32$) for SUDs. Responses from acceptance group participants (n = 19) had $M = 41.32$ ($SD = 26.94$) for cravings and $M = 56$ ($SD = 25.07$) for SUDs. Responses from reappraisal group participants (n = 2) had $M = 29.50$ ($SD = 14.85$) for cravings and $M = 70$ ($SD = 29.70$) for SUDs. Finally, responses from both interventions group participants (n = 7) had a craving $M = 39.43$ ($SD = 18.46$) and a SUDs $M = 59.71$ ($SD = 18.46$). Despite the low number of responses, a between groups ANOVA was attempted to test for differences between the control group (n = 5), the acceptance group (n = 19), and the both interventions group responses (n = 7) in regards to craving intensity as measured by the Urge VAS. The results showed no statistically significant difference between any of the three groups, $F(2,28) = 0.27$, $p = .77$.

Smoking frequency at a 24-hour follow-up. At a 24-hour follow-up, 15 out of 26 participants answered our messages to indicate how many cigarettes they had the previous day (see Table 10).
Table 10

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Past 24 hours</th>
<th>Previous three months</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>2</td>
<td>5.5 (0.71)</td>
<td>10 (2.83)</td>
</tr>
<tr>
<td>Acceptance</td>
<td>7</td>
<td>5.14 (5.4)</td>
<td>18.14 (12.2)</td>
</tr>
<tr>
<td>Reappraisal</td>
<td>1</td>
<td>12</td>
<td>20</td>
</tr>
<tr>
<td>Both interventions</td>
<td>5</td>
<td>3.2 (2.78)</td>
<td>6.8 (4.0)</td>
</tr>
</tbody>
</table>

4.4. EXTENDED DISCUSSION

4.4.1. Part A: Further notes on findings from craving induction lab.

In addition to the points discussed in section 3.4., this section discusses the findings from secondary analyses, the correlational results and the findings from the EMA component. It also discusses in greater detail issues related to attrition and strategy diffusion, before concluding with recommendations for future studies.

4.4.1.1. ‘By strategy’ analysis.

Findings from the secondary analyses performed in section 4.3.1.2. seem to provide further support to the hypothesis that reappraisal as a strategy may be associated with greater reductions in cravings and increases in self-efficacy compared to acceptance and distraction. Examination of the effectiveness of acceptance-based strategies in comparison to distraction provided no evidence that either strategy may be more effective in reducing cravings. However, similarly
to the ‘per allocation’ and ‘per protocol’ analyses, acceptance was associated with
greater increases in abstinence self-efficacy compared to distraction which was
shown to be a frequent strategy employed by participants when instructed to use
“any strategy that they have found useful in the past”. That is, looking at the
effectiveness of what people actually did to regulate their cravings as opposed to
the effectiveness of our interventions before and after attempts to take into account
the observed strategy diffusion, findings seem to provide further evidence in favour
of the interpretations discussed in section 3.4. However, the findings from this ‘per
strategy’ analysis need be considered with caution because participants
implementing the strategies (i.e. distraction, acceptance and reappraisal) had
different histories when doing so (i.e. some had received training in one or more of
these strategies). This means that the validity of the ‘by strategy’ findings may be
subject to a selection x history threat. To be in a better position to answer
questions about which strategies per se may be more useful in regulating cravings
and increasing self-efficacy, future studies would need to ensure participants are
not primed differently before being subjected to the cue induction procedure.

4.4.1.2. Manipulation checks and strategy diffusion.

A potential explanation for the observed strategy diffusion across groups
could be related to an experimental ineffectiveness in effectively manipulating the
independent variable. However, participants’ equally good performance in the
quizzes testing memory and understanding of video content, and the fact that all
interventions were appraised as equally and highly credible may increase
confidence in the suggestion that our interventions were indeed administered and
received as intended.

A similar point to consider in terms of the effectiveness with which the
independent variable was manipulated is that by virtue of our online experimental
design there may have been differences with regard to the way our intervention
videos were watched by participants (i.e. in different screen sizes pertinent to the
use of mobile phones, laptops, desktop computers, etc.), levels of environmental
distraction, technical difficulties encountered, as well as differences in the extent to which participants watched the full videos or skipped through different video segments. Although randomisation may increase confidence in the hypothesis that such variations may have similarly affected participants in all groups, future studies may wish to assess the extent to which this is the case. A disadvantage of doing so relates to subsequent increases in the time taken to complete the study, which may be contribute toward increasing attrition rates.

Since both control group and acceptance group participants heavily relied on reappraisal to a similar extent, the apparent diffusion of strategies may be explained on the basis of pre-existing tendencies of participants to habitually use reappraisal as a strategy to regulate their cravings. Participants’ reliance on reappraisal contrary to experimental instructions has been demonstrated in other similar ‘micro-studies’ taking place in ‘traditional’ labs attended in person (see Feldner et al., 2003). This suggests that this observed strategy diffusion cannot be solely attributed to the characteristics of our design.

4.4.1.3. Further notes on attrition.

Overall attrition rates observed cannot reliably answer questions regarding the acceptability of the interventions, as several participants fed back to the research team that they had technical difficulties watching the intervention videos and there was no way to determine how many participants opted to drop out and how many were unable to complete the study. The technical difficulties reported by participants could not have been predicted, especially since no such difficulties were identified during pilot-testing of the survey. The videos were uploaded on the survey via one of the most popular, free video sharing websites (YouTube) in order to minimise technical problems and increase accessibility. Despite efforts to reduce technical difficulties, we were made aware that participants with low connectivity to the web and participants trying to complete the study using their phones were often faced with difficulties watching the full videos.
The exact reason for these difficulties cannot be accurately known. However, on the basis of the knowledge gained by this study, it is possible to predict that future studies wishing to employ a similar design are likely to be faced with similar issues. Since such technical difficulties may be beyond the experimenters’ ability to control, it may be important to focus efforts at reducing attrition rates in other areas. These efforts may involve using fewer assessment scales, having fewer assessment points, and perhaps even presenting participants with shorter interventions if that would not compromise the quality of training provided. Since such adaptations would be reducing the overall cognitive effort needed to complete the study, this could also increase the proportions of people with cognitive decline or impairment completing the survey. Another way to reduce attrition could be to incorporate as part of the inclusion criteria questions about prospective participants’ levels of motivation to quit smoking, e.g. by use of some relevant question before administration of baseline measures (see Beadman et al., 2015; Rogojanski, Vettesse, & Antony, 2011; Szasz, Szentagotai, & Hofmann, 2012).

