

**Implicit Processes in Smoking Interventions**

by

Omid Fotuhi

A thesis

presented to the University of Waterloo

in fulfillment of the

thesis requirement for the degree of

Doctor of Philosophy

in

Psychology

Waterloo, Ontario, Canada, 2013

© Omid Fotuhi 2013

Author's declaration

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

I understand that my thesis may be made electronically available to the public.

## Abstract

Although explicit attitudes have traditionally been used in predictive models of health behaviour, recent theorizing suggests that implicit attitudes might be more useful in predicting socially undesirable or addictive behaviours. In Studies 1 through 3, smokers' explicit and implicit attitudes were examined to compare the predictive utility of each. Results confirmed that implicit attitudes are better at predicting impulse-driven behaviours, such as smoking consumption. Consequently, implicit attitudes also predict whether a quit attempt will be successful. In contrast, explicit attitudes are better at predicting deliberative outcomes, such as having intentions to quit, and making planned quit attempts. Extending these findings, in Studies 4 and 5, the effectiveness of a novel affirmation intervention designed to break the association between smoking and stress-reduction is evaluated. Preliminary results demonstrate that an affirmation intervention designed to break the smokers' reliance on smoking as a means of coping with stress can have beneficial and sustainable effects in cessation outcomes. The impact on smokers' implicit attitudes as a possible mediating role is discussed. Implications for more effective health interventions are also discussed.

## Acknowledgements

I am extremely grateful for the support, guidance, and supervision of Drs. Geoffrey T. Fong, Steven Spencer, and Mark P. Zanna during my graduate studies. Their boundless enthusiasm, keen insight, and deep love for social psychology have been a constant source of inspiration and motivation. I am very lucky to have worked with such brilliant researchers and mentors.

I would like to thank the University of Waterloo, and the Department of Psychology, for providing me with a peaceful and rich academic environment in which I could cultivate my ideas, and bring this dissertation to fruition. In particular, I would like to thank the faculty and staff in the Department of Psychology for providing me with the resources and support I needed to successfully meet my scholastic and research goals. I would also like to acknowledge the resources and support made available to me through the tireless work of each of the International Tobacco Control Policy (ITC) Evaluation Project's collaborators, investigators, and funders.

I would like to gratefully acknowledge the financial support for my research through a CIHR Frederick Banting and Charles Best Canada Graduate Scholarship, a CIHR Foreign Studies Supplement, a CIHR Strategic Training Program in Tobacco Research (STPTR) Fellowship, an Ontario Tobacco Research Unit (OTRU) Ashley Studentship, and the ITC Project.

It has been a pleasure and an honour to have shared my graduate experiences with my cohort (Daniel, Jo, Justin, Mandy, and Steve). Thank you for the fond memories, the support, and for keeping the bar of expectations consistently high.

Most of all, I would like to thank my wife, Karina. Your unwavering love, unconditional support, and fertile mind have kept me moving forward through the ups and downs of the past months, culminating, finally, in the successful completion of this dissertation. Thank you.

## Dedication

I would like to dedicate this to my mother and father, whose lives have been the accumulation of sacrifices for their children, driven by the single hope of providing us with an education, and a chance at a better life. Thank you.

I would also like to dedicate this to my brothers Majid, Hamid, Vahid, and Saeed, and my sister Maryam, for constantly being a silent motivator through the examples of their own individual lives.

## Table of Contents

List of Figures .....	viii
List of Tables.....	ix
Introduction .....	1
Tobacco Use – A Contradiction .....	1
The Role of Attitudes .....	1
Challenges to Attitude-Behaviour Correspondence.....	2
Implicit Attitudes and Dual Process Models of Health Behaviour .....	4
Changing Implicit Attitudes as Possible Smoking Intervention .....	7
Implicit Attitude Formation .....	7
Smoking and Stress .....	8
Implications for Health Interventions .....	10
Self-Affirmation Intervention .....	10
Overview of the Present Studies .....	12
Study 1: Explicit Attitudes and Smoking.....	14
Methods.....	15
Results .....	19
Discussion .....	21
Study 2: Implicit Attitudes and Smoking.....	23
Methods.....	24
Results .....	27
Discussion .....	31
Study 3: Longitudinal Predictive Utility of Implicit Attitudes .....	33
Methods.....	34
Results .....	36
Discussion .....	40
Study 4: Contingent Affirmation Intervention for Smoking.....	41
Methods.....	42
Results .....	44
Discussion .....	52
Study 5: Replication of Contingent Affirmation Intervention for Smoking.....	55
Methods.....	56
Results .....	57
Discussion .....	70
General Discussion.....	73
Important Contributions of this Research .....	73
Limitations .....	74
Alternative Explanations.....	75

Implications for Health Interventions .....	76
Future Research.....	78
 References .....	79
 Appendices .....	92
Appendix A: Self-Affirmation Manipulation Instructions (Study 3).....	92
Appendix B: Control Group Instructions (Studies 3) .....	93
Appendix C: Smoking Belief Items (Studies 3).....	94
Appendix D: Four Month Follow-Up Telephone Script (Studies 3) .....	96
Appendix E: Contingent Affirmation Manipulation Instructions (Studies 4 and 5).....	98
Appendix F: Traditional Affirmation Manipulation Instructions (Study 4) .....	101
Appendix G: Control Group Instructions (Studies 4 and 5) .....	103

## List of Figures

<i>Figure 1.</i> Implicit Association Test (IAT) scores for smokers and nonsmokers as a function of IAT measure in Study 2 .....	27
<i>Figure 2.</i> IAT scores as a function of condition in Study 3 .....	37
<i>Figure 3.</i> IAT scores as a function of smoking status in Study 3 .....	38
<i>Figure 4.</i> IAT scores as a function of experimental condition at Time 2 in Study 4.....	48
<i>Figure 5.</i> IAT scores as a function of experimental condition at Time 1 in Study 5.....	57
<i>Figure 6.</i> IAT scores as a function of experimental condition at Time 2 in Study 5.....	64

## List of Tables

<i>Table 1.</i> Characteristics of the International Tobacco Four Country Survey (ITC-4) Sample by Country in Study 1 .....	18
<i>Table 2.</i> Correlation and Logistic Regression Analyses Between Measures of Explicit Attitudes at Wave 6 and Relevant Quitting-Related Variables among Smokers in Study 1 ..	21
<i>Table 3.</i> Correlations Between Measures of Implicit Attitudes and Explicit Attitude Separated by Smoking Status in Study 2.....	30
<i>Table 4.</i> Sample Characteristics at Time 1 in Study 3 .....	34
<i>Table 5.</i> Sample Characteristics at Time 1 in Study 4 .....	45
<i>Table 6.</i> Smoking-Related Outcomes at Time 1 by Condition in Study 4.....	47
<i>Table 7.</i> Smoking-Related Outcome Variables at Time 2 Separated by Condition in Study 4 .....	49
<i>Table 8.</i> Longitudinal Results at Time 3 in Study 4 .....	52
<i>Table 9.</i> Sample Characteristics at Time 1 for Study 5 .....	58
<i>Table 10.</i> Group Differences at Time 2 in Study 5 .....	62
<i>Table 11.</i> Group Differences at Time 3 in Study 5 .....	66
<i>Table 12.</i> Correlations between Measures of Implicit and Explicit Attitudes at Time 1 on Relevant Smoking-Related Variables Across Time in Study 5.....	68
<i>Table 13.</i> Correlations between Measures of Implicit and Explicit Attitudes at Time 2 on Relevant Smoking-Related Variables at Times 2 and 3 in Study 5.....	69

## **Introduction**

“What a weird thing smoking is and I can't stop it. I feel cozy, I have a sense of well-being when I'm smoking, poisoning myself, killing myself slowly. Not so slowly maybe. I have all kinds of pains I don't want to know about and I know that's what they're from. But when I don't smoke I scarcely feel as if I'm living. I don't feel as if I'm living unless I'm killing myself.” ~Russell Hoban, *Turtle Diary*, 1975

---

### **Tobacco Use – A Contradiction**

Tobacco use continues to be the leading preventable cause of morbidity and mortality in the world. Annually, it is responsible for approximately 5.4 million deaths worldwide (World Health Organization (WHO), 2008), and has been linked to more than 40 different smoking-related diseases and at least 14 different forms of cancer (U.S. Department of Health and Human Services (USDHHS), 2004). Yet, over one billion people around the world continue to smoke (WHO, 2008).

Perhaps the most striking phenomenon in tobacco use is that many smokers simply do not want to smoke. Most smokers concede that tobacco use is a health risk (Health Canada, 2001), and consequently the vast majority of smokers (about 90%) regret ever having started smoking (Fong et al., 2004). Approximately 70% of smokers report wanting to quit and over 50% try to quit in any given year. Yet, only about 6% will stay quit for more than 12 months (Centers for Disease Control (CDC), 2011).

### **The Role of Attitudes**

So why do smokers engage in a behaviour that is harmful to their health and seems so clearly opposed to their attitudes? To understand this question, we must first understand the role that attitudes play in guiding behaviour. Social psychologists have long been interested in *attitudes*—generally defined as learned evaluations (positive or negative) of people, objects, places, or issues—for their functional utility of being able to predict behaviour (Ajzen &

Fishbein, 1977; Fazio, 1995; Zanna & Rempel, 1988). Indeed, numerous studies have shown that attitudes can reliably predict behaviour, such as consumer behaviour, voting behaviour, contraceptive use, various health behaviours, discrimination, and many others (for reviews, see Eagly & Chaiken, 1993; Fazio, 1995).

### **Challenges to Attitude-Behaviour Correspondence**

However, this assumption regarding attitude-behavioural correspondence has also been repeatedly challenged by researchers who have demonstrated that attitudes sometimes show little or no relation to subsequent behaviour (LaPierre, 1934; Wicker, 1969, Bem, 1972). For instance, in a highly provocative literature review, Wicker (1969) highlighted the inconsistency between attitudes and behaviour by noting that the “*correlation coefficients relating to the two kinds of responses are rarely above .30, and are often near zero*” (Wicker, 1969, p. 65). As a consequence, Wicker essentially suggested that the field of psychology should abandon the attitude construct as a tool for predicting behaviour.

Yet, rather than abandoning the attitude construct, social psychologists have since sought to improve the predictive value of attitudes. The initial approach within this area has been to create integrated models of behaviour by including additional determinants of behaviour, such as social norms and intentions (Olson & Zanna, 1993). For instance, a leading predictive model of health behaviour, the Theory of Planned Behaviour (Ajzen, 1988, 1991), suggests that attitudes, along with social norms and perceived behavioural control, predict behavioural intentions, which in turn predict actual behaviour. Impressively, in certain domains this model has been shown to account for 39% of the variance in intentions, and 27% of the variance in behaviour (Armitage & Conner, 2001).

Nonetheless, a renewed wave of challenges about such predictive models of behaviour—those relying on self-report measures of attitudes—has resurfaced in recent years. The first major criticism about models that rely on self-report measures is that people's responses may not be a true representation of what they actually feel, due to response biases caused by social desirability concerns (Crowne & Marlowe, 1960; Marlowe & Crowne, 1961; Nosek, 2005). In general, the more socially undesirable the topic under investigation, the greater the potential risk of response distortions. For instance, in a classic study by Linn (1965), female students were asked how willing they would be to have their picture released along with a picture of an African American male for the purpose of ameliorating inter-race relations. Although a large proportion of participants initially agreed to share their picture, less than half of those who reported having a strong willingness to do so subsequently consented to having their pictures (ostensibly) released for the purported reason. The author concluded that “statements or predictions of [socially undesirable] behavior based on attitude measurement have little reliability unless first validated empirically” (Linn, 1965, p. 353).

The second criticism of such integrated models of behaviour is targeted at the assumption that people are aware of all important aspects of their attitudes and can express these attitudes through self-report measures. Over the last two decades, it has become evident that people are more aware of some aspects of their attitudes and less aware of other aspects (Greenwald & Banaji, 1995; Wittenbrink & Schwartz, 2007). Evidence for these unconscious processes comes from work showing that activation can occur more rapidly than can be accounted for by conscious processes (Bargh, Chaiken, Govender, & Pratto, 1992), and that these unconscious processes can be activated by subliminal priming, which is usually not perceived by the observer (Greenwald, Klinger, & Liu, 1989). These findings suggest that

people can hold two attitudes at the same time: one that is implicit and often outside one's awareness, and one that is explicit and under deliberative control.

### **Implicit Attitudes and Dual-Process Models of Health Behaviour**

In light of the limitations of existing self-report measures of attitudes, recent indirect (or implicit) measures of attitudes have attempted to measure the strength of associations between concepts by relying on reaction time paradigms (for reviews, see Fazio & Olson, 2003; Cunningham, Preacher, & Banaji, 2001; De Houwer, Teige-Mocigemba, Spruyt, & Moors, 2009; Greenwald, Poehlman, Uhlman, & Banaji, 2009). Because participants are more focused on completing the task than on the content of their responses, these measures are presumed to be less susceptible to social desirability concerns, and a better reflection of automatic evaluative associations.

For addictive behaviours, such as smoking, such measures of implicit attitudes might be particularly useful because they are less prone to social desirability biases, and also because instances of substance use tend to be impulse-driven and automatic (Wiers & Stacy, 2006). Consistent with this view, recently developed dual-process models of behaviour (e.g., Gerrard, Gibbons, Houlihan, Stock, & Pomery, 2008; Friese, Hofmann, & Wiers, 2011; Sheeran, Gollwitzer, & Bargh, 2013, Wiers & Stacy, 2006) suggest that many health behaviours are guided not only by explicit (reflective, conscious, controlled, cold) processes, but also by implicit (impulsive, unconscious, associative, affective) processes.