One more practical difficulty affecting our ability to engage in more in-depth attrition analyses relates to the inability to control or know about the timings of participants’ progress through various points in the study, and consequently the inability to know how each person’s scores should be treated without introducing an unwarranted degree of bias. In addition, as mentioned in Section 3.5, by virtue of our design it was not possible to know which condition participants were allocated to before completion of condition-specific memory quizzes. The online software platform used to design the survey did not enable us to know which condition participants were assigned to on the basis of their selecting to watch the intervention video (i.e. pressing ‘play’). It was, therefore, not possible to get a precise estimate of how many participants were actually allocated to and dropped out from each condition before completing the quizzes. This specific difficulty could perhaps have been averted by a more careful design of the ‘flow’ elements of the online survey. In retrospect, it may have been prudent to have presented a single item question immediately after randomisation (e.g. ‘are you ready to watch the
video?'), numbered or phrased differently across conditions, and preceding the presentation of the intervention videos. This would have given us an exact estimate of the numbers of individuals allocated to watch each of the intervention videos. However, this study involved a niche experimental design and as is often the case when creating something that is niche it is hard to predict in foresight all potential difficulties.

Furthermore, other than being practically difficult to engage in in-depth attrition analyses using methods typically employed within RCTs (see Flick, 1998; Howard, Krause, & Orlinsky, 1986), such analyses would perhaps carry little meaning in the context of our study. Since this was not a smoking cessation treatment study and we were merely interested in testing the short-term effectiveness of specific strategies in relation to certain smoking-related processes, methods such as ‘intention to treat analysis’ (see Hollis & Cambell, 1999) may be considered as having little relevance to the study aims and characteristics.

4.4.1.4. Correlational analysis component

Findings from the series of correlational analyses carried out showed that craving intensity is related to the content of craving-related primary and secondary appraisals as suggested by cognitive appraisal theories of emotion (see Lazarus, 1991; Lazarus & Folkman, 1984). The higher the craving intensity is, the more likely cravings are to be appraised as intolerable and threatening to one’s well-being, and the less likely it is for smokers to report confidence in their ability to cope with them. Decreases in craving intensity go hand-in-hand with decreases in how intolerable and threatening cravings are appraised to be, and with increases in secondary appraisals of one’s coping self-efficacy. These patterns of relationships were replicated in the relevant correlational analysis of ‘real-life’ data collected via the short Ecological Momentary Assessment component of the study. Furthermore, these relationships were shown to remain consistent across responses of reappraisal group participants subjected to interventions directly targeting the
content of craving-related appraisals, as well as acceptance group participants who were not primed in the same way.

These findings suggest that irrespective of whether or not an intervention targets the content of craving-related appraisals, the process associated with changes in craving intensity involves changes to the form of craving-related cognitions. When taking this finding into joint consideration with results from the craving induction lab, one may be led to suggest that the findings of this study provide preliminary evidence in support of the hypothesised mechanisms of change as put forward by CBT approaches to smoking cessation (Beck et al., 1993; Marlatt & Gordon, 1985). In other words, since: a) decreases in cravings were associated with changes in craving related appraisals (irrespective of whether or not these appraisals were the target of an intervention), and b) the CBT-based reappraisal strategies targeting the form of craving-related appraisals were associated with greater decreases in cravings for the same participants and in the same study, it may be possible to conclude that our findings provide preliminary support in favour of the CBT hypothesised mechanism of change according to which changes in craving intensity are possible via changes in craving-related cognitions and that such changes can be achieved by CBT-based reappraisal strategies.

However, more research is needed to reach such conclusions with any degree of certainty. One of the premises in the aforesaid syllogism is based on findings from correlational evidence which showed only moderate to high strength of relations between the variables examined. The single-item VASs used in the context of this study have not been experimentally tested and validated in regards to their psychometric properties. Single-item scales often lack sensitivity, may suffer from problems regarding their construct validity and can be associated with high measurement error. Although single item scales have often been used in the past to capture the content of primary and secondary appraisals related to an emotion-eliciting situation (e.g. Dobson, 1983; Dobson & Neufield, 1981; Folkman & Lazarus, 1985; Forsythe & Compas, 1987), adapting, validating and using a multi-dimensional measure of cognitive appraisals (e.g. Gall & Evans, 1987;
Peacock & Wong, 1990) may be a preferable starting point to answer the questions raised by our findings.

Confidence in the conclusion that similar findings provide support in favour of the hypothesised mechanism of change within CBT would increase if a well-validated scale of craving-related appraisals was used, if the predicted relations among variables were stronger, and if by using these scales it could be shown that decreases in cravings were associated with decreases in primary appraisals as captured by these scales. Complementary approaches may involve using qualitative methods to explore the participants’ reported experience pertinent to the use of ACT- and CBT-based strategies to regulate their cravings. In any case, the present study is the first study to our knowledge to examine the structural content of craving-related appraisals while studying changes in craving intensity affected by experimental interventions. Our findings showed that adopting such an approach may enable answering important process-related questions.

Interestingly, our findings revealed that the relationships between primary appraisals and secondary appraisals were equally strong for acceptance and reappraisal participants. In fact, the relationship between coping with cravings and craving intolerance appraisals was shown to be stronger among acceptance participants than their reappraisal counterparts. Since: a) coping self-efficacy appraisals and primary appraisals were related, and b) both acceptance and reappraisal were associated with increased self-efficacy, it may be tempting to assume that with both groups of participants similar processes (i.e. changes in primary appraisals) underpinned the observed changes in self-efficacy. However, this question cannot be answered without simultaneously collecting data pertinent to the change mechanisms hypothesised by ACT theory (i.e. experiential avoidance) as it may be possible that different processes (i.e. cognitive change and psychological flexibility) may account for self-efficacy changes in the different groups of participants.
4.4.2. Part B: Ecological Momentary Assessment

Unfortunately, the high attrition rates pertinent to the EMA component of the study rendered it impossible to make any meaningful comparisons between groups. Although it has been suggested that the wide availability of smartphones may increase the ability to capture ‘real life data’ using EMA designs (Shiffman, Stone, & Hufford, 2008), and despite offering participants a choice of how to be contacted for the purposes of the study, response rates from participants were remarkably low. Most often EMA designs involve meeting with participants face-to-face to explain the rationale for faithfully responding to communications by researchers, aiming to increase compliance with experimental procedures (Shiffman et al., 2008). As this was not an option due to the characteristics of our study, all efforts made to increase compliance were focused on ensuring that participants would not be heavily burdened by experimental demands. Although participants were only asked to reply to four in total messages over a 24-hour period, and despite the fact that each response was planned to engage participants for less than five minutes, attrition remained high. It may thus be important for future studies aiming to employ an EMA design that does not involve meeting face-to-face with participants, to consider developing some means to ensure participants are made aware of experimental communications as and when they occur, e.g. by developing an app that will ensure this takes place. In addition, future studies may consider using a different incentive system than the prize draws employed in the present study.