Among these dual-process models of behaviour, there is now general agreement that implicit attitudes are assumed to be automatically activated, and are therefore more likely to guide behaviour by default, unless they are overridden by more controlled processes. In contrast, explicit attitudes tend to affect evaluation after intentional processes have had an

opportunity to deliberate, and thus tend to better predict intentional outcomes (Fazio & Olson, 2003). Indeed, there is a growing body of literature showing that implicit measures predict behaviour better than explicit measures for other socially stigmatized behaviours (Chassin, Presson, Sherman, Seo, & Macy, 2010; Dovidio, Kawakami, Johnson, Johnsom, & Howard, 1997; Dovidio, Kawakami, & Gaertner, 2002; Fazio, Jackson, Dunton, & Williams, 1995; Fazio & Olson, 2003; Nosek, 2005; Perdue & Gurtman, 1990). For instance, compared to explicit measures (e.g., Stacy, Bentler, & Flay, 1994), implicit measures have been shown to be stronger predictors of binge drinking (Thush & Wiers, 2007) and marijuana use (Stacy, 1997).

In the first part of this paper, I will attempt to build on the existing research among smokers by demonstrating that measures of explicit attitudes tend to be better at predicting certain deliberative aspects of smoking behaviour, whereas implicit attitudes tend to be better at predicting other automatic aspects of smoking behaviour. Specifically, I hypothesize that explicit attitudes will predict smokers' deliberative decisions about smoking, such as their intentions to quit and their planned quit attempts. In contrast, because implicit attitudes develop through affective and physiological associations with smoking, I predict that they will better predict behaviours that are affect-based or impulse driven, such as cigarette consumption among continuing smokers, and the ability to resist the temptation of smoking by maintaining a quit attempt among those who attempt to quit.

Recent research on smoking has provided evidence consistent with this reasoning. For example, Borland et al. (2010) found a significant relation between smokers' explicit attitudes with their intentions to quit, as well as their subsequent quit attempts. Smokers' explicit attitudes, however, did not predict whether they would be successful in their quitting attempt.

Although informative about the role of explicit attitudes on subsequent deliberative smoking-related outcomes, implicit attitudes were not assessed in the study by Borland et al. (2010). Three other studies that have examined the relation between implicit attitudes and smoking behaviour have demonstrated the longitudinal predictive utility of implicit attitudes. A study by Sherman and colleagues (2009) showed that nonsmoking adolescents had more positive implicit attitudes for smoking if their parents were smokers, and that those implicit attitudes prospectively predicted whether those adolescents would later initiate smoking. However, it is difficult to rule out potential confounding factors in this study (e.g., social modeling) that might have accounted for, at least in part, the greater likelihood of having both more positive implicit attitudes and initiating smoking. Another study among a smoking cessation treatment group found that implicit attitudes at the initial wave predicted seven-day cessation at a two-month follow-up (Kahler et al., 2007). However, these findings do not generalize to the rest of the population very well, because most smokers are not in a smoking cessation program. Finally, one recent study systematically examined the longitudinal predictive utility of implicit attitudes compared to explicit attitudes (Chassin, Pesson, Sherman, Seo, & Macy, 2010). Chassin and her colleagues were able to demonstrate that implicit attitudes did predict later cessation above and beyond explicit attitudes, although this relation was moderated by previous quitting history and quit intentions. In addition, Chassin et al. did not examine the types of more deliberative smoking behaviours (e.g., quit intentions) that are predicted by explicit attitudes.

Although these studies demonstrate the predictive utility of implicit attitudes, it is unlikely that effective smoking cessation is solely determined by smokers' implicit attitudes. Rather, consistent with dual-process models of behaviour, it is important to consider both

explicit and implicit attitudes, each providing a unique contribution to effective smoking cessation under different circumstances (Wiers & Stacy, 2006). Therefore, the goal of the first part of this paper is to provide data on both measures of explicit and implicit attitudes to compare their longitudinal predictive utility.

### **Changing Implicit Attitudes as a Possible Smoking Intervention**

Given the potentially important role of implicit attitudes in the domain of addictive behaviours, interventions that have the power to change these automatic evaluative associations may be particularly useful (Wiers & Stacy, 2006). Thus, the second part of my dissertation will focus on creating an intervention that will target smokers' implicit attitudes, in the hope of creating more negative implicit attitudes, which in turn should lead to a greater likelihood of successful smoking cessation.

However, in order to create an effective intervention that interrupts the influence of implicit attitudes on smoking, it is necessary to first gain a better understanding of the processes through which positive implicit attitudes for smoking are formed.

### **Implicit Attitude Formation**

Learning models of attitudes—such as classical conditioning (Pavlov, 1927) and instrumental (or operant) conditioning (Thorndike, 1901; Skinner, 1963)—suggest that attitude formation is primarily the product of repeated positive or negative experiences associated with a given attitude object. That is, direct experience can account for most of the attitudes that we hold (Dobb, 1947). However, the link from implicit attitudes might be more reliably associated with addictive behaviours because they are less likely to be contaminated by other factors, such as response biases (Olson & Fazio, 2001). Yet, in the domain of addictive behaviour, the majority of interventions have attempted to change people's explicit attitudes (e.g., informing

smokers of the health risks associated with smoking) with the hope of promoting cessation. However, very little research has looked at trying to change implicit attitudes. To be able to change implicit attitudes, it might be informative to first gain a better understanding of the exact experiences that contribute to the formation of more positive implicit attitudes. This way, interventions can attempt to interrupt the process in which smoking is associated with positive implicit attitudes, and thus minimize the influence that implicit associations have on the desire to smoke.

### **Smoking and Stress**

As Robert West (1993, p. 589) explained: “Many smokers report that they enjoy smoking and also that smoking helps them in various ways—particularly controlling stress.” In a study by Ikard, Green, and Horn (1969), 80% of smokers agreed that smoking was “relaxing” or “pleasurable.” However, the positive mood effects of smoking typically disappear within minutes after the last inhalation (Perkins, Grobe, Fonte, & Beus, 1992). In fact, without their regular dose of nicotine, smokers typically report feeling a range of negative moods, which include feeling more stressed, nervous, and irritable (Hughes, Higgins, & Hatsukami, 1990; McNeill, 1987; Parrot, 1994). Consistent with these findings, smokers usually report that “smoking relaxes me when I am upset or nervous,” and “smoking calms me down” (Ikard, et al., 1969).

Taken together, these studies suggest that, rather than smoking for its positive visceral effects, smokers eventually come to view smoking as a means of regulating their negative emotions (Kassel, Stroud, & Paronis, 2003; McNeill, Jarvis, & West, 1987; Naquin & Gilbert, 1996; Nichter, Nichter, & Cargoklu, 2007; Parrott, 1995). As Schachter (1978) has suggested, smoking simply reverses the negative effects of withdrawal. McNeil (1991, p. 591) also

describes a similar process in children and adolescents aged 11 to 17: “Rather than the direct effect of their smoking, feeling calmer may therefore come about as a belief of incipient withdrawal symptoms.”

For a pack-a-day smoker, this association between smoking and the reduction of negative affect and/or stress occurs about 25 times a day. Naturally, on some level, it is likely that the smoker will learn to associate smoking with stress reduction. Thus, this repeated association between stress-reduction and smoking can eventually lead to the development of a conditioned positive implicit association for smoking (Olson & Fazio, 2001).

Consequently, smokers will use smoking not only for the immediate physiological effect, but also as a coping strategy for stress. In turn, this reliance on smoking as a means of coping with stress can make quitting even more difficult. Smokers who attempt to quit not only have to deal with the withdrawal symptoms, but also feel a loss of control over their emotions in stressful situations (Parrot, 1999; Parrot, 2000). There is a body of research that clearly demonstrates the crippling effects of stress on quitting attempts. For example, smokers who relapse commonly report that their return to smoking was triggered by a stressful event or negative affective state (Baer & Lichtenstein, 1988; Cummings, Jaen, & Giovino, 1985; Shiffman, 1982).

Furthermore, when people are stressed, they are likely to have fewer cognitive resources available to engage in deliberative and conscious thought. In such situations, implicit attitudes—which require fewer cognitive resources—may be particularly potent drivers of behaviour (Hofmann, Gschwendner, Friese, Wiers, & Schmitt 2008). Interventions that target implicit attitudes may thus be particularly crucial during these periods of constrained cognitive resources to help smokers maintain their quit attempts.

## **Implications for Health Interventions**

In the first part of this dissertation, I test the hypothesis that, relative to explicit attitudes, implicit attitudes are more closely linked to smoking behaviour. Evidence in support of this hypothesis could have meaningful implications for health interventions. To date, the majority of interventions aimed at promoting healthier behaviour (e.g., quitting smoking) have attempted to do so by informing people of the potential consequences of their behaviours (e.g., smoking causes lung cancer). That is, these interventions have tried to change people's explicit attitudes with the hope of changing their behaviour. However, if implicit attitudes are better predictors of behaviour than explicit attitudes in many situations, then health interventions might benefit from targeting implicit associations, in addition to changing smokers' explicit attitudes. Therefore, equipping people with strategies to better cope with stress might lead to reductions in smoking and more successful quit attempts.

## **Self-Affirmation Intervention**

Social psychological research on *self-affirmation* provides a potential solution. The basic premise of self-affirmation theory is that people are motivated to maintain a sense of perceived worth and integrity of the self (Sherman & Cohen, 2006, Steele, 1988). However, everyday life offers numerous instances of potential psychological threats, such as getting negative performance feedback or being reminded of one's current unhealthy practices. By being able to "affirm" other domains of their self-worth, rather than the specific domain under threat, people can maintain a sense of global self-integrity. That is, by affirming a domain of self-worth that is unrelated to the threatened domain, people's self evaluation can be less contingent on a particular source of stress, and they can consequently be more resilient to threat or stress (Sherman & Cohen, 2006). For example, if someone receives negative

feedback from their boss, they may be able to buffer against this threat to their sense of competence by focusing, instead, on their caring nature through the charitable contributions they frequently make.

Utilizing this phenomenon, recent advances in social psychology have revealed that subtle psychological interventions can effectively protect people against experiences of stress. In *self-affirmation* interventions, participants reflect on values that remind them of their self-worth, which consequently reduces their stress and helps them cope with psychologically threatening situations (Cohen, Garcia, Purdie-Vaughns, Apfel, & Brzustoski, 2009; Sherman & Cohen, 2006).

Given the link between smoking and stress, self-affirmation interventions might have the potential to help smokers better cope with their stress, thus making them less dependent on their smoking. Indeed, affirmation interventions have been shown to reduce the physiological responses to stress (Creswell, Welch, Taylor, Sherman, Gruenewald, & Mann, 2005; Sherman, Bunyan, Creswell, & Jaremka, 2009). However, despite the fact that these interventions have demonstrated a wellspring of sustainable benefits in a variety of domains (e.g., Cohen et al., 2009; Finez & Sherman, 2012; Sherman, Nelson, & Steele, 2000), they have not yet yielded sustainable reductions in smoking consumption. For example, two previous studies using self-affirmation interventions found that the affirmation was effective at increasing acceptance of health messages, but was not successful at reducing smoking (Armitage, Harris, Hepton, & Napper, 2008; Harris, Mayle, Mabbott, & Napper, 2007).

In reflecting on this research, I realized that standard self-affirmation interventions may have produced mixed results because of their ability to buffer people against threats by providing multiple avenues to affirm a person's global sense of self-worth. Specifically, I

reasoned that a standard self-affirmation likely allows people to be more responsive to information suggesting they should quit smoking, but it might also allow them to feel a sense of global self-integrity *even* as they continue to smoke. For example, people who reflect on how they have consistently engaged in charitable activities might feel a bolstered sense of self-integrity, consequently allowing them to smoke, even though smoking—which is inconsistent with their health beliefs—undermines their self-integrity. What is needed, I argue, is a self-affirmation that buffers people against stress, but does not allow them to maintain a sense of global self-integrity as they smoke. By providing people with an alternative way to cope with stress, this affirmation could remove the perceived stress-reducing benefits of smoking, which I argue, create positive implicit associations with smoking. Consequently, this affirmation could change people's implicit attitudes over time, ultimately increasing their likelihood of successfully quitting. In the second part of this dissertation, I examine the proposed effects of a novel affirmation intervention on smokers' implicit attitudes, as well as their subsequent smoking behaviour.

### **Overview of the Present Studies**

In the present research, I examined and compared the utility of explicit and implicit attitudes in predicting long-term smoking behaviour. Specifically, in Study 1, I examined the predictive utility of traditional measures of smoking-related attitudes using data from a large sample of nationally representative smokers from the U.S., Canada, U.K, and Australia. In Studies 2 and 3, I then examined the predictive utility of implicit attitudes for smoking from a sample of smokers and nonsmokers. I predicted that explicit attitudes would be a better predictor of more deliberative behaviours, such as making quitting attempts and having

quitting intentions. In contrast, I predicted that implicit attitudes would be a better predictor of subsequent smoking behaviour because of the impulsive nature of smoking.

Next, in Studies 4 and 5, I tested a new intervention utilizing a modified form of self-affirmation aimed at helping people maintain quit attempts. Specifically, I asked people to think about an important value that they share with a close-other who is supportive of their intentions to quit smoking. Such a self-affirmation should allow people to affirm their sense of global self-integrity, but it should not allow them to maintain these feelings of self-integrity if they smoke. By providing people with a way to cope with stress other than smoking (and consequently reducing the extent to which they rely on smoking to relieve their stress), I expected this affirmation to break down people's positive implicit associations with smoking. I therefore expected this affirmation to help people reduce their smoking by both buffering them against stress and weakening their positive associations with smoking.