Nevertheless, the data that was collected as part of the EMA component did allow replication of findings pertinent to the correlational analyses as described above, and also provided some insights into the contexts within which participants are more likely to reply to experimental communications. In this respect, it was shown that participants were more likely to respond when being alone and while at home. In addition, no participant responded to suggest they were being with friends or socialising outside the home or work environment.
In terms of choice of strategy, the low completion rates rendered answering the research questions impossible. However, it was shown that similarly to the craving induction lab, the use of distraction as a strategy to regulate cravings figured prominently among participants’ choices. This finding lends further support to the suggestion made in Section 3.5 that distraction may be a more clinically relevant comparison group (versus ‘suppression’) to be employed within similar ‘micro-studies’ investigating the effectiveness of different strategies for regulating cravings to smoke. Furthermore, findings showed that participants who replied to our messages used reappraisal five times, and they appraised its effectiveness at average levels or above. Similarly, only 2 out of the 11 in total responses reporting the use of acceptance suggested the strategy was working only ‘slightly well’, and scores generally reported the strategy had been working above average. Once again, however, the low number of responses collected does not allow for safe conclusions to be reached.

4.3. Concluding remarks

The present study aimed to lay the groundwork for new methodological approaches to the study of smoking-related processes. Creating an online experimental lab represented a new approach to the study of cravings with consequences potentially generalising to other similar areas of inquiry. In addition, the use of white board animation videos to deliver interventions was associated with reductions in cravings (at least for the ‘reappraisal’ condition) and increases in self-efficacy (for all intervention groups), suggesting that this method may be appropriately used to deliver similar interventions in the future. As often is the case when walking in uncharted territory, various difficulties presented themselves that could not have been predicted (e.g. technical issues and associated attrition rates). However, science progresses through trial-and-error and the present study contributed to the increasing evidence base from other similar ‘micro-studies’ investigating smoking-related processes. Overall, our findings showed that reappraisal was associated with greater reductions in cravings compared to
strategies typically employed by smokers, and that both reappraisal and acceptance are associated with gains in terms of abstinence self-efficacy. Furthermore, the results showed that craving intensity is significantly correlated with the content of craving-related appraisals. The simultaneous investigation of these two research questions (i.e. effectiveness of strategies to reduce cravings and increase self-efficacy as well as the relationships between craving intensity and content of craving appraisals) allowed us to make a first attempt at approaching questions regarding key mechanisms of change related to cravings and self-efficacy and link these findings with CBT and ACT theory.

Furthermore, the experience gained and lessons learnt from our methodological approach can be a valuable source of information for further improving the outcomes of similar efforts in future research. Our inability to recruit and retain enough participants for the EMA component of the study provided useful insights into how similar designs can be improved in order for recruitment for online EMA studies to overcome some of the issues we were faced with. Disentanglement of the EMA component from the experimental lab component and utilisation of separate recruitment processes may be the best way to increase recruitment rates, while developing methods of increasing motivation to adhere to the experimental protocol is crucial in reducing attrition even when experimental demands are low.

4.4. Points of personal reflection

This section aims to share with the reader some personal reflections regarding my experience of carrying out this research project as well as of adopting a certain epistemological perspective while doing so.

4.4.1. Learning points

The first thing to acknowledge in reflecting over the process of carrying out this piece of research regards to how my relative inexperience in carrying out
research of this scale was reflected in the design of the study as well as the study’s findings. On one hand, my limited experience allowed me to think ‘outside of the box’ and develop an online paradigm for approaching the research questions. This may have not been possible had I been flooded by and invested in carrying out similar research in more ‘conventional’ ways. That is, the lack of overlearned behavioural patterns with regard to carrying out experimental research of this scale may have been a key factor that enabled me to design and deliver a research protocol that is niche, at least in the context of studying craving-related processes.

On the other hand, my limited previous experience contributed to an underestimation of the complexities of the task ahead, leading to the development of a perhaps overly ambitious project. More specifically, not having personal experience of how hard it would be to recruit participants for a study of this scale, I was mistakenly led to believe that purely by means of recruiting participants from around the world via an online experimental lab design, it would be feasible to recruit participants for an adjunct, secondary EMA study whose findings could replicate and complement those from the online craving-induction experimental component. As discussed in the relevant sections of the thesis, this confidence was proven to be ill-placed, and our research hypotheses pertaining to the secondary EMA design could be not be answered.

This experience developed my skills in appreciating the various difficulties associated with carrying out research. It also led me to conclude that in my future research efforts I need to reflect back on this experience, keep the task manageable and not entertain unrealistic hopes regarding how much it may be possible to achieve within a certain time frame.

Another similar learning point gained from the experience of this project relates to knowing that when carrying out research one needs to ‘expect the unexpected’. With regard to the present study this statement refers to the difficulties recruiting participants even for an online project, the technical difficulties faced by participants, and attrition rates.
4.4.2. Epistemological considerations

This study was approached from a positivist perspective that is not inconsistent with the critical realist epistemological perspective with which I identify most closely. I personally consider both qualitative and quantitative approaches as useful methods of enquiry that can suitably be applied to answer diverse research questions. The present study relied on quantitative methods typically associated with the positivist tradition, and hence it involved the development of specific research hypotheses, the isolation of variables of interest, the quantification of constructs and the statistical analysis of collected quantitative data.

Throughout the processes of research design, data collection, data analysis and results interpretation, the ‘objectivity’ with which quantitative methods have been traditionally associated was shown to be tested. The design involved deciding which variables were relevant to the phenomena of interest, the development of inclusion / exclusion criteria which affected the kind of data we would be collecting and the type of populations our findings would be generalisable to, as well as the development of recruitment strategies which potentially affected the pool of participants we recruited from. Data collection involved the operationalisation of various constructs and a decision-making process about which scales to use. Data analysis involved choice of statistical tests, and, of course, interpretation involving choice of an arbitrarily selected cut-off point (e.g. $a = .05$) for concluding whether or not there was enough evidence to reject the null hypotheses. With regard to the latter point about significance levels, the arbitrariness of this selected criterion was evident when finding ‘marginally significant’ results and ‘trends’ toward significant results. In sum, in carrying out this project I was faced with the need to make a series of subjective decisions on how to protect the ‘objectivity’ of the experimental process and the validity of the findings, and the frequency with which I was faced with such decisions brought to mind all points raised by constructivists regarding the limitations of quantitative methodologies.

Nevertheless, I still abide by the view that certain factors or variables can be considered as more or less relevant to a given phenomenon and that the onus is
on the researcher to minimise bias in the questions asked and the means chosen to answer them. Although I was able to experience first-hand the process by which isolation of variables may lead to an oversimplification of a research question, I was also able to develop a deep appreciation of the value of replication studies in confirming (or otherwise) previous findings. Finally, I was able to appreciate fully the value of being part of a scientific community whose efforts, debates and ongoing discussions can only collectively answer clinically important questions such as those that I tried to answer in the present study.

(Extended Paper word count: 22257)
References


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Appendix A

Ethical approval

1. Original ethics approval by SOPREC

Hi,

This is to confirm that your application titled *Investigating the effectiveness of two emotion regulation strategies in the management of cravings for tobacco use, and to understand what moderates smokers’ choice between different strategies* which was submitted for ethical approval, has been Approved by the School of Psychology Research Ethics Committee.