## **Study 1: Explicit Attitudes and Smoking**

### **Introduction and Objectives**

In Study 1, I aimed to test the attitude-behavioural correspondence among smokers using large, nationally-representative samples of smokers. In this study, I assessed smokers' explicit attitudes using a widely used single-item measure of a smoker's overall opinion of smoking (Ajzen, 1991), and examined the relation of explicit attitudes on smokers' daily cigarette consumption. I predicted smokers' self-reported attitudes (or explicit attitudes) for smoking would not be valid predictors of smoking consumption. This lack of attitude-behavioural correspondence using explicit attitudes is a potential issue anytime there are social desirability concerns (i.e., the smoker is motivated to conceal their true preferences from others or from themselves). If social desirability concerns do affect smokers' self-reported attitudes about smoking, then I predicted smokers would not report having overly positive attitudes for smoking. Specifically, I predicted that their mean attitude scores will be only slightly positive, or possibly negative. Furthermore, I predicted that their explicit attitudes will be similar to those of ex-smokers because both smokers and ex-smokers would be similarly motivated to report having non-positive attitudes for smoking.

It may also be that self-reported (explicit) attitudes are not associated with smoking behaviour because smoking tends to be an impulse-driven, automatic, and associative behaviour, and thus is not represented by the controlled and conscious processes represented through self-reported measures of attitudes. If this is the case, then I predicted that smokers' self-reported attitudes would be weakly, or not at all, correlated with their daily cigarette consumption. Instead, I predicted that smokers' explicit attitudes should be consistently related to more deliberative, controlled, and conscious processes, such as having intentions to quit.

## Methods

**Sample.** Data for this study was drawn from the International Tobacco Control Four Country Survey (ITC-4). The ITC-4 is a longitudinal study conducted annually among nationally representative samples of adult smokers (18 years or older who smoked at least 100 cigarettes in their lifetime, and who smoked at least once in the past 30 days) from Canada, the USA, the UK and Australia. Beginning in 2002, standardized data collection methods and measures were used, and a sample size of nearly 2000 smokers was accumulated in each of the four countries. Ex-smokers were also retained in subsequent waves of the study. The ITC-4 cohort was constructed using probability sampling methods with telephone numbers selected at random from each country. In order to attain nationally representative samples, random digit dialing was used during the recruitment of smokers within strata defined by geographical region and community size (see Fong et al., 2006; and Thompson et al., 2006 for a detailed explanation of the conceptual model and methods of the ITC Project).<sup>1</sup> The number of smokers within each eligible household was assessed, and the *next birthday method* (Binson, Canchola, & Catania, 2000) was used to select respondents from households with more than one eligible adult smoker. The survey was conducted using a software package called Computer Assisted Telephone Interviewing (CATI). The survey took about 45 minutes to complete, and participants were re-contacted yearly for follow-up surveys. An average of 30% were lost yearly to attrition, so replenishment of new participants was conducted yearly to retain a sample size of around 2000 participants in each country.

For the current study, cross-sectional and longitudinal associations between smoking beliefs and smoking behaviour were assessed using data collected from waves 6 and 7—the

---

<sup>1</sup> A full description of the ITC-4 methodology, sample profile and survey rates, including comparisons with national benchmarks, is available online (<http://www.itcproject.org>).

most recent waves at the time of the analyses. Participants for the current analyses were restricted to those who were either present at W6, and who were retained in W7. Participants included current smokers ( $n = 4983$ ) and ex-smokers ( $n = 930$ ). Smokers were defined as individuals who self-reported as having smoked at least 100 cigarettes in their lifetime, and who had smoked at least once a month, once a week, or daily at the time of the survey. Ex-smokers were those individuals who reported having quit for at least a month at the time of the survey.

**Demographic variables.** Consistent with other papers using data from the ITC-4, participants provided basic demographic information at the time that they were entered into the survey. Gender, age, and ethnicity of the respondents was assessed during the baseline wave. For Canada, the US, and the UK samples, ethnicity was measured at baseline using the relevant census question for each country and then analyzed as a dichotomous variable to allow for comparisons across countries (“white” vs. “non-white and mixed race”). For Australia, language was used as a proxy for Australian ethnicity (“English-speaking” = white, “non-English speaking” = non-white), as is consistent with the Australian census. At each wave, level of education was assessed by creating three categories, which included: high school diploma or lower; technical, trade school, community college, or some university; and university degree. In Canada, the US, and Australia, annual income was categorized into “under \$30 000,” “\$30 000–\$59 999,” and “\$60 000 and over.” The following categories were used for the UK sample: “£15 000 or under,” “£15 001–£30 000,” and “£30 001 and over.” Income and education were assessed at waves 6 and 7 in order to ascertain the most recent information.

A measure of smoking dependence, the Heaviness of Smoking Index (HSI) was included (Heatherton, Kozlowski, Frecker, Richert, & Robinson, 1989). The HSI was calculated as the sum of the scores from two categorical variables: time to first cigarette (reverse scored) and cigarettes per day. It is important to include a measure of smoking dependence in this study because of the potential difference in smoking dependence that smokers from different regions or countries might have. The first question asked respondents “On days that you smoke, how soon after you wake up do you have your first cigarette?” Three points are given if the respondent smokes with the first 5 minutes of waking; 2 points if between 6 and 30 minutes; 1 point if between 31 and 60 minutes; and 0 points if they smoke 61 or more minutes after waking up. The second question asks “How many cigarettes do you typically smoke per day?” Zero points are allocated if respondents report smoking 10 or fewer cigarettes; 1 point if they smoke between 11 and 20; 2 points if between 21 and 30 cigarettes per day; and 3 points for smoking 31 or more cigarettes per day. A label of low nicotine addiction is given when the combined score for these two items is between 0 and 2; a score of 3 or 4 points is considered to be moderate addiction; and a score of 5 or 6 points suggests a high level of addiction.

Table 1 presents the sample characteristics. All the analyses in this Study controlled for relevant demographic and smoking dependence measures.

**Measures of explicit smoking attitudes.** Self-reported explicit attitudes were assessed by asking participants: “What is your overall opinion of smoking. Is it...” with response options ranging from 1: “very negative” to 5: “very positive” on a 5-point Likert scale.

Table 1

*Characteristics of the International Tobacco Four Country Survey (ITC-4) Sample by Country in Study 1*

	(n = 5865)			
	CAN (n = 1459)	US (n = 1291)	UK (n = 1484)	AUS (n = 1631)
<b>Sex</b>				
Female	58.4%	60.3%	56.7%	54.8%
Male	41.6%	39.7%	43.3%	45.2%
<b>Age</b>				
18-24	6.6%	4.0%	4.6%	7.9%
25-39	25.4%	18.0%	23.9%	29.7%
40-54	42.4%	43.5%	38.9%	41.3%
55+	25.5%	34.6%	32.6%	21.1%
<b>Education</b>				
high school diploma or lower	42.4%	40.2%	59.0%	58.9%
technical, trade school, community college, or some university	39.0%	38.3%	26.0%	23.8%
university degree or higher	18.6%	21.5%	15.0%	17.2%
<b>Income</b>				
under \$30 000/ under £15 000 (UK)	24.5%	33.7%	32.2%	27.4%
\$30 000–\$59 999/£15 001–£30 000	35.2%	34.7%	32.1%	31.5%
\$60 000 and over/£30 001 and over	33.6%	27.0%	27.0%	35.4%
No answer	6.6%	4.6%	8.7%	5.7%
<b>Ethnicity</b>				
White/English only	91.6%	84.9%	95.4%	89.6%
Other/mixed	8.4%	15.1%	4.6%	10.4%
<b>Mean Cigarettes per day</b>	16.29 (SD = 9.34)	17.92 (SD = 14.00)	16.30 (SD = 11.45)	17.42 (SD = 10.15)
<b>Mean Time to First Cigarette (minutes)</b>	59.67 (SD=122.10)	57.86 (SD=116.02)	64.20 (SD=119.63)	80.86 (SD=161.11)
<b>Mean Heaviness of Smoking Index</b>	2.70 (SD = 1.53)	2.71 (SD = 1.57)	2.52 (SD = 1.46)	2.66 (SD = 1.64)

**Measures of smoking and quitting behaviour.** In addition, standard questions about smoking consumption, quit intentions, and quit attempts were assessed. As a measure of smoking behaviour, participants were asked how many cigarettes per day they smoked on average. Quitting intentions were assessed by asking smokers if they “plan on quitting smoking...”, with response options: 1 – not intending to quit, 2 – beyond 6 months from now, 3 – within 6 months, and 4 – within the next month. Quitting behaviour was assessed by asking participants whether they had (1) made a quit attempt since the last time they were surveyed, and (2) whether they were still quit at the time of the current survey. Respondents who reported having quit for at least a month or more were categorized as ex-smokers.

## **Results**

Despite the hypothesis that smokers’ explicit attitudes would be susceptible to social desirability concerns, smokers’ explicit attitudes were predicted to be less negative than those of ex-smokers. Consistent with this prediction, smokers ( $M = 2.47$ ,  $SD = 0.95$ ) had a slightly less negative explicit attitude towards smoking, compared to ex-smokers ( $M = 2.21$ ,  $SD = 0.99$ ;  $t(5811) = 7.76$ ,  $p < .001$ ). However, a one-sample t-test comparing mean values of self-reported attitudes for smoking to the midpoint value of 3 (representing “neither positive nor negative”) revealed that both smokers’ and ex-smokers’ explicit attitudes fell significantly below the midpoint ( $t(5129) = 45.59$ ,  $p < .001$  and  $t(680) = 19.88$ ,  $p < .001$ , respectively), which suggests that both groups held a negative overall opinion of smoking. Indeed, more than half of smokers (51.7%) reported having negative or very negative overall opinions about smoking, compared to only 12.8% who reported having a positive or very positive attitude for smoking.

In addition, measures of explicit attitudes were postulated to capture more deliberative or controlled processes, such as having intentions to quit and even making a planned quit attempt. However, explicit attitudes were not predicted to be reliably associated with addictive behaviours, such as smoking, which tend to be impulse-driven. A correlation analysis was conducted among current smokers only to test this association. As expected, the association between smokers' explicit attitudes about smoking at W6 and the number of cigarettes consumed per day ( $r = .03, p < .05$ ) was significant, but considered to be small.<sup>2</sup> A similarly small association emerged at W7: explicit attitudes at W7 were not significantly correlated with the number of cigarettes consumed per day ( $r = -.02, p = .125$ ).

In contrast, a correlation analysis revealed that smokers' explicit attitudes at W6 were related to having intentions to quit ( $r = -.31, p < .001$ ) in the same wave. Similarly, a logistic regression analysis controlling for demographic variables (gender, age, country, ethnicity, household composition, education, and socioeconomic status), as well quitting intentions at W7, revealed that explicit attitudes were associated with making a quit attempt by W7 ( $OR = 0.71, CI [0.66-0.75], p < .001$ ). Smokers with more negative explicit attitudes toward smoking thus reported greater intentions to quit and were more likely to try to quit over the next year (see Table 2). However, another logistic regression analyses controlling for the same variables revealed that smokers' explicit attitudes towards smoking were not predictive of whether they were successful in their quit attempts at W7 ( $OR = 0.87, CI [.66-1.16], p = .334$ ).

---

<sup>2</sup> The significance of these analyses is driven primarily by the large sample size. The effect size for this correlation is considered negligible (Cohen, 1988, 1992).

Table 2

*Correlation and Logistic Regression Analyses Between Measures of Explicit Attitudes at Wave 6 and Relevant Quitting-Related Variables among Smokers in Study 1*

	<b>Smokers (<i>n</i> = 4559)</b>			
	<b>Explicit Attitudes at Time 6</b>	<b>QI_6</b>	<b>QI_7</b>	<b>QA_7</b>
<b>Quitting intentions at Wave 6 (QI_6)</b> [1: not intending to quit – 4; within next month]	<i>r</i> = -.31***	-	-	-
<b>Quitting intentions at Wave 7 (QI_7)</b> [1: not intending to quit – 4; within next month]	<i>r</i> = -.27***	<i>r</i> = .54***	-	-
<b>Quitting attempts at Wave 7 (QA_7)</b> [0: No – 1: Yes]	<i>OR</i> = 0.71*** <i>CI</i> = [.66-.75]	<i>OR</i> = 4.42*** <i>CI</i> = [3.90-5.01]	<i>OR</i> = 6.33*** <i>CI</i> = [5.51-7.27]	-
<b>Successful Quitting at Wave 7 (SQ_7)</b> [0: Back to smoking – 1: Still quit]	<i>OR</i> = 0.87 <i>CI</i> = [.66-1.16]	<i>OR</i> = 1.25* <i>CI</i> = [1.03-1.52]	N/A	N/A

†  $p < .10$ ; \*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$

*r* : Correlation coefficient; *OR*: Odds Ratio; *CI*: Confidence Intervals

## Discussion

Both smokers and ex-smokers reported having negative explicit attitudes toward smoking. Despite being negative, smokers' explicit attitudes were not related to their daily cigarette consumption. Although smokers' explicit attitudes were related to their quit intentions and quitting attempts (consistent with the Theory of Planned Behaviour), they were not predictive of whether they were successful in their quit attempts.

Current models of health behaviour rely on measures of explicit attitudes to predict behaviour. I have demonstrated that in the domain of smoking behaviour, explicit attitudes are mainly successful at predicting other deliberative behaviours and cognitions, such as intentions to quit smoking and making a quitting attempt. However, successfully maintaining a quit attempt requires the ability to consistently resist the temptation to give in to the cravings of smoking or use smoking as a coping strategy in times of stress. At the time of the survey,

smokers are likely employing controlled and deliberative thoughts to try to predict how they might behave during more stressful or nicotine-deprived moments. Consequently, it is unlikely that they are successful in their predictions, especially given the physiological strength of nicotine addiction and the pressures of the situation.

Thus, these findings highlight the existing limitations of current models of health behaviour in predicting sustainable and meaningful health outcomes (e.g., actual consumption, and sustained quitting). To predict this form of impulsive behaviour, we require measures that are capable of tapping into the part of the psyche from which impulsive behaviours are derived. In the next study, I examined whether measures of implicit attitudes are better able to predict such behaviours.

## **Study 2: Implicit Attitudes and Smoking**

### **Introduction and Objective**

Studies have shown that implicit attitudes can be better predictors of behaviour when social desirability concerns are present, or simply when the person is unaware of their underlying preferences (for review, see Fazio & Olson, 2003). Recently, researchers have identified measures that can capture people's implicit attitudes. The most widely used and validated measure of implicit attitudes is the Implicit Association Test (IAT; Greenwald, McGhee, & Schwartz, 1998; Greenwald, Poehlman, Uhlman, & Banaji, 2009). The IAT requires categorizing words that belong to target (e.g., flowers, insects) and attribute (e.g., pleasant words, unpleasant words) concepts. Participants' implicit associations are assumed to be stronger for trials that they find easier to perform. For example, participants are typically faster in trials when flower and pleasant are mapped onto one key, compared to trials when insect and pleasant are mapped onto one key, suggesting a preference for flowers over insects (Greenwald et al., 1998). The IAT has also demonstrated predictive validity for socially sensitive behaviours, for which impression management may distort self-report measures, such as interracial behaviours (Greenwald et al., 2009). In Study 2, I used the IAT to examine smokers' implicit attitudes for smoking. I predicted that smokers' implicit attitudes, compared to their explicit attitudes, would provide a more accurate reflection of smokers' true preference for smoking. I tested this in Study 2 by comparing smokers' implicit attitudes to those of nonsmokers. If the IAT offers a more accurate reading of smokers' attitudes for smoking, I expected to find more positive implicit attitudes among smokers compared to those of nonsmokers.

However, Olson and Fazio (2004) have argued that the traditional IAT may be contaminated by what they refer to as 'extra-personal associations.' These authors argue that

the labels “Pleasant” and “Unpleasant” may be activating normative associations with the attribute object in addition to personal attitudes towards the attribute object. For instance, although smokers may have positive implicit associations for smoking, when presented with category labels “Pleasant” and “Unpleasant,” their reaction times may also reflect their perceptions of how society views smoking. Consequently, the normative contamination associated with the category labels of the traditional IAT may lead to artificially more negative implicit associations for smoking among smokers (e.g., Swanson, Rudman, & Greenwald, 2001). To decrease the influence of normative information when solving the IAT’s mapping task, Olson and Fazio (2004) created a Personalized IAT by changing the category labels of the pleasant and unpleasant categories to “I Like” and “I Dislike”.

In Study 2, I compared the predictive utility of the traditional IAT to that of the Personalized IAT. In addition, I created another version of the Personalized IAT, with category labels “I enjoy”, and “I don’t enjoy”. I reasoned that the category labels of “I enjoy/ I don’t enjoy” would be a better representation of the pleasant or unpleasant visceral experience of smoking. Using these three versions of the IAT, I tested for such ‘extra-personal’ associations by comparing the associations between smokers’ implicit attitudes and their smoking consumption. I predicted that the version of the IAT that had the highest association with smoking consumption, while also having a non-significant relation with measures of subjective norms, would be the most useful tool for assessing smokers’ implicit attitudes for smoking.

## Methods

**Sample.** American adult smokers ( $n = 351$ ) and nonsmokers ( $n = 361$ ) were recruited from Mechanical Turk to complete an online study about their smoking attitudes. Only adults

(18 years or older) were allowed to take part in the study. Thirty-one people (15 smokers and 16 nonsmokers) were excluded from the analyses because they did not correctly answer a red herring question (“Please click neither agree nor disagree for the following question”).

Smokers were those who reported (1) having smoked at least 100 cigarettes in their lifetime, (2) had smoked at least once in the past week, and (3) identified as being a ‘current smoker.’

The average daily cigarette consumption among smokers was 11.92 ( $SD = 9.17$ ) cigarettes.

Participants who were granted access to the study were defined as nonsmokers if (1) they had not smoked at least 100 cigarettes in their life, (2) they had not smoked at least once in the past week, and (3) they did not self-identify as being a ‘current smoker.’ The average age of the sample was just over 30 years old ( $SD = 19.52$ ), with just over 53% being women. There were no group differences between smokers and nonsmokers on either age or gender ( $p > .22$ ).

**Procedures.** Participants were recruited through Amazon’s Mechanical Turk—a crowdsourcing internet marketplace that provides access to people who complete human intelligence tasks (HITs) in exchange for a monetary payment. The quality of data and validity of results drawn from Mechanical Turk for psychological research has been established in a number of studies (e.g., Buhrmester, Kwang, & Gosling, 2011; Paolacci, Chandler, & Ipeirotis, 2010).

A short description of the study (entitled “Attitudes about Smoking”) was posted on Mechanical Turk. Potential participants had the opportunity to view the description and decide whether to take part in the study. Those who volunteered to participate were offered 50 cents in exchange for their time (approximately 20 minutes). This rate of remuneration is standard for Mechanical Turk studies.

Qualifying participants were first given an assessment of their implicit associations for smoking with the IAT, followed by a questionnaire about their smoking-related behaviours and beliefs, which included measures of their explicit attitudes. In a between-subjects design, participants were randomly assigned to complete one of three measures of implicit attitudes.

## **Measures.**

***Implicit Attitudes.*** The three versions of the Implicit Association Test (IAT) measures included the traditional IAT (with category labels “Pleasant/Unpleasant”; Greenwald, McGhee, & Schwartz, 1998) and two versions of the personalized IAT (Olson & Fazio, 2004) with category labels “I like/I don’t like” and “I enjoy/I don’t enjoy.” The latter version of the personalized IAT was developed for the purposes of this study. The rationale for using the category label “I enjoy,” rather than “I like,” is because it was theorized that the word “enjoy” better captures the essence of the smoker’s impulse to smoke cigarettes. In contrast, “I like” could have also represented a smokers’ evaluative attitudes for the *behaviour* of smoking.

***Smoking-related outcomes.*** Smoking behaviour was assessed by looking at smokers’ daily cigarette consumption (“On average, how many cigarette do you smoke each day?”). Because of the objective nature of this measure, daily cigarette consumption was used as a measure of behaviour—reality constraints restrict that degree to which smokers can adjust their reporting of their behaviour (Kunda, 1990).

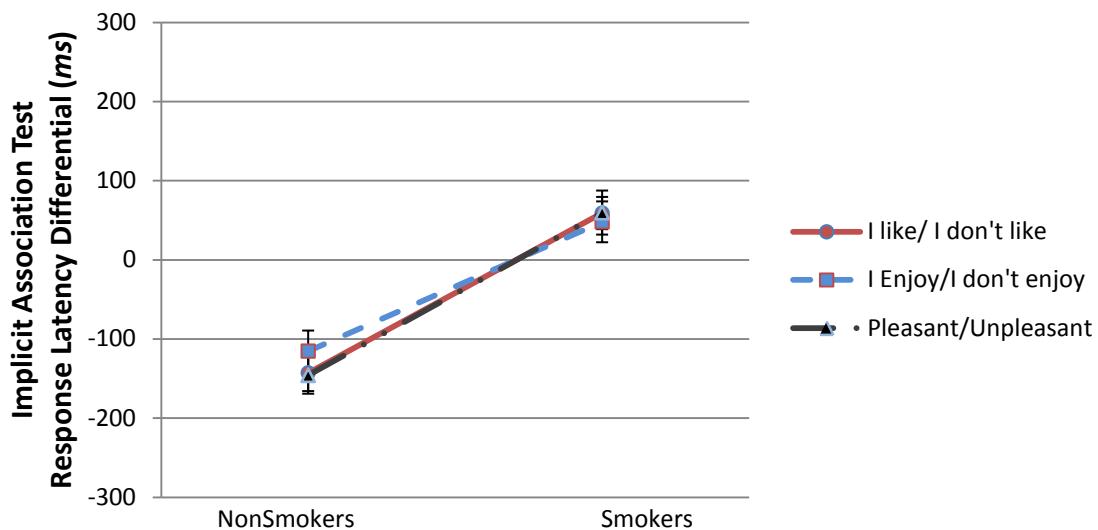
A self-reported measure of craving was also included, which asked participants to rate how much they agreed with the following statement; “A cigarette would feel good right now,” on a scale of 1 to 5. This single item was adapted from the 10-item Questionnaire on Smoking Urges (QSU-brief) (Cox, Tiffany, & Christen, 2001; Tiffany & Drobes, 1991). Perceptions of subjective norms for smoking were assessed by asking smokers how much they agreed with

the statement: “People who are important to you believe that you should not smoke” on a scale of 1 to 5. This single-item measure of subjective norms has been widely used in other health models, such as the Theory of Planned Behaviour (Ajzen, 1991).

## Results

**Patterns of implicit attitudes.** A 2 (Smoking status: smoker vs. nonsmoker) X 3 (IAT Type: “I like/I don’t like” vs. “I enjoy/I don’t enjoy” vs. “Pleasant/Unpleasant”) ANOVA revealed a significant main effect ( $F(1, 625) = 86.88, p < .001$ ) for smoking status, such that smokers had more positive attitudes for all three of the IAT measures, compared to nonsmokers (see Figure 1). However, there was no main effect for IAT type for either smokers or nonsmokers ( $t_s < 1$ ). That is, smokers had similar IAT scores for all three versions of the IAT; as did nonsmokers.

*Figure 1.* Implicit Association Test (IAT) scores for smokers and nonsmokers as a function of IAT measure in Study 2.



### **Correlations with implicit attitudes.**

**Smokers.** A preliminary analysis on the association between smokers' implicit attitudes and their explicit attitudes was conducted by running a binary correlation analysis. If smokers are adjusting their explicit attitudes, but not their implicit attitudes, then we would expect a low level of association between these two types of attitude measures. Indeed, results demonstrated that there were no significant correlations between explicit attitudes and implicit attitudes for smokers using any of the IAT measures (see Table 3). Thus, implicit attitudes and explicit attitudes were not shown to be significantly associated among smokers, where smokers might be motivated to adjust their explicit attitudes.

However, we postulated that smokers may be unable to adjust their implicit attitudes, in which case we would expect to find an association between implicit attitudes and their smoking behaviour. In this sample, the measure of implicit attitudes using the category labels "I enjoy/I don't enjoy" was significantly correlated to smokers' smoking behaviour (daily cigarette consumption). The other two versions of the IAT were not significantly correlated to smoking behaviour (see Table 3). Similarly, only the version of the personalized IAT with the category labels "I enjoy/I don't enjoy" was correlated with a measure of craving for cigarettes. The correlations between implicit attitudes and both the measure of daily cigarette consumption ( $r = .24, p = .024$ ) and the measure of craving remained significant even after controlling for explicit attitudes ( $r = .22, p = .034$ ). None of the measures of implicit attitudes were related to subjective norms. However, both forms of the personalized IAT ("I like/I don't like" and "I enjoy/I don't enjoy") were marginally correlated with smokers' intentions to quit smoking. This correlation was no longer significant when we controlled for explicit attitudes ( $r = .15, p = .153$ ).

These findings are consistent with the proposition that implicit attitudes are more strongly associated with impulsive behavioural outcomes, such as smoking consumption or cravings, than they are with controlled or deliberative outcomes, such as quitting intentions. Furthermore, of the three versions of the IAT, the “I enjoy/I don’t enjoy” version of the IAT measure may be a better representation of the smokers’ implicit preference for smoking—one that is independent of their social desirability concerns and effectively captures their smoking behaviour and their craving for cigarettes.

**Nonsmokers.** Among nonsmokers, there was only a marginal correlation between implicit and explicit attitudes for the version of the IAT using the “I like/I don’t like” category labels. The other two versions of the IAT did not correlate with measures of explicit attitudes. Also, similar to smokers, none of the versions of the IAT were related to subjective norms among nonsmokers.

### **Correlations with explicit attitudes.**

**Smokers.** Consistent with the hypothesized predictions, explicit attitudes were significantly correlated with perceptions of subjective norms as well as with having intentions to quit smoking. However, as in Study 1, explicit attitudes were not associated with how much smokers actually smoked. This pattern suggests that explicit attitudes are more likely to be affected by smokers’ their perceptions of social norms, and that such explicit attitudes are more closely associated with deliberative outcomes, such as having quitting intentions.

**Nonsmokers.** Similarly, among nonsmokers, there was a significant correlation between explicit attitudes and perceptions of subjective norms, suggesting that nonsmokers’ explicit attitudes are similarly affected by their perceptions of social norms for smoking.