Kind regards,

Matt
2. First request for ethics approval by Chair's Action regarding advertising content (i.e. use of fliers, posters and online advertisements)

RE: Request for Chair's Action
Soprec
Sent: Fri 06/01/2017 13:36
To: Evangelos Stephanopoulos (14500289)
Cc: Aidan Hart; Mark Gresswell; Dave Dawson

Hi Evangelos,

This has now been fully approved by Chair's Action.

Kind regards,
Matt

From: Evangelos Stephanopoulos (14500289)
Sent: 14 December 2016 08:11
To: Soprec <Soprec@lincoln.ac.uk>
Cc: Aidan Hart <ahart@lincoln.ac.uk>; Mark Gresswell <mgresswell@lincoln.ac.uk>; Dave Dawson <ddawson@lincoln.ac.uk>
Subject: Request for Chair's Action

Dear Soprec,

I would like to request for Chair's action in respect to advertising for my study 'Managing Tobacco Cravings' which has already been approved by yourselves.

I would like approval via Chair's action in order to be able to distribute in the community the newly developed flyers (Attachment1) and posters (Attachment2). Furthermore, I would like to ask for Chair's action in order to be able to use the content depicted in Attachment3 and Attachment4 as part of online advertising (e.g. Facebook).

Looking forward to your reply,
Evangelos Stephanopoulos
3. Second request for SOPREC approval of the use of a website developed to attract participants

FW: Request for Chair’s action URGENT

Soprec
Sent: Thu 09/02/2017 09:35
To: Evangelos Stephanopoulos (14500289)
Cc: Aidan Hart; Mark Gresswell; Dave Dawson

Dear Evangelos,
Thank you for your email and apologies for the delay in replying. We can confirm your changes have now been approved by the committee.
Regards
SOPREC

From: Evangelos Stephanopoulos (14500289)
Sent: 30 January 2017 20:57
To: Soprec <soprec@lincoln.ac.uk>
Cc: Mark Gresswell <mgresswell@lincoln.ac.uk>; Aidan Hart <ahart@lincoln.ac.uk>; Dave Dawson <ddawson@lincoln.ac.uk>
Subject: Request for Chair’s action

Dear SOPREC,

I would like to make a further request for Chair’s action in respect to advertising for my study ‘Managing Tobacco Cravings’ which has already been approved by yourselves. This is due to current difficulties with recruiting participants for the project.

I would like approval via Chair’s action in order to be able to promote my study using a website specifically designed for this purpose. As the website is not open to public, I cannot send you a usable link, therefore I am attaching for you pictures with all its contents. In this respect, Attachments 1,2,3 depict the proposed website’s Home page, Attachments 4 and 5 depict the ‘About’ page with more information about the study, Attachments 6,7,8 depict a proposed FAQ page, and Attachment 9 depicts the ‘Contacts’ page of the proposed site. Please note that all the contents have been taken out of advertising material and / or the Participants Information Sheet which have already been approved by yourselves.

I look forward to your reply.

Kind Regards,
Evangelos Stephanopoulos
Appendix B

Introductory information for Part A given to prospective participants.

Spend 30 minutes learning two strategies to manage your tobacco cravings and enter a prize draw that could win you £100.

Are you a current smoker? Have you ever tried to quit but found that cravings got in your way?

Then we invite you to take part in this study which has been designed to teach smokers how to use two contemporary psychological strategies to help manage their cravings.

Who can take part?

Participants need to be current smokers, fluent in English, over 18 years old and not currently using any smoking cessation treatments (e.g. nicotine patches, e-cigarettes). They would be required to complete an online survey and engage with our interactive videos that have been designed to teach two psychological strategies for the management of cravings.

What will I gain by participating?

We expect that both strategies will provide you with important skills in coping with cravings that might aid your future efforts to give up smoking.

Participants who complete the study will be asked if they wish to be included in a prize draw giving away a prize of £100.

Is it safe for me to participate?

You have the right to withdraw from taking part in the study at any point and without having to give a reason.

All the information you will provide during the course of the study will be treated as strictly confidential and will be securely stored at the University of Lincoln. There will not be a report on individual performance, and your individual participation will not be personally identifiable in any way in the process of disseminating our findings.

The study is organised by the University of Lincoln and has obtained ethical approval from the School of Psychology Ethics Committee at the University of Lincoln. It is part of the Doctorate in Clinical Psychology training of one member of the research team.
Appendix C

Detailed Participant Information Sheet for Part A of the study.

MANAGING TOBACCO CRAVINGS

PARTICIPANT INFORMATION SHEET

Thank you for expressing an interest in taking part in our study. We would like to give you some more information about what this study entails and what might be asked of our participants. Please read the following information carefully as it is important to know what the study involves before you make up your mind about taking part in it. Please do not hesitate to contact us should you require any further information about any aspects of the study.

Background Information

This study wishes to understand the different strategies smokers use to manage their cravings and to test the effectiveness of two psychological techniques in managing such urges to smoke. Smoking is the leading cause of preventable illness and premature death worldwide. Although one in five deaths of people over 35 years old in England are due to smoking, one in five adults in the country continue to smoke. Giving up smoking is a difficult challenge for every smoker, and many smokers experience multiple relapses before successfully giving up. Although traditional treatments have helped millions to quit, success rates are not as high as health professionals would have wished them to be.

It has been shown that smokers relapse because nicotine withdrawal produces negative emotional states and cravings. The way we think about those states has been shown to contribute to how intensely they are experienced and they affect us. This study aims to examine the effectiveness of two strategies in helping smokers manage their craving-related thoughts.

Who can take part in the study?

Participants need to:

- Be 18 years old or older.
- Be fluent English speakers and able to understand written English.
- Be current, regular smokers (i.e. daily smokers for at least 12 months prior to taking part in the study).
- Not be currently receiving any smoking treatment (i.e. nicotine patches, e-cigarettes, etc.).

What does this study involve?
This study runs in two phases. If you are reading this document you are about to be asked if you consent to take part in Part A of the study. Part A involves completing an online survey of approximate average duration of 30 minutes.

During this time participants will:

- Be asked to answer various questions, e.g. about their smoking history and cravings.
- Be randomly allocated to one of four experimental conditions. Some participants will be shown a ten-minute training video teaching them how to use one of the two contemporary, psychological strategies for the management of their cravings. Others will be allocated to a control group (i.e. will not be taught any of the two strategies at this point), while some participants will be shown both videos (20 minutes in total). Please note that following completion of the study both training videos will be made accessible to all those participants who wish to benefit from their content, irrespective of group allocation.
- Be asked to take part in an exercise that is designed to assess how effective these strategies are in managing cravings for tobacco.

At the end of this online survey participants will be asked if they wish to enter a raffle for prize of £100 (see below for more information). Participants will also be asked if they wish to take part in the second phase of the study, which involves putting what they learnt into practice. Participation in Part B is once again voluntary and it does not affect the results of Part A, or Part A participants’ rights to enter the Part A prize raffle.

**Do I have to take part?**

You have the right to withdraw from taking part in the study at any point and without having to give a reason. In order to withdraw you simply have to close the survey from your browser.