Table 3

*Correlations Between Measures of Implicit Attitudes and Explicit Attitude Separated by Smoking Status in Study 2*

	<b>Smokers</b>			
	<b>Category Labels for each IAT Measure</b>			<b>Explicit Attitude Measure</b>
	<b>"I Like/I don't like"</b> (n=121)	<b>"I enjoy/I don't enjoy"</b> (n=98)	<b>"Pleasant/Unpleasant"</b> (n=98)	<b>"Overall opinion about smoking"</b> (n=317)
Explicit Attitude ("Overall opinion about smoking")	-.02	.10	.07	-
Smoking behaviour (Cigarettes per day)	.06	.22*	.11	.09
Craving cigarettes ("Smoking would feel good now")	.03	.28*	.03	.05
Normative evaluation ("People think you should not smoke")	.01	-.07	-.02	-.21***
Quitting intentions	-.19 <sup>†</sup>	-.18 <sup>†</sup>	-.12	-.31***
<b>Nonsmokers</b>				
	<b>Category Labels for each IAT Measure</b>			<b>Explicit Attitude Measure</b>
	<b>"I Like/I don't like"</b> (n=138)	<b>"I enjoy/I don't enjoy"</b> (n=120)	<b>"Pleasant/Unpleasant"</b> (n=68)	<b>"Overall opinion about smoking"</b> (n=326)
Explicit Attitude ("Overall opinion about smoking")	.15 <sup>†</sup>	-.03	.18	-
Normative evaluation ("People think you should not smoke")	-.09	-.07	-.09	-.12*

<sup>†</sup> p < .10; \* p < .05; \*\* p < .01; \*\*\* p < .001

## **Discussion**

Study 2 provides preliminary evidence that implicit attitudes might be more closely associated with smoking behavior than are explicit attitudes. Specifically, implicit attitudes as measured by a personalized version of the IAT with the category labels of “I enjoy/I don’t enjoy” was associated with smoking behaviour and cravings for smoking, whereas explicit attitudes and the other two measures of implicit attitudes did not. The lack of associations with the traditional IAT is perhaps not surprising. If, as Olson and Fazio (2004) suggest, a smoker’s behaviour is associated with their “intra-personal” implicit associations for smoking, then the traditional IAT might have failed to be significantly correlated with smoking behaviour because it is likely contaminated by their “extra-personal” associations. This might be because category labels “pleasant” or “unpleasant” don’t specify a reference group for whom cigarettes might be pleasant or unpleasant. For example, a smoker may perceive cigarettes to be personally pleasant, while at the same time believing that cigarettes are not pleasant to others. Which of these two possible interpretations gets activated at the time of the IAT task is unclear.

In the case of the personalized version of the IAT with category labels “I like/I don’t like,” I had suspected that the word “like” may also be prone to ambiguity. Rather than assessing a smokers’ personal preference for smoking, the category label “I like” might also be tapping into whether the smoker approves of their own smoking behaviour. For instance, a smoker might enjoy the physiological experience of smoking, but despise the fact that they are addicted to smoking, and hence dislike their smoking behaviour. Given the nearly universal sense of regret among smokers (Fong et al., 2004), most smokers are likely to say they don’t like that they smoke.

Therefore, in the creation of the personalized IAT with the category labels “I enjoy/I don’t enjoy,” I was able to specify the reference group for whom the evaluations were relevant (i.e., “I”), while also using a verb (“enjoy”) that better captures smokers’ positive or negative evaluations for the *experience* of smoking. Therefore, of the three measures of implicit attitudes, the version that measured the association between what people enjoy and smoking seemed to be the best candidate for predicting actual smoking behaviour.

It is important to note that, as in Study 1, explicit attitudes were associated with smokers’ deliberative intentions to quit smoking, but they were did not determine how much they actually smoked (generally an impulse-driven behaviour). In contrast, the measure of implicit attitudes with category labels “I enjoy/I don’t enjoy” was only marginally associated with the deliberative intentions to quit, but was significantly associated with the impulse-driven behaviour of smoking.

One limitation of the present study, however, was that it was correlational and therefore does not allow any assessment of whether implicit attitudes can predict future behaviour. In Study 3, I extend the current findings by examining the relation between implicit attitudes and smoking behaviour over time.

## **STUDY 3: Longitudinal Predictive Utility of Implicit Attitudes**

### **Introduction and Objectives**

In Study 2, I demonstrated that implicit attitudes, but not explicit attitudes, are cross-sectionally associated with smoking behaviour. I did not examine, however, how these variables predict smoking behavior longitudinally. I turned to that question in this study.

In addition, although smokers commonly report that smoking helps them relax (e.g., McNeil, Jarvis, & West, 1987; Dozois, Farrow, & Miser, 1995; Nicter, Nicter, & Carkoglu, 2007), few laboratory or field studies have provided empirical support for this claim. In Study 3 I attempted to examine the impact of stress on smoking by experimentally manipulating stress. Finally, I also attempted to examine the potential stress-buffering effects of an affirmation manipulation on subsequent smoking behaviour.

Although it was not the goal of this study to directly examine the validity of smokers' belief that smoking helps to reduce stress, I did want to examine whether this learned association operates at the implicit level. If smokers had learned to associate smoking with stress reduction, we might expect that smokers would have an increased activation of positive associations for smoking after experiencing a stressful situation. Similarly, I was interested in assessing whether the stress-buffering effects of an affirmation manipulation also had the potential to affect smokers' implicit stress responses. Thus, I predicted that stress would increase smokers' positive implicit associations for smoking, but that self-affirmation would counter the effects of increased stress. Furthermore, I predicted that implicit attitudes would reliably predict subsequent smoking behaviour four months later.

## Methods

**Sample.** A longitudinal study was conducted on a sample of 112 students (37 daily smokers, 41 social smokers, 14 ex-smokers, and 12 nonsmokers) from the University of Waterloo.<sup>3</sup> Participants were randomly assigned to one of 4 conditions in a 2 (stress vs. no stress) X 2 (affirmation vs. no affirmation) factorial design. The mean age of participants was just over 20 ( $M = 20.43$ ;  $SD = 1.47$ ), of which 46% were females (see Table 4 for demographic information for each experimental condition). No group differences in demographics were found between conditions ( $p > .28$ ).

Table 4

*Sample Characteristics by Condition at Time 1 in Study 3*

	Condition ( $n = 112$ )			
	Threat and affirmation ( $n=30$ )	Threat and no affirmation ( $n=30$ )	Threat and no affirmation ( $n=20$ )	No threat and no affirmation ( $n=32$ )
Age	21.4 ( $SD = 1.81$ )	20.7 ( $SD = 0.82$ )	20.2 (1.96)	20.5 ( $SD = 1.69$ )
Gender (% male)	56.7%	56.7%	58.8%	40.6%
Smoking status (%)				
Current smoker	40.0% ( $n = 12$ )	36.7% ( $n = 11$ )	20.0% ( $n = 4$ )	31.3% ( $n = 10$ )
Social smoker	40.0% ( $n = 12$ )	30.0% ( $n = 9$ )	40.0% ( $n = 8$ )	37.5% ( $n = 12$ )
Ex-smoker	16.7% ( $n = 5$ )	13.3% ( $n = 4$ )	5.0% ( $n = 1$ )	12.5% ( $n = 4$ )
Nonsmoker	3.3% ( $n = 1$ )	20.0% ( $n = 6$ )	20.0% ( $n = 4$ )	3.1% ( $n = 1$ )
No response			15.0% ( $n = 3$ )	15.6% ( $n = 5$ )
Cigarettes per week	20.38 ( $SD = 26.85$ )	18.68 ( $SD = 26.87$ )	10.93 ( $SD = 18.34$ )	22.12 ( $SD = 26.75$ )

<sup>3</sup> This sample was difficult to accumulate, because of the relatively low frequency of smokers among university samples. The sample was collected over three terms. In addition, although screening questions had been used during mass testing to select only those who were daily smokers, there must have been an error that occurred during mass testing because participants with a range of smoking statuses were given access to the study. This error was not identified until the time of the analysis. However, rather than excluding nonsmokers from the analyses, all participants were retained because of the small sample size, and because of the focus on the predictive utility of implicit attitudes.

**Stress and affirmation manipulations.** All participants completed a questionnaire about their smoking related beliefs and behaviours<sup>4</sup>. Then, those in the stress conditions were asked to write about a time when they experienced a dilemma that caused them stress. This manipulation was originally developed from Taylor & Gollwitzer (1995), and adapted by McGregor, Zanna, Holmes, & Spencer (2001). The instructions were as follows:

*Please try to think of an unresolved personal dilemma in your life, which has caused you a great deal of stress. Such predicaments are characterized by the fact that you are not yet sure whether to take action in order to change things. You feel very uncertain and you ask yourself whether it might not be better to leave things as they are. In other words, you haven't decided to take action, but you haven't decided against it either. Please do not select a problem that is easy to solve, or that you have already made your mind up about. On the other hand, do not select one for which a solution will likely never be reached. The problem should be complex and should take the form of "Should I . . . or not?"*

Those in the no stress condition were asked to write about a similar event that might have happened to an acquaintance of theirs. All participants were then given the affirmation manipulation, which consisted of a list of six values and characteristics, and they were asked to circle the value that was most important to them (see Appendices A and B for the manipulation instructions). Those in the affirmation condition were then asked to write about the value that they had circled, and explain why that value was important to them. Those in the no affirmation condition were asked to circle the value that was least important to them, and write about why that value might be important to someone else (Sherman & Cohen, 2006).

**Measure of attitudes.** All the participants were then asked to complete the personalized IAT with category labels “I enjoy/I don’t enjoy” as a measure of their implicit attitudes. The measure of explicit attitudes was not included in this study.

---

<sup>4</sup> Because this study was intended to be administered to smokers only, all participants completed questions related to their smoking beliefs and behaviour, even if they reported being a social smoker, ex-smoker, or nonsmoker at the time of the study.

**Measures of smoking behaviour.** Following the manipulations, participants were given a questionnaire that assessed their smoking beliefs and intentions about their future smoking (see Appendix C). One question asked participants how likely they were to have a cigarette immediately after the study on a 5-point Likert scale (1: not at all likely – 5: extremely likely). As a measure of smoking behaviour, participants were contacted by phone later that evening and asked “Have you had a cigarette since you completed the study today?”, which they answered with either a “yes” or “no” response.

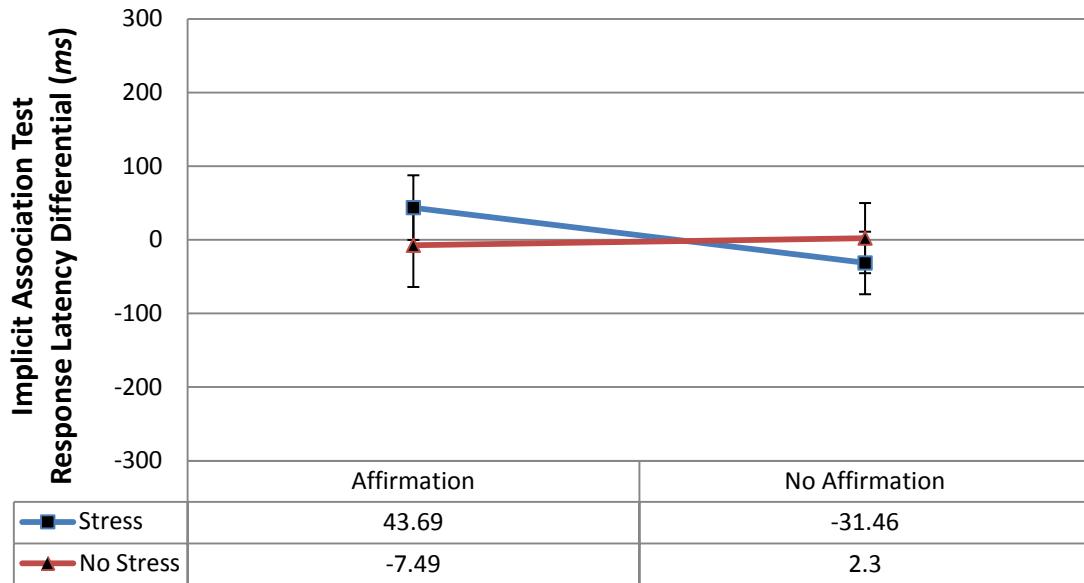
In addition, participants were contacted four months later for a brief telephone follow-up session, during which they were asked about their current smoking behaviour, history of quit attempts over the past four months, and their overall opinion of smoking (see Appendix D). Smoking behaviour was assessed by asking whether they had smoked in the 30 days before the telephone interview, and if they had smoked, how frequently they smoked. They were also asked how many cigarettes they consumed per day. Quitting behaviour was assessed by asking “Have you made any attempt to quit smoking since the last session, about 4 months ago?”, followed by “Are you still quit or back to smoking?”

## Results

**Effects of stress and affirmation on implicit attitudes.** To examine the possible effects of the stress and affirmation manipulations on implicit attitudes towards smoking, a 2 (stress vs. no stress) X 2 (affirmation vs. no affirmation) factorial ANCOVA was conducted, while controlling for smoking status at session 1 by including it as a covariate (see Figure 2 for implicit attitude scores). There were no significant effects of stress ( $F(1,94) = 0.03, p = .86$ ), affirmation ( $F(1,94) = 0.47, p = .50$ ), or the interaction between stress and affirmation ( $F(1,94) = .76, p = .39$ ). Thus, in this sample, an effect on smokers’ implicit attitudes in

response to a stress manipulation or an affirmation manipulation was not supported, possibly because of the diverse smoking statuses of the sample used in this study.

*Figure 2. IAT scores as a function of condition in Study 3.*



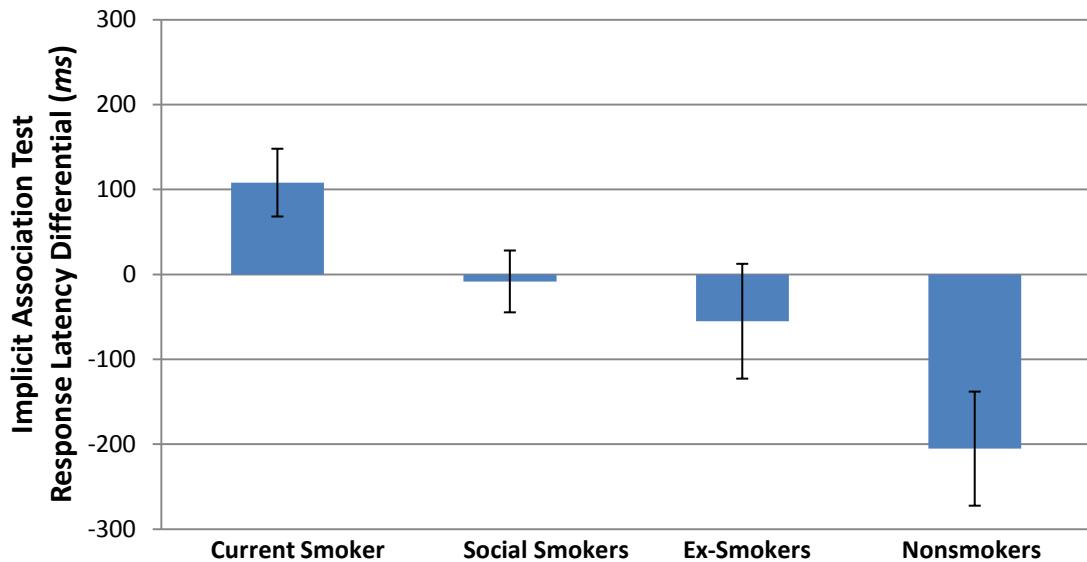
**Implicit attitude by smoking status.** Further, due to a high attrition rate (48%), it was not feasible to assess the longitudinal impact of stress and affirmation on smoking behaviour. Therefore, the four conditions were collapsed, and instead, an examination of the influence of implicit attitudes on subsequent smoking behaviour is reported. To ensure that the experimental manipulations did not have an effect on the outcome variables, all analyses were conducted while controlling for the manipulations conditions.

Using an Analysis of Covariance (ANCOVA) to test for the relation between implicit attitudes and smoking behaviour, while controlling for the effects of the experimental conditions, revealed that, indeed, implicit attitudes did vary as a function of smoking status. Specifically, current smokers ( $M = 108.04$ ,  $SD = 252.89$ ) had more positive implicit attitudes for smoking than did social smokers ( $M = -8.31$ ,  $SD = 186.63$ ), ex-smokers ( $M = -55.20$ ,  $SD =$

273.97), and nonsmokers ( $M = -205.26$ ,  $SD = 264.49$ ;  $F(3, 94) = 5.80$ ,  $p < .001$ ) (see Figure 3).

These findings suggest that having more positive implicit attitudes for smoking was associated with a greater likelihood of self-identifying as a smoker. However, the direction of the association is not yet clear when using this cross-sectional data.

Figure 3. IAT score as a function of smoking status in Study 3.



**Relation of implicit attitudes to smoking behaviour.** Although self-reported smoking status is an informative measure of smoking behaviour, daily cigarette consumption was also examined to provide additional support for the pattern of findings. In the following analyses, the relation between implicit attitudes and daily cigarette consumption among smokers was assessed. Data from nonsmokers was excluded because they have never had any direct experience with smoking, and therefore their implicit attitudes would not be an accurate reflection of their implicit personal preference for consuming cigarettes. However, data from ex-smokers was not excluded from this set of analyses because, despite claiming to no longer

be smoking, seven out of the 14 ex-smokers reported occasionally smoking an average of 38.4 cigarettes per week, making the average daily consumption for the ex-smoker group over 19 cigarettes per day ( $M = 19.21$ ,  $SD = 31.13$ ). This left us with a sample of 92 current, social, and ex-smokers to test the relation between implicit attitudes and smoking behaviour.

Regression analysis, controlling for experimental conditions, showed that implicit attitudes significantly predicted cigarette consumption in the same wave ( $\beta = .28$ ,  $p = .012$ ;  $R^2 = .08$ ), such that more positive implicit attitudes were associated with greater cigarette consumption. However, implicit attitudes did not predict quit intentions ( $\beta = -.12$ ,  $p = .28$ ;  $R^2 = .02$ ). This is consistent with previous findings, which suggest that implicit attitudes are not associated with the more deliberative processes involved in smoking.

In contrast, implicit attitudes were hypothesized to be associated more with measures of smoking behaviour. Indeed, a regression analysis controlling for experiment condition, revealed that implicit attitudes was associated with whether smokers reported that they thought they would have a cigarette right after the study ( $\beta = .38$ ,  $p < .001$ ;  $R^2 = .15$ ). Similarly, a binary logistic regression controlling for experimental condition also revealed that those with more positive implicit attitudes were marginally more likely to have actually smoked later in the day ( $OR = 1.83$ ,  $CI [0.91-3.68]$ ,  $p = .088$ ). These findings provide support for the utility of using implicit attitudes to predict smoking behaviour.

In addition, linear and logistic regression analyses controlling for experimental conditions were conducted to test the longitudinal predictive utility of implicit attitudes. However, due to attrition, only 58 participants were retained at Time 2, four months after the initial session. In the follow-up session four months later, about 52% ( $n = 30$ ) had made an attempt to quit smoking, of which 57% ( $n = 17$ ) reported still being quit at Time 2.

Importantly, having more positive implicit attitudes at Time 1 did not predict the number of cigarettes participants consumed per day at Time 2 ( $\beta = .08, p = .661; R^2 = .10$ ), nor did they predict whether they were more likely to have made a quit attempt by Time 2 ( $OR = 0.62, CI [.31-1.21], p = .16$ ). Rather, implicit attitudes did predict whether a smoker who had tried to quit in the interim had returned to smoking by Time 2, ( $OR = 0.17, CI [.03-0.98], p = .048$ ). Not surprisingly, the IAT scores for those who were able to successfully stay quit were more negative at Time 1 ( $M = -98.04$  ms), compared to those who failed in their quit attempts and relapsed back to smoking ( $M = 115.56$  ms;  $t(21) = 2.56, p = .018$ ).

## **Discussion**

In Study 3, I found that implicit attitudes were associated with self-reported daily cigarette consumption as well as reported smoking behaviour after the study. Importantly, implicit attitudes were also predictive of whether people were successful in their quit attempts. These findings replicate the findings from Studies 1 and 2, and provide further support for the view that implicit attitudes are more closely associated with smoking behaviour.

However, there were a couple of limitations in this study. First, due to the small sample size at follow-up (due to attrition), the longitudinal findings should be interpreted with caution. Second, I did not have a measure of explicit attitudes in this study, which meant that a direct comparison of the predictive utility between implicit and explicit attitudes could not be assessed. In Studies 4 and 5, I address these two limitations by including measures of both explicit and implicit attitudes, and I recruit a larger sample of smokers. In addition, I attempted to carefully examine the potential longitudinal impact of affirmation interventions designed to change people's implicit attitudes over time.

## **Study 4 – Contingent Affirmation Intervention for Smoking**

### **Introduction and Objectives**

In Study 4, I attempted to replicate and extend the findings from Study 3. I recruited from a sample of adult daily smokers in order to avoid getting smokers with diverse smoking patterns. I thought it was important to work with a sample of smokers who had an established history of smoking because they would have had adequate opportunity to develop stronger implicit associations for smoking. This consistency in smoking history is important when trying to understand the influence that implicit attitudes have on smoking behaviour.

In addition, I aimed to develop a more powerful intervention by creating a self-affirmation that is contingent on smokers' behaviour. Specifically, I reasoned that a standard self-affirmation is likely to allow people to be more responsive to information suggesting that they should quit smoking, but it might also allow them to feel a sense of global self-integrity even if they continue to smoke. Therefore, rather than simply giving smokers an opportunity to unconditionally bolster their sense of self-integrity, I tailored the affirmation intervention to elicit positive feelings of self-integrity only when they are not smoking. I attempted to do this by asking smokers to reflect on affirming values that they share with close individuals who are supportive of their intentions to quit. By linking the self-affirming value to an individual who supports their goal of quitting, I believe that smokers can only experience the stress-relieving benefits of the affirmation if they act in accordance with the shared goal of wanting to quit (Fitzsimons & Bargh, 2003). This *contingent self-affirmation* should therefore motivate smokers to resist smoking when faced with daily stressful situations.

By providing people with a way to cope with stress other than smoking, this affirmation should reduce the perceived stress-reducing benefits of smoking over time. Because these perceptions likely play an important role in creating positive implicit

associations with smoking, reducing them should change people's implicit attitudes over time, making them less positive, and ultimately increasing their likelihood of successfully quitting.

## Methods

**Sample.** Smokers ( $N = 117$ ) were recruited from the community through an ad in the paper (see Table 5 for sample characteristics). Participants were randomly assigned to one of three affirmation conditions when they arrived to the lab: (1) traditional affirmation, (2) contingent affirmation, or (3) control (see Appendices E, F, and G for the manipulation instructions).

**Affirmation instructions.** Participants in the *traditional affirmation* (TA) condition ( $n = 40$ ) wrote about their most important personal value (manipulation adapted from Cohen, Garcia, Apfel, & Master, 2006). Those in the *contingent affirmation* (CA) condition ( $n = 43$ ) were asked to "write about a value that is most important to you and to someone in your life who is most supportive of your intentions to quit smoking." Those in the *control* condition ( $n = 34$ ) wrote about a value that is important to an arbitrarily chosen third person. In addition, all participants were given a bracelet and a keychain with the words "Remember the Values" written on them. They were instructed to think about the value they had just written about anytime they saw the bracelet over the course of the following month. The specific phrasing of the instructions was kept the same across condition, and consisted of saying: "We would like you to think about the value that you wrote about anytime you look at either the bracelet or key chain over the next month. We will be asking you about your experiences with these items when you come back for your next session in about a month." This was done to ensure that participants were getting repeated exposures to the contingent affirmation (Dal Cin, MacDonal, Fong, Zanna, & Elton-Marshall, 2006). In the quest to change implicit attitudes,

repeated exposure to an intervention is a crucial part of the process. This is because of the nature in which implicit attitudes are naturally formed, which is through repeated exposure. Instead of allowing smokers to continue to unconsciously enforce their positive associations for smoking each time they light up, I wanted to provide them with a visual cue that had the potential to interrupt the encoding of that automatic positive association.

**Smoking beliefs measures.** Various smoking-related beliefs were assessed immediately after the affirmation manipulation. Smokers' explicit attitudes were assessed by asking them how positive their overall opinion of smoking was (1: very negative – 5: very positive). Smokers' craving for smoking was assessed by asking them how good smoking would feel (1: very negative – 5: very positive). One item was included to assess whether smokers used smoking as a strategy of coping with stress (1: strongly disagree – 5: strongly agree). Smokers also indicated whether they thought they would smoke immediately after the study (1: strongly disagree – 5: strongly agree).

**Smoking behaviour measures.** In addition, the same standard questions that assessed daily cigarette consumption, intentions to quit, and past quitting attempts were included. Participants were then given an opportunity to smoke immediately after the study at Time 1, and their behaviour was surreptitiously observed and recorded by a researcher who was blind to condition. To capture participants' smoking behaviour, research assistants escorted the participants back outside to their cars (in a parking lot behind the building). Once outside, the researchers were instructed to pretend as though they had forgotten the participants' payment. The researchers then claimed that it would "take about 10 minutes to get the money from the lab upstairs," while being apologetic about having forgotten the money.<sup>5</sup> The research

---

<sup>5</sup> No participant was suspicious that the researcher was going to run off with their money. Consequently, everyone agreed to wait. The average smoker takes just over 6 minutes to smoke a full cigarette (American

assistant was then able to run down a connecting hallway to another doorway where they had a clear view of the participants. None of the participants reported having spotted our researcher while they were being observed. The participants' behaviour was observed for 3 minutes to assess whether they smoked. The researcher then returned to the participant, paid them for their time, and debriefed them on the deception of the study.

**Follow-up sessions.** Participants were asked to return for a follow-up session at Time 2, one month after their initial session. Many of the same variables relating to their smoking behaviour and smoking-related attitudes were assessed. Smokers were also asked about their experiences with the bracelet and key chains during the month since Time 1 (e.g., frequency of noticing them, whether they made participants think about quitting, whether they thought the bracelet or key chain had role in their quitting intentions); 1: strongly disagree – 5: strongly agree). An IAT was also administered to assess smokers' implicit attitude for smoking.

Finally, participants were contacted for a second follow-up to assess their smoking behaviour approximately 5 or 6 months following their initial session.

## Results

**Sample Characteristics.** Despite random assignment, pre-existing differences on three smoking-related variables emerged (see Table 5). Specifically, those in the control condition ( $M = 21$ ) smoked an average of 5 extra cigarettes more than those in either the CA ( $M = 16$ ;  $t(114) = 2.26, p < .05$ ) or the TA group ( $M = 16$ ;  $t(114) = 2.29, p < .05$ ), and they also had lower quitting intentions than these two groups ( $t(114) = 3.96, p < .001$ ; and  $t(114) = 3.03, p < .01$ , respectively). There were no significant differences between the two affirmation groups in either daily cigarette consumption or quit intentions ( $t < 1$ ). In addition, those in the CA

---

Cancer Society). For this reason, I wanted to give the participants the impression that they might potentially be waiting for up to 10 minutes, so that they would know that they could finish smoking, if they chose to do so.

group were more likely to have made a quit attempt in the past 12 months than the TA group,  $t(114) = 2.12, p < .05$ , and the control group  $t(114) = 2.22, p < .05$ ; no differences emerged between these latter two groups ( $t < 1$ ). All subsequent analyses controlled for these pre-existing group differences (daily cigarette consumption, previous quit attempts, and quitting intentions) by including them as covariates.