**Are there any potential disadvantages in taking part?**

We do not expect you to experience any sense of discomfort as a result of taking part in the study. However, you may experience mild nicotine withdrawal symptoms during the exercise aimed to assess the effectiveness of the two strategies.

**What are the potential benefits from taking part?**

We expect that both strategies will teach you important skills in coping with cravings that might aid your future efforts to give up smoking. Please note that following completion of the study both intervention videos will be made available to
all those who took part in the study and who may wish to benefit from accessing their content.

**Information about the prize draw**

All participants who complete the online survey may opt to take part in a prize draw. The prize is an Amazon or a Love2Shop voucher (depending on the lucky participant’s preference) worth £100. The Love2Shop voucher can be redeemed in numerous UK top stores, retailers and attractions (e.g. Argos, Boots, Debenhams, House of Fraser, Mamas & Papas, Toys ‘R’ Us, HMV and Waterstones).

At the end of the survey participants who wish to enter the prize draw will be asked to provide their contact details and will subsequently enter the prize draw upon completion of the study. The lucky winner will be contacted by the research team using the contact details he or she has provided.

**What happens with the information I will provide?**

All the information you will provide during the course of the study will be treated as strictly confidential and will be securely stored in locked up filing cabinets at the University of Lincoln and/or password protected computers. All data collected for the study will be kept safe for a period of seven years and will then be securely destroyed.

**What will happen with the results of the study?**

The results will be written up and presented as part of Evangelos Stephanopoulos’ Clinical Psychology Doctorate thesis. Participants will receive a general summary of the findings at the end of this process. Our findings might also be presented at academic conferences and an academic paper will be submitted for publication in a peer-reviewed academic journal.

There will not be a report on individual performance, and your individual participation will not be personally identifiable in any way in the process of disseminating our findings.

**Who is organising the study?**

The study is organised by the University of Lincoln. It is part of the Doctorate in Clinical Psychology training of one member of the research team.

**Who has reviewed the study?**

The study has obtained ethical approval from the School of Psychology Ethics Committee at the University of Lincoln.
Who do I contact if I want to make a complaint?
School of Psychology Ethics Committee, University of Lincoln at:
SOPREC@lincoln.ac.uk

Who do I contact to find out more?
For more information please contact:
Evangelos Stephanopoulos (Clinical Psychologist in Training) at:
14500289@students.lincoln.ac.uk

Thank you for your time. We hope that you found the information on this leaflet useful. Please do not hesitate to contact us if you have any more questions.
Appendix D.

Part A participant debrief sheet

Managing Tobacco Craving Part A: Participant Debrief Sheet

Thank you for participating in this study.

The aim of Part A of this research was to examine the effectiveness of two psychological strategies in helping smokers manage their cravings. The study involved four groups to which participants were randomly allocated: a Control group, a Reappraisal group, an Acceptance group and a Reappraisal + Acceptance group.

Participants in the Reappraisal group watched a 10 minute and 17 seconds-long video teaching them how to use reappraisal to respond to their cravings. The video was developed by the research team on the basis of previous literature and specifically for the purposes of this study.

Participants in the Acceptance Group watched a 9 minute and 48 seconds-long video teaching them how to use acceptance to respond to their cravings. The video was developed by the research team on the basis of previous literature and specifically for the purposes of this study.

Participants in the Reappraisal + Acceptance groups watched both videos that taught them the use of both strategies. The aim of having this group was to see if being taught both strategies would be more effective in managing cravings than any strategy alone.

Participants in the Control group watched a neutral video (nature documentary) publicly available on YouTube (overall duration 11 minutes and 21 seconds) and were not taught any of the two strategies. The aim of having this group was to ensure that any benefits in regards to managing cravings for the participants of the other groups were indeed a result of the effectiveness of the two strategies and could not be attributed to other factors.

Although participants in the Control group were not taught any of the two strategies, all participants of the study are given the opportunity to access the training videos. To this end, all participants in Part A have been given the option of providing us with their contact details in order for the research team to send them the links for the videos upon completion of the study (i.e. once all data have been collected and analysed).

The online survey consisted of questions taken from various validated measures found in the literature. These included:

- Questions about Smoking Urges – Brief (QSU-B): This scale is a measure of current cravings.
- 1-Urge: This is a single question asking about the severity of current cravings.
- Smoking Self-Efficacy / Temptation Questionnaire (SET) Short Form: This scale was used to see if training in any of the two strategies would affect participants’ sense of self-efficacy in managing cravings in different contexts. Previous literature
has shown that self-efficacy is an important predictor of future relapses among those who attempt to quit smoking.

- Positive and Negative Affect Scale (PANAS): This is a state measure of positive and negative affect that participants were experiencing at the time of completing the study. Previous literature has indicated that positive and negative affect (e.g. how sad or how happy people feel) are linked to the ability to manage cravings.

- Acceptance and Action Questionnaire – II (AAQ-II): This is a trait measure of experiential avoidance, i.e. the tendency of different people to try and avoid experiencing difficult emotions and thoughts. It has been hypothesised that people who try to avoid or suppress difficult emotions and thoughts may find it hard to engage in strategies that involve acceptance and/or exposure to such aversive private events, potentially affecting the effectiveness of training in the use of strategies that are thought to work through exposure to such emotions and thoughts (e.g. cravings).

- Fagerstorm Test for Nicotine Dependence (FTND): This scale assesses levels of dependence to nicotine and was used to test the hypothesis that the effectiveness of the two strategies may partially depend on the severity of nicotine dependence.

- The Subjective Units of Distress question and three more questions developed by the research team aimed at understanding how different appraisals of cravings and the self-perceived ability to cope with them may have affected the intensity of cravings.

The four videos of people smoking were developed by other researchers and have been shown to elicit cravings among smokers who watch them.

For further information regarding the aims and purposes of the study, please refer to your participant information sheet.

Your responses and information have been kept anonymous and confidential therefore individual feedback cannot be given. Those participants who decided to provide us with their contact details will be emailed a summary of the study findings following completion of the data analysis.

If you decide to withdraw consent for your data to be used, this will need to occur within two weeks following taking part in the study. Please note that in order to withdraw consent you need to contact the Ethics Committee at the University of Lincoln (see below for contact details) and provide the committee with your Unique Participant Identification Number as produced at the beginning of the survey, the title of the study (Managing Tobacco Cravings) and the name of the principal investigator (Evangelos Stephanopoulos). After two weeks, the data may have been analysed and therefore it might not be possible to remove them from the study.

If participating in this study has raised any questions or concerns for you and you need somebody to talk to, we have provided details of the principal researcher, his supervisors and the Lincoln University ethics committee below and links to further sources of support.
Thank you and best wishes,

Evangelos Stephanopoulos

Further information and contact details:

Evangelos Stephanopoulos
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14500289@students.lincoln.ac.uk

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3rd Supervisor
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ahart@lincoln.ac.uk
01522 837394

Lincoln University Ethics Committee (SOPREC):
SOPREC@lincoln.ac.uk

Support services and Helplines:
In the unlikely event that you have found taking part in this study distressing you should seek support. Below there are a number of options and details which you may find useful.

Your local GP may offer you support and refer you for specialist services.

Lincoln University Student Wellbeing Service:

Phone number: 01522 886400; email: studentwellbeing@lincoln.ac.uk

Samaritans (24 hours a day): 08457 909090; website: www.samaritans.org

NHS direct available 24 hours a day for expert health advice and information, call 0845 4647

For more help and information regarding quitting smoking please talk to your GP. You may also visit: www.smokefree.gov

If you live in the USA please speak to your doctor for further support and a referral to specialist services.

To find a list of contact details for the Samaritans in the USA please visit: http://www.samaritansusa.org/contact.php. Alternatively you may call: (212) 673-3000.

If you live in the USA and want to find out more information about quitting smoking you can visit:

http://www.tobaccofree.org/quitting.htm?gclid=CNXMqd_WoNACFe0K0wodp7sPAQ

and http://www.lung.org/stop-smoking/join-freedom-from-smoking/

If you live in any other part of the world please speak to your doctor for support and for advice / guidance on quitting smoking.
Appendix E

Online advertising
Appendix F

Fliers used for advertising the study

Managing cravings for tobacco

- Online Study
- 30 minutes duration
- Prize draw of £100

Participants need be:
- Current smokers
- Over 18 years old
- Fluent in English
- Not currently using any other smoking cessation treatments

Participants do not need to want to quit smoking at the present time in order to take part.

For more information:
14500289@students.lincoln.ac.uk

Are you a smoker who has tried to quit but found that cravings got in your way? Do you know of a smoker in a similar position?

The University of Lincoln will give the opportunity for regular smokers to participate in cutting-edge psychological research that might help them learn to better manage their cravings.

To participate:
Visit: https://goo.gl/FflvZB

Or scan the following QR code:
Appendix G

Posters

Managing cravings for tobacco

Participants need be:
- Current smokers
- Over 18 years old
- Fluent in English
- Not currently using any other smoking cessation treatments

Participants do not need to want to quit smoking at the present time in order to take part.

For more information
14500289@students.lincoln.ac.uk

Are you a smoker who has tried to quit but found that cravings got in your way? Do you know of a smoker in a similar position?

Spend 30 minutes online learning two psychological techniques for managing tobacco cravings and enter a prize draw for £100.

To participate:
Visit: https://goo.gl/PtLxZB
Or scan the following QR code:

UNIVERSITY OF LINCOLN

Managing Cravings
https:// goo.gl/PtLxZB
Managing Cravings
https:// goo.gl/PtLxZB
Managing Cravings
https:// goo.gl/PtLxZB
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Managing Cravings
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https:// goo.gl/PtLxZB
Appendix H

Website

https://www.managingtobaccocravings.site/

Home Page (as approved by SOPREC)
Background Information

Thank you for expressing an interest in taking part in our study. We would like to give you some more information about what this study entails and what might be asked of our participants. Please read the following information carefully as it is important to know what the study involves before you make up your mind about taking part in it. Please do not hesitate to contact us should you require any further information about any aspects of the study.

This study wishes to understand the different strategies smokers use to manage their cravings and to test the effectiveness of two psychological techniques in managing such urges to smoke. Smoking is the leading cause of preventable illness and premature death worldwide. Although one in five deaths of people over 35 years old in England are due to smoking, one in five adults in the country continue to smoke. Giving up smoking is a difficult challenge for every smoker, and many smokers experience multiple relapses before successfully giving up. Although traditional treatments have helped millions to quit, success rates are not as high as health professionals would have wished them to be.

It has been shown that smokers relapse because nicotine withdrawal produces negative emotional states and cravings. The way we think about those states has been shown to contribute to how intensely they are experienced and they affect us. This study aims to examine the effectiveness of two strategies in helping smokers manage their craving-related thoughts.

Who can take part in the study?

Participants need to:
- Be 18 years old or older.
- Be fluent English speakers and able to understand written English.
- Be current, regular smokers (i.e. daily smokers for at least 12 months prior to taking part in the study).
- Not be currently receiving any smoking treatment (i.e. nicotine patches, e-cigarettes, etc.).

What does this study involve?

The study runs in two phases.

The study links available on this website will take you to a page asking if you wish to participate in Part A. Part A involves completing an online survey of approximate average duration of 30 minutes.

During this time participants will:
- Be asked to answer various questions, e.g. about their smoking history and cravings.
- Be randomly allocated to one of four experimental conditions. Some participants will be shown a ten-minute training video teaching them how to use one of the two contemporary, psychological strategies for the management of their cravings. Others will be allocated to a control group (i.e. will not be taught any of the two strategies at this point).
- Be asked to take part in an exercise that is designed to assess how effective these strategies are in managing cravings for tobacco.

At the end of this online survey participants will be asked if they wish to enter a raffle for prize of £100 (see below for more information). Participants will also be asked if they wish to take part in the second phase of the study, which involves putting what they learnt into practice. Participation in Part B is once again voluntary and it does not affect the results of Part A, or Part A participants’ rights to enter the Part A prize raffle.

Although one in five deaths of people over 35 years old in England are due to smoking, one in five adults in the country continue to smoke. Giving up smoking is a difficult challenge for every smoker, and many smokers experience multiple relapses before successfully giving up. Although traditional treatments have helped millions to quit, success rates are not as high as health professionals would have wished them to be.

Email: 14500289@students.lincoln.ac.uk
Telephone: +44 (0)7484 776096
FAQ

Do I have to take part?
You have the right to withdraw from taking part in the study at any point and without having to give a reason. In order to withdraw you simply have to close the survey from your browser.

Are there any potential disadvantages in taking part?
We do not expect you to experience any sense of discomfort as a result of taking part in the study. However, you may experience mild nicotine withdrawal symptoms during the exercise aimed at assessing the effectiveness of the two strategies.

What are the potential benefits from taking part?
We expect that both strategies will teach you important skills in coping with cravings that might aid your future efforts to give up smoking. Please note that following completion of the study both intervention videos will be made available to all those who took part in the study and who may wish to benefit from accessing their content.

What is the prize draw?
All participants who complete the online survey may opt to take part in a prize draw. The prize is an Amazon or a Love2Shop voucher (depending on the lucky participant’s preference) worth £100. The Love2Shop voucher can be redeemed in numerous UK top stores, retailers and attractions (e.g. Argos, Boots, Debenhams, House of Fraser, Mamas & Papas, Toys ‘R’ Us, HMV and Waterstones).

At the end of the survey participants who wish to enter the prize draw will be asked to provide their contact details and will subsequently enter the prize draw upon completion of the study. The lucky winner will be contacted by the research team using the contact details he or she has provided.

What happens with the information I will provide?
All the information you will provide during the course of the study will be treated as strictly confidential and will be securely stored in locked up filing cabinets at the University of Lincoln and/or password protected computers. All data collected for the study will be kept safe for a period of seven years and will then be securely destroyed.