Table 5

*Sample Characteristics at Time 1 in Study 4*

	Contingent Affirmation	Traditional Affirmation	Control
	<i>n=40</i>	<i>n=43</i>	<i>n=34</i>
Gender (% male)	65	55.8	70.6
Age	37.23	36.70	39.18
History of mental illness (% yes)	25	30.2	17.6
Working status (% yes)	45	48.8	35.3
Number of children at home	1.78	1.65	1.73
Smoking status (% current smokers vs. social, ex- or non-smoker)	95	88.4	94.1
Smoking frequency (% at least once a day)	100	95.2	100
Cigarettes per day	15.88 <sup>a</sup>	15.88 <sup>a</sup>	20.97 <sup>b</sup>
Quit intentions (% intend to quit within 6 mths)	60.0 <sup>a</sup>	51.2 <sup>a</sup>	20.6 <sup>b</sup>
Quit attempt in past 12 mths (% yes)	57.5 <sup>a</sup>	34.9 <sup>b</sup>	32.4 <sup>b</sup>
Number of smoking friends	3.50	3.49	4.00
Overall smoking opinion [1: very neg – 5: very pos]	1.97	2.31	2.24

For each variable, elements with a common single superscript letter represent non-significantly different means,  $p < 0.05$ , as determined by relevant simple effects tests.

All other elements within each belief type are significantly different from each other.

**Cross-sectional effects of the affirmation intervention.** To assess whether the affirmation manipulation had any short-term effects, an analysis of covariance (ANCOVA) was conducted, while controlling for Time 1 condition differences in daily cigarette consumption, quitting attempts, and quitting intentions. The result of the ANCOVA revealed a marginally significant group difference in smokers' prediction about whether they would smoke immediately after the study ( $F(2,111) = 2.64, p = .076$ ). Subsequent post-hoc comparisons using Fisher LSD<sup>6</sup> on the adjusted means revealed that the CA participants were significantly less likely to intend to smoke right after the study, compared to the TA group ( $p = .026$ ). However, neither the CA or TA groups significantly differed from the control group ( $p > .13$ ) (see Table 6). Importantly, when given the opportunity to smoke outside immediately after the study, the CA group (23.1%) was less likely to actually smoke compared to those in either the TA group (44.2%;  $OR = .39, CI [.14 - 1.01], p = .062$ ) or the control group (70.6%;  $OR = .33, CI [.12 - .92], p = .034$ ). The TA group was also marginally less likely to have smoked after the study, compared to the control group ( $OR = .15, CI [.15 - 1.05], p = .06$ ).

---

<sup>6</sup> Here and throughout this results section, when an analysis of covariance (ANCOVA) was significant, subsequent pair-wise post-hoc analyses were conducted by using the adjusted means in ANOVA—generated by saving the unstandardized regression residuals of the covariates for each of the dependent variables (DV) of interest, adding the grand mean from each DV to the new respective variables, and adjusting the degrees of freedom in the final statistic to reflect the additional step in the analysis (Cohen, Cohen, West, & Aiken, 2003).

Table 6

*Smoking-Related Outcomes at Time 1 by Condition in Study 4*

	Time 1		
	Contingent Affirmation	Traditional Affirmation	Control
	<i>n=40</i>	<i>n=43</i>	<i>n=34</i>
Going to smoke after study [1: strongly disagree – 5: strongly agree]	3.69 <sup>a</sup>	4.19 <sup>b</sup>	4.26 <sup>ab</sup>
Smoked after study (% smoked)	23.1 <sup>a</sup>	44.2 <sup>b</sup>	70.6 <sup>c</sup>

For each variable, elements with a common single superscript letter represent non-significantly different means,  $p < 0.05$ , as determined by relevant post-hoc analyses.  
All other elements within each belief type are significantly different from each other.

**Longitudinal effects of the affirmation intervention.**

**One month follow-up.** The main objective of this study was to examine the longitudinal effect of the affirmation manipulation from Time 1 on smokers' implicit attitudes at Time 2 (see Table 7 for all means and pair-wise comparisons). There was good retention between Time 1 and Time 2, with 73.5% ( $n = 86$ ) returning to complete the session 2 survey. At the end of their first session, I gave participants a bracelet or a key chain with the words "Remember the Values" and told them to think about the affirmation manipulation between sessions. I predicted that smokers who were exposed to the CA manipulation would have the least positive implicit attitudes for smoking at Time 2. This is because the CA was designed to buffer smokers against stress while also linking the affirmation with a motivation to quit. In effect, I set up a contingency to only allow smokers to self-affirm if they were acting in accordance with their quitting goals.

Logistic regression analyses were used on the first two dichotomous measures, which included having made any quit attempts in the past 30 days and having intentions to quit in the next 6 months. An ANCOVA was performed on the other continuous dependent measures.

When the results from the ANCOVA analyses were significant, post-hoc contrasts were also conducted to assess pair-wise comparisons on the adjusted means.

Consistent with my predictions, the CA group had more negative implicit attitudes, compared to the control condition (see Figure 4). Moreover, at one month's follow-up, the CA group was less likely to self-identify as being current smokers, had thought about quitting more often between sessions, was less likely to report that cigarettes would taste good (a measure of craving), was less likely to report using smoking as a means of dealing with stress, and thought that the bracelet or key chain had helped motivate their intentions to quit, compared to the other two groups (see Table 7).

In addition, among continuing smokers at Time 2, compared to the control group, both the CA and the TA groups had higher intentions to quit, and reported that the bracelet or key chain made them think about quitting more, at one month's follow-up. However, there was no group difference in smokers' overall opinion for smoking, which was our measure of explicit attitudes.

*Figure 4. IAT scores as a function of experimental condition at Time 2 in Study 4.*

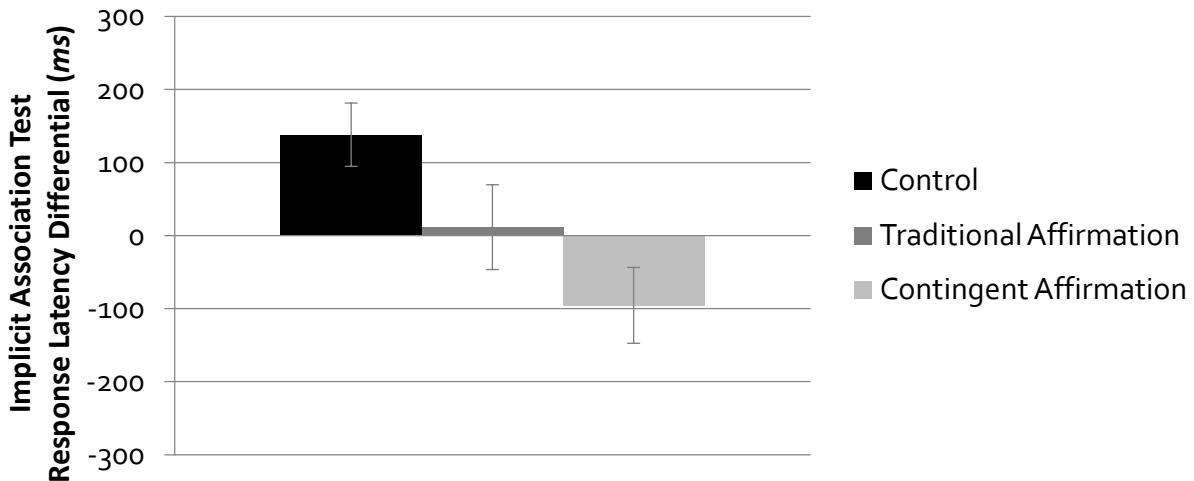


Table 7

*Smoking-Related Outcome Variables at Time 2 Separated by Condition in Study 4*

	One month follow-up		
	Contingent Affirmation <i>n=29</i>	Traditional Affirmation <i>n=30</i>	Control <i>n=27</i>
Implicit attitudes for smoking (milliseconds)	-95.61 <sup>a</sup> ( <i>SD</i> = 269.82)	11.44 <sup>ab</sup> ( <i>SD</i> = 312.49)	137.94 <sup>b</sup> ( <i>SD</i> = 255.07)
Smoking opinion [1: very neg – 5: very pos]	2.48 ( <i>SD</i> = 1.36)	2.22 ( <i>SD</i> = 0.98)	2.20 ( <i>SD</i> = 0.87)
Smoking status (% current smokers vs. social or ex-smoker)	71.4 <sup>a</sup> ( <i>n</i> = 20)	93.8 <sup>b</sup> ( <i>n</i> = 30)	96.2 <sup>b</sup> ( <i>n</i> = 25)
Cigs per day	16.57 ( <i>SD</i> = 8.81)	20.25 <sup>ab</sup> ( <i>SD</i> = 8.12)	20.65 <sup>b</sup> ( <i>SD</i> = 10.71)
Quit attempts in past 30 days (% yes)	48.1 ( <i>n</i> = 13)	37.5 ( <i>n</i> = 12)	11.5 ( <i>n</i> = 3)
Back to smoking or still quit (% still quit among those who had made a quit attempt)	25.0 ( <i>n</i> = 3)	18.2 ( <i>n</i> = 2)	0.0 ( <i>n</i> = 0)
Quit intentions (% intend to quit within 6 mths)	70.4 <sup>a</sup> ( <i>n</i> = 19)	61.3 <sup>a</sup> ( <i>n</i> = 19)	15.4 <sup>b</sup> ( <i>n</i> = 4)
Frequency of thinking about quitting in past month	26.41 <sup>a</sup> ( <i>SD</i> = 32.32)	8.44 <sup>b</sup> ( <i>SD</i> = 8.94)	7.58 <sup>b</sup> ( <i>SD</i> = 8.81)
Bracelet or key chain caused thinking about quitting	2.57 <sup>a</sup> ( <i>SD</i> = 0.88)	2.45 <sup>a</sup> ( <i>SD</i> = 1.06)	1.77 <sup>b</sup> ( <i>SD</i> = 0.77)
Frequency of noticing bracelet or key chain [1: Very rarely – 5: very often]	4.39 <sup>ab</sup> ( <i>SD</i> = 0.74)	4.55 <sup>a</sup> ( <i>SD</i> = 0.62)	4.08 <sup>b</sup> ( <i>SD</i> = 1.02)
Bracelet played role in wanting to quit [1: Not at all – 5: extremely]	3.67 <sup>a</sup> ( <i>SD</i> = 1.11)	2.97 <sup>b</sup> ( <i>SD</i> = 1.16)	2.38 <sup>b</sup> ( <i>SD</i> = 1.02)
Cig would feel good now [1: Strongly disagree– 5: strongly agree]	2.54 <sup>a</sup> ( <i>SD</i> = 1.07)	3.45 <sup>b</sup> ( <i>SD</i> = 0.94)	3.67 <sup>b</sup> ( <i>SD</i> = 1.04)
Smoke when life gets stressful [1: Strongly disagree– 5: strongly agree]	3.63 <sup>a</sup> ( <i>SD</i> = 1.08)	4.26 <sup>b</sup> ( <i>SD</i> = 0.93)	4.19 <sup>b</sup> ( <i>SD</i> = 0.63)
For each variable, elements with a common single superscript letter represent non-significantly different means, <i>p</i> <0.05, as determined by relevant post-hoc analyses.			
All other elements within each belief type are significantly different from each other.			

**Six months follow-up.** Retention was also good at Time 3, with nearly 65% ( $n = 67$ ) of the participants who completed their second session at Time 2 who also completed the telephone questionnaire at Time 3. In addition, there was a group of participants who had completed the first session, but had not returned for the second in-lab session, who were re-contacted to complete the telephone questionnaire at Time 3. Consequently, 18 additional participants were included in the analyses at Time 3, for a total sample of 85 participants.<sup>7</sup>

To examine the potential for sustainable long-term effects in our intervention, I compared some important smoking-related outcomes between our three conditions at six months after their initial session. Once again, I controlled for pre-existing differences in daily cigarette consumption, quitting attempts, and quitting intentions at Time 1. Logistic regression analyses were used on the first two dichotomous measures, which included having made any quit attempts in the past 6 months and having intentions to quit in the next 6 months. An ANCOVA was performed on the other continuous dependent measures. When the results from the ANCOVA analyses were significant, post-hoc contrasts were also conducted to assess pair-wise comparisons on the adjusted means (see Table 8).

I found that participants in the CA group were more likely to have made a quit attempt between Time 2 and Time 3, compared to the other two groups. In addition, 36% of those who had made a quit attempt in the CA condition maintained their quit attempts, compared to only 15.8% in the TA condition, and 0% in the control. However, given the small number of participants who were still in the sample, and the even smaller number who had tried to quit between Time 2 and Time 3, these results should be interpreted with caution.

---

<sup>7</sup> The aim of the current study was to examine the impact of the affirmation manipulation. Therefore, those who were exposed to the affirmation at Time 2, but did not return for their second session at Time 2 were also eligible to complete the measure of outcomes at Time 3. This small group of 18 participants who missed their second in-lab session were not included in any of the longitudinal analyses.

In addition, among continuing smokers at Time 3, an ANCOVA revealed a group difference in reported use of smoking as a means of helping deal with stress ( $F(2, 37) = 3.24, p = .050$ ). Post-hoc analyses revealed that those in the CA group were less likely to report smoking as a means of dealing with stress, compared to the other two groups. There was once again no group difference in smokers' overall opinion for smoking.