What will happen with the results of the study?
The results will be written up and presented as part of Evangelos Stephanopoulos’ Clinical Psychology Doctorate thesis. Participants will receive a general summary of the findings at the end of this process. Our findings might also be presented at academic conferences and an academic paper will be submitted for publication in a peer-reviewed academic journal.

There will not be a report on individual performance, and your individual participation will not be personally identifiable in any way in the process of disseminating our findings.

Who is organising the study?
The study is organised by the University of Lincoln. It is part of the Doctorate in Clinical Psychology training of one member of the research team.

Who has reviewed the study?
The study has obtained ethical approval from the School of Psychology Ethics Committee at the University of Lincoln.

Who do I contact if I want to make a complaint?
School of Psychology Ethics Committee, University of Lincoln at SOPREC@lincoln.ac.uk

Although one in five deaths of people over 35 years old in England are due to smoking, one in five adults in the country continue to smoke, making it a major risk factor for death and disease. Quitting smoking is a difficult change for many smokers, with around half of all people who start smoking successfully giving up. Although traditional treatments have helped millions to quit, success rates are not as high as health professionals would have wished them to be.
CONTACT

For more information please contact:
Evangelos Stephanopoulos (Clinical Psychologist in Training) at:
14500289@students.lincoln.ac.uk
Or phone: +44 (0)7464776096

Although one in five deaths of people over 35 years old in England are due to smoking, one in five adults in the country continue to smoke. Giving up smoking is a difficult challenge for many smokers, and many smokers experience multiple relapses before successfully giving up. Although traditional treatments have helped millions to quit, success rates are not as high as health professionals would have worked them to be.

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Appendix I
Introductory information to Part B

Welcome to the information page for the second part of the 'Managing tobacco cravings' research project.

This part of the study is designed to allow participants who have completed Part A to put into practice the strategies they have previously learned for managing their tobacco cravings.

What does Part B involve?

Those individuals who wish to take part in this phase will:

- Be asked to make a practice attempt at managing their cravings and quitting smoking for the next 24 hours.

- Be asked to contact the research team to inform us about when they have their first cigarette (should they decide to do so). This may be done via email, text or social media depending on each participant's preferred media.

- Be asked to reply to four messages over the next 24 hours (8 a.m. - 8 p.m.) asking them about their cravings and how they manage them, as well as how many cigarettes they have smoked over this 24-hour period. Once again, participants may be contacted via email, text or social media depending on each participant's preferred media.

What will I gain by participating?

Part B offers participants the opportunity to put what they learnt into practice, utilising the strategies they were taught in a practice attempt to quit smoking. This attempt may lead to successful abstinence, or failing that, to useful information that can be drawn upon in future attempts to quit smoking.

Furthermore, all participants involved may opt to take part in a prize draw to win £100.

Is it safe for me to participate?

You have the right to withdraw from taking part in the study at any point and without having to give a reason.

All the information you will provide during the course of the study will be treated as strictly confidential and will be securely stored at the University of Lincoln. There will not be a report on individual performance, and your individual participation will not be personally identifiable in any way in the process of disseminating our findings.

The study is organised by the University of Lincoln and has obtained ethical approval from the School of Psychology Ethics Committee at the University of Lincoln. It is part of the Doctorate in Clinical Psychology training of one member of the research team.
Where can I find out more? To access the full Participation Information Sheet please click: Participant information sheet part b
Appendix J

Participant Information Sheet: Part B

MANAGING TOBACCO CRAVINGS: PART B

PARTICIPANT INFORMATION SHEET

Thank you for expressing an interest in taking part in Part B of our study. We would like to give you some more information about what this study entails and what might be asked of our participants. Please read the following information carefully as it is important to know what the study involves before you make up your mind about taking part in it. Please do not hesitate to contact us should you require any further information about any aspects of the study.

Background Information

Part B of the study aims to investigate the effectiveness of the two strategies taught in Part A, as well as to understand some of the factors that affect smokers in choosing among different strategies to manage their cravings in real-life settings.

Who can take part in the study?

Participants need to:

- Be 18 years old or older.
- Be current, regular smokers (i.e. daily smokers for at least 12 months prior to taking part in the study).
- Be fluent English speakers and able to understand written English.
- Not be currently receiving any smoking treatment (i.e. nicotine patches, e-cigarettes, etc.).
- Have completed Part A of the study.

What does Part B of this study involve?

Participants who wish to complete Part B will be asked to reply to four messages (using texts, emails, or social media depending on their chosen media) over the 24 hours following giving consent to take part (in-between 8am to 8pm). These messages will ask participants about their whereabouts, their cravings and the strategies they currently use to manage those cravings. The last message will be sent 24 hours after completion of Part A of the study and will ask participants how many cigarettes they had over the last 24 hours.
Replying to these messages should not take more than five minutes on each occasion. Participants will also be asked to try abstaining from smoking and to let the research team know when they had their first cigarette (if they chose to have one indeed) by text / email / social media depending on their chosen media.

Do I have to take part?

You have the right to withdraw from taking part in the study at any point and without having to give a reason.

Are there any potential disadvantages in taking part?

We do not expect you to experience any sense of discomfort as a result of taking part in the study. However, it is highly likely that you will experience nicotine withdrawal symptoms during the attempt to abstain from smoking.

What are the potential benefits from taking part?

Part B offers participants the opportunity to put what they learnt in action, utilising the strategies they were taught in a practice attempt to quit smoking. This attempt may lead to successful abstinence, or failing that, to useful information that can be drawn upon in future attempts to quit smoking.

Information about the prize draw

All participants who complete the online survey may opt to take part in a prize draw. The prize is an Amazon or a Love2Shop voucher (depending on the lucky participant’s preference) worth £100. The Love2Shop voucher can be redeemed in numerous UK top stores, retailers and attractions (e.g. Argos, Boots, Debenhams, House of Fraser, Mamas & Papas, Toys ‘R’ Us, HMV and Waterstones).

At the end of the survey participants who wish to enter the prize draw will be asked to provide their contact details and will subsequently enter the prize draw upon completion of the study. The lucky winner will be contacted by the research team using the contact details he or she has provided.

What happens with the information I will provide?

All the information you will provide during the course of the study will be treated as strictly confidential and will be securely stored in locked up filing cabinets at the University of Lincoln and/or password protected computers. All data collected for the study will be kept safe for a period of seven years and will then be securely destroyed.

What will happen with the results of the study?

The results will be written up and presented as part of Evangelos Stephanopoulos’ Clinical Psychology Doctorate thesis. Participants may choose to receive a general summary of the findings at the end of this process. Our findings might also be presented at academic conferences and an academic paper will be submitted for publication in a peer-reviewed academic journal.
There will not be a report on individual performance, and your individual participation will not be personally identifiable in any way in the process of disseminating our findings.

Who is organising the study?

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Who do I contact if I want to make a complaint?

School of Psychology Ethics Committee, University of Lincoln at:
SOPREC@lincoln.ac.uk

Who do I contact to find out more?

For more information please contact:
Evangelos Stephanopoulos (Clinical Psychologist in Training) at:
14500289@students.lincoln.ac.uk

Thank you for your time. We hope that you found the information on this leaflet useful. Please do not hesitate to contact us if you have any more questions.
Appendix K

Participant Debrief Sheet for Part B of the study

Managing Tobacco Cravings Part B: Participant Debrief Sheet

Thank you for participating in this study.

The aim of Part B of this research was to examine the effectiveness of two psychological strategies in helping smokers manage their cravings. Part B of the study also wished to examine participants’ choice of strategy in real-life settings aiming to understand how choice of strategy may be affected by factors such as intensity of cravings and on-going activities and how training in the two strategies may have affected such choice. Finally, Part B asked participants to try managing their cravings and abstaining from smoking using any strategies at their disposal. By doing so the aim was to examine whether training in one or both of the strategies would be actually translated into less frequent smoking behaviour.

The questions used in this part of the study included:

- 1-Urge: This is a single question asking about the severity of current cravings.
- The Subjective Units of Distress question and three more questions developed by the research team aimed at understanding how different appraisals of cravings and the self-perceived ability to cope with them may have affected the intensity of cravings.
- Ecological Momentary Assessment questions: These asked participants about their whereabouts, the people they were with and the types of activity they were engaged in at the point of contact in order to develop an understanding of how such factors influenced the intensity of their cravings and their ability to cope with them.

For further information regarding the aims and purposes of the study, please refer to your participant information sheet.

Your responses and information have been kept anonymous and confidential therefore individual feedback cannot be given. All participants in Part B of the study may opt to be emailed a summary of the study findings following completion of the data analysis.

If you decide to withdraw consent for your data to be used, this will need to occur within two weeks following taking part in the study. Please note that in order to withdraw consent you need to contact the Ethics Committee at the University of Lincoln (see below for contact details) and provide the committee with your Unique Participant Identification Number as produced at the beginning of the survey, the title of the study (‘Managing Tobacco Cravings’) and the name of the principal investigator (Evangelos Stephanopoulos). After two weeks, the data may have been analysed and therefore it might not be possible to remove them from the study.
If participating in this study has raised any questions or concerns for you and you need somebody to talk to, we have provided details of the principal researcher, his supervisors and the Lincoln University ethics committee below and links to further sources of support.

Thank you and best wishes,

Evangelos Stephanopoulos

Further information and contact details:

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**Lincoln University Ethics Committee (SOPREC):**
SOPREC@lincoln.ac.uk

**Support services and Helplines:**
In the unlikely event that you have found taking part in this study distressing you should seek support. Below there are a number of options and details which you may find useful.

Your local GP may offer you support and refer you for specialist services.

Lincoln University Student Wellbeing Service:
Phone number: 01522 886400; email: studentwellbeing@lincoln.ac.uk
Samaritans (24 hours a day): 08457 909090; website: www.samaritans.org
NHS direct available 24hours a day for expert health advice and information, call 0845 4647
For more help and information regarding quitting smoking please talk to your GP. You may also visit: www.smokefree.gov

If you live in the USA please speak to your doctor for further support and a referral to specialist services.
To find a list of contact details for the Samaritans in the USA please visit: http://www.samaritansusa.org/contact.php. Alternatively you may call: (212) 673-3000.
If you live in the USA and want to find out more information about quitting smoking you can visit:
http://www.tobaccofree.org/quit.html?gclid=CNXMqd_WoNACFe0K0wodp7sPAQ
and
http://www.lung.org/stop-smoking/join-freedom-from-smoking/

If you live in any other part of the world please speak to your doctor for support and for advice / guidance on quitting smoking.
Appendix L

Coding Frame: content of experiencing cravings

1) Place

1a) Home
1b) Workplace
1c) Outdoors

2) People

2a) Alone
2b) Close family. Examples include spouse or partner, children, parents, siblings.
2c) Work colleagues. Managers are also included.
2d) Extended family & friends.
2e) Pets

3) Activities

3a) Working. May include academic type of work, e.g. studying.
3b) Socialising.
3c) Relaxing. Includes only responses using specifically the word ‘relaxing’.
3d) Home entertainment / leisure. Examples includes watching TV, surfing the internet, playing video games. Code as 3c if ‘relaxing’ is used.
3e) Doing house chores
3f) Leisure outdoors.
Responding to tobacco cravings using acceptance and/or reappraisal: Results from an experimental study employing an online craving induction lab.

E. Stephanopoulos, M. Gresswell, A. Hart, D. Dawson
University of Lincoln

Introduction
Despite recent improvements in smoking cessation outcomes, 1 in 5 adults in the UK continue to smoke and relapse rates remain high\(^1\). Recent advances in the study of smoking-related processes have involved examining in controlled, laboratory settings the effectiveness of a range of psychological techniques. This study examined the effectiveness of ‘reappraisal’ and ‘acceptance’ in managing tobacco cravings and improving abstinence self-efficacy in comparison to strategies employed by a control group’s participants using strategies they have found useful in the past. Acceptance is a key process within Acceptance and Commitment Therapy (ACT)\(^2\) and reappraisal is the hypothesised mechanism of change within Cognitive Behaviour Therapy (CBT)\(^3\).

Method
This experimental study took place online. Participants were 110 regular, adult smokers not using any smoking cessation treatments. Participants:
1) Completed baseline measures (Time 1).
2) Were randomly allocated to one of four conditions (control group, acceptance, reappraisal, both acceptance and reappraisal).
3) Watched condition-specific videos embedded in the online survey. Control group participants watched a nature documentary. Reappraisal and acceptance groups participants watched white board animation videos teaching them their respective strategy. Both interventions group participants watched both these videos.
4) ‘Entered’ the craving induction lab and were shown four craving-eliciting videos. Participants in the three experimental groups were instructed to use the strategies they were taught to respond to any emerging cravings. Control group participants were instructed to use any strategy they had found useful in the past.
5) Were re-administered craving and self-efficacy scales (Time 2).

Cravings: Key Findings
Reappraisal was the only strategy associated with statistically significant improvements in cravings compared to the control group. Teaching participants the use of both strategies was not associated with greater improvements in craving intensity.

Analysis of responses from participants who most faithfully adhered to experimental instructions (i.e. did not report using strategies associated with other conditions) showed that reappraisal was also associated with greater decreases in cravings in comparison to acceptance.

Self-efficacy: Key Findings
All experimental groups’ participants reported increases in abstinence self-efficacy compared to the control group. Analysis of scores of the most instructions-adherent participants found reappraisal to be associated with greater self-efficacy increases than acceptance.

Conclusions
Reappraisal produced the best outcomes in terms of decreasing cravings and increasing self-efficacy. Acceptance was not associated with reductions in cravings, but was associated with increases in abstinence self-efficacy. Teaching both strategies did not lead to improved outcomes.

References