A pattern that emerged between Time 2 and Time 3 is the fact that the rate of quitting attempts at Time 3 (any attempts in the past 6 months) for the TA group was the only one that was not higher than the rate of quit attempts at Time 2 (in the past 30 days). To test this possibility, a paired samples t-test was conducted for each condition. Indeed, although the CA and control condition both showed an increase in the rate of having made a quit attempt from Time 2 to Time 3 ( $t(21) = 3.13, p = .005$ ; and  $t(17) = 2.20, p = .042$ , respectively), the TA group did not have a similar increase ( $t(24) = 0.33, p = .746$ ). This result suggests that the TA might have unintentionally reduced the motivation to make a quit attempt between Time 2 and Time 3.

Table 8.

*Longitudinal Results at Time 3 in Study 4*

	6 month follow-up		
	Contingent Affirmation <i>n=29</i>	Traditional Affirmation <i>n=34</i>	Control <i>n=22</i>
Quit attempts in past 6 months (% yes)	79.3 <sup>a</sup> ( <i>n</i> = 23)	35.5 <sup>b</sup> ( <i>n</i> = 13)	40.9 <sup>b</sup> ( <i>n</i> = 9)
Back to smoking or still quit (% still quit among those who had made a quit attempt)	36.0 <sup>a</sup> ( <i>n</i> = 9)	15.8 <sup>ab</sup> ( <i>n</i> = 3)	0 <sup>b</sup> ( <i>n</i> = 0)
Quit intentions (% intend to quit within 6 months)	56.5 ( <i>n</i> = 13)	55.2 ( <i>n</i> = 16)	33.3 ( <i>n</i> = 7)
Cigs per day	11.12 ( <i>SD</i> = 11.55)	15.13 ( <i>SD</i> = 11.43)	16.05 ( <i>SD</i> = 12.31)
Smoking frequency (% at least once a day)	76.0 ( <i>n</i> = 19)	87.5 ( <i>n</i> = 28)	90.9 ( <i>n</i> = 20)
Smoking opinion [1: very neg – 5: very pos]	2.14	1.88	2.34
Smoking helps deal with stress [1: strongly disagree – 5: strongly agree]	3.75 <sup>a</sup>	4.41 <sup>b</sup>	4.24 <sup>b</sup>

For each variable, elements with a common single superscript letter represent non-significantly different means,  $p < 0.05$ , as determined by relevant post-hoc analyses.  
If no letters are included, then there means are not significantly different from each other, or the analysis was not possible.

**Discussion**

In this study, I was able to find preliminary evidence for the potential of my contingent affirmation intervention to change smokers' implicit attitudes. I also found that the intervention showed a consistent pattern of changing their smoking behaviour over time. Compared to the control group (and often the traditional affirmation group as well), the contingent affirmation helped smokers increase their intentions to quit, increase their

likelihood of making a quit attempt, and importantly, made them more successful in those quitting attempts. The affirmation did not, however, affect smokers' explicit attitudes for smoking, nor did it reliably affect their quitting intentions—both of which can be argued to be more deliberative processes than actual smoking behaviour or cravings for smoking.

This study also provided the unique opportunity to examine the potential benefits of the CA, compared to the TA. The CA manipulation was founded on the premise that a regular affirmation might backfire among smokers. Given that most smokers want to quit, the TA might unintentionally buffer smokers against the stress that they would typically experience whenever they light up. A potential consequence of this, we posited, would be that smokers would be less motivated to reduce or quit their smoking. Although the sample size was too small to rigorously assess this in this study, we did find some preliminary support for this possibility. Specifically, we found that those in the TA condition were the only ones that didn't report a higher quitting rate at Time 3 (having made a quit attempt in the past 6 months), compared to Time 2 (having made a quit attempt in the past 30 days). This finding is consistent with a growing body of research that suggests that simply affirming people can sometimes have detrimental consequences on their motivations to persist at a difficult task. For instance, in a series of 4 experiments, Vohs and her colleagues (2013) found that affirmed participants demonstrated a deflated sense of motivation and observed performance on a difficult task—a pattern that is consistent with goal-disengagement. These findings suggest that affirming people can lead to an internalization of experiences failures, which consequently leads to goal disengagement. Because of the inherent difficulty of quitting smoking, it is important to ensure that smokers' motivation to persist in their quitting attempts is not compromised.

Although I had expected to find a significant decrease in smoking consumption in response to the CA, compared to the other two groups, the results did not reach significance in this study. Similarly, given the small number of participants, I was not able to test whether implicit attitudes mediated the effect of the intervention on cessation. In addition, we experienced a failure in random assignment in this study. Because of these limitations, I recommend that the results from this study be interpreted with caution. Further replication of these results with larger sample sizes and more careful random assignment is necessary. Nonetheless, preliminary results suggest that the theoretical contribution of this study is potentially valuable for future smoking interventions. For these reasons, I decided to run a replication in Study 5.

## **Study 5 – Replication of Contingent Affirmation Intervention for Smoking**

### **Introduction and Objectives**

In my final study, I sought to replicate and extend the findings from Study 4. Specifically, I planned to more carefully capture the potential mediating role of implicit attitudes on the effects that the CA manipulation has in motivating smokers to quit smoking. In addition, this replication provides an opportunity to examine the robustness of the results of Study 4. This is particularly important given the failure of random assignment at Time 1.

In addition, I propose that an important component of the intervention is the repeated exposure to the CA manipulation. This was achieved in Study 4 by first giving participants a bracelet or key chain with the words “Remember the Values” written on them, and instructing participants to think about the value from the experimental manipulation whenever they looked at the bracelet or key chain. This same procedure was used in Study 4 to remind participants of the value they wrote about between sessions.

By associating an affirming value with their experience of smoking, I expected those in the CA condition to have less positive scores on measures of implicit attitudes for smoking. I also expected that those who were affirmed would demonstrate the greatest self-restraint on the behavioural DVs for smoking. Finally, I predicted that the relation between the affirmation and increased quitting behaviour would be mediated by the decreased positive implicit associations for smoking. I did not, however, expect the effect to be due to any changes in explicit attitudes.

## **Methods**

**Sample.** Participants were invited to complete a study about “Smoking Attitudes” through an online ad on a local website (Kijiji.ca). In exchange for their participation, they were promised \$60 for completing two in-lab sessions and one follow-up phone survey. A total of 47 participants were recruited and randomly assigned to the CA condition ( $n = 24$ ) or control condition ( $n = 23$ ). The data from one person was dropped from the analyses because it was discovered that they had also participated in Study 4 (see Table 9 for sample characteristics).

**Procedures.** Using a longitudinal design, I used a sample of daily smokers from the community. I conducted a study with a 2 (contingent affirmation vs. control) X 2 (Time 1 vs. Time 2) mixed model design. The manipulation instructions and many of the measures remained the same as those in Study 4.

## **Measures.**

***Implicit and explicit attitudes.*** The dependent variables consisted of measures that assessed implicit (personalized IAT with “I enjoy/I don’t enjoy” category labels) and explicit attitudes (overall opinion of smoking) at both time points. This way, I was able to measure the change in these variables as a result of the affirmation manipulation.

***Smoking behaviour.*** Participants’ smoking behaviour was once again assessed through both self-report measures and through surreptitious observation by a research assistant.

***Manipulation check.*** I included two items to check whether the manipulation had the intended effect of getting smokers in the CA to reflect on values that were more important to their lives. On scales of 1 (“strongly disagree”) to 5 (“strongly agree”), participants indicated the extent to which the affirmation value had influenced their life and was important to them.

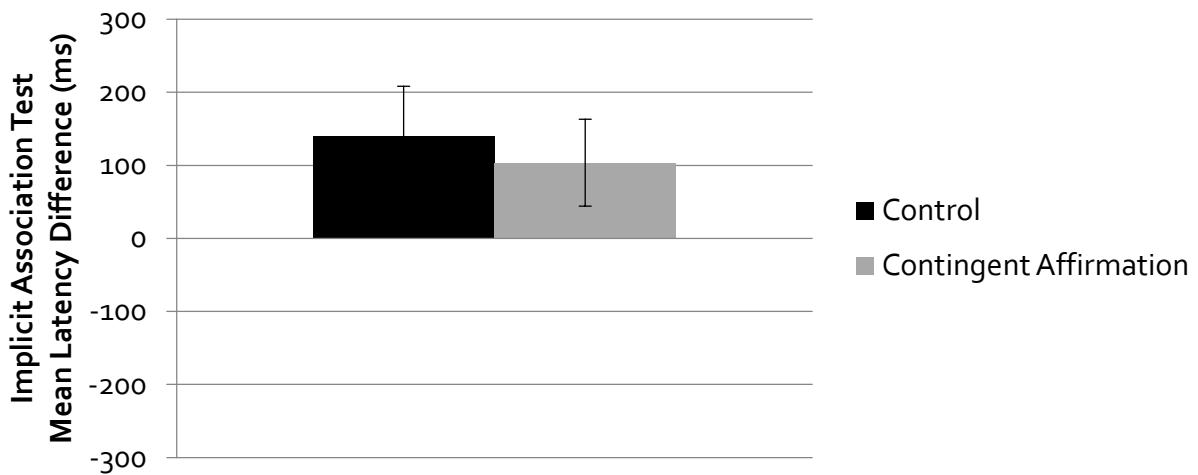
**Mood.** I also included a single item measure of participants' mood immediately after the affirmation. On a scale of 1 ("negative") to 9 ("positive"), participants were asked to "rate your general mood." I wanted to ensure that the affirmation wasn't causing a change in mood, which might have been responsible for some of the observed differences.

## Results

**Sample characteristics.** Table 9 presents the sample characteristics for the participants in the two conditions. There were no significant group differences in any of the variables tested. Thus, random assignment did not fail us in this study.<sup>8</sup>

**Baseline implicit attitudes.** Similarly, before the affirmation manipulation was administered at Time 1, I found no group differences in implicit attitudes towards smoking between the two conditions (see Figure 5).

*Figure 5.* IAT scores as a function of experimental condition at Time 1 in Study 5.



<sup>8</sup> Only daily smokers were recruited for this study, however some participants were resistant to self-identify as being a "current smoker" (see Table 9). This finding is consistent with the basic premise of this study, which is that there are sometimes underlying psychological motivations that affect smokers' self-reported responses.

Table 9. Sample Characteristics at Time 1 for Study 5

	Contingent Affirmation <i>n</i> =24	Control <i>n</i> =22	Group Difference ( <i>p</i> -value)
Gender (% male)	45.8 ( <i>n</i> =11)	68.2 ( <i>n</i> =15)	$\chi^2(1)=2.33;$ <i>p</i> = .127
Age	29.91 ( <i>SD</i> = 11.96)	31.95 ( <i>SD</i> = 10.79)	<i>t</i> (44)=0.61; <i>p</i> = .548
History of mental illness (% yes)	4.2 ( <i>n</i> =1)	22.7 ( <i>n</i> =5)	N/A <sup>9</sup>
Working status (% currently working)	62.5 ( <i>n</i> =15)	59.1 ( <i>n</i> =13)	$\chi^2(1)=0.06;$ <i>p</i> = .813
Annual Income [1: under 10,000 to 6:100K to 150K]	3.36 ( <i>SD</i> = 1.95)	3.00 ( <i>SD</i> = 1.69)	<i>t</i> (37)=0.63; <i>p</i> = .531
Children living at home (% yes)	25 ( <i>n</i> =6)	22.7 ( <i>n</i> =5)	$\chi^2(1)=0.03;$ <i>p</i> = .86
Self esteem [0: very low – 100: very high]	66.67 ( <i>SD</i> = 18.09)	70.46 ( <i>SD</i> = 17.59)	<i>t</i> (44)=0.72; <i>p</i> = .476
Relationship status (% in a relationship or married)	58.3 ( <i>n</i> =14)	50.0 ( <i>n</i> =11)	$\chi^2(1)=0.32;$ <i>p</i> = .571
Overall smoking opinion [1: very neg – 5: very pos]	2.27 ( <i>SD</i> = 0.85)	2.27 ( <i>SD</i> = 1.03)	<i>t</i> (44)=0.01; <i>p</i> = .995
Smoking status (% current smokers vs. social, ex- or non-smoker)	83.3 ( <i>n</i> =20)	95.2 ( <i>n</i> =20)	$\chi^2(1)=1.61;$ <i>p</i> = .205
Smoking frequency (% at least once a day)	100 ( <i>n</i> =24)	100 ( <i>n</i> =22)	N/A
Cigarettes per day	13.85 ( <i>SD</i> = 5.94)	16.36 ( <i>SD</i> = 7.23)	<i>t</i> (44)=1.29; <i>p</i> = .204
Quit intentions (% intend to quit within 6 mths)	39.1 ( <i>n</i> =9)	31.8 ( <i>n</i> =7)	$\chi^2(1)=0.26;$ <i>p</i> = .608
Quit attempt in past 12 mths (% yes)	25 ( <i>n</i> =6)	27.3 ( <i>n</i> =6)	$\chi^2(1)=.03;$ <i>p</i> = .861
Enjoy a cig right now [1: Not at all – 5: extremely]	3.58 ( <i>SD</i> = 0.83)	3.72 ( <i>SD</i> = 0.77)	<i>t</i> (44)=0.61; <i>p</i> = .546
Cigarette would taste good now [1: Not at all – 5: extremely]	3.33 ( <i>SD</i> = 1.05)	3.36 ( <i>SD</i> = 0.66)	<i>t</i> (44)=0.12; <i>p</i> = .908
Want to not smoke [1: Not at all – 5: extremely]	3.27 ( <i>SD</i> = 1.07)	3.50 ( <i>SD</i> = 1.19)	<i>t</i> (44)=0.69; <i>p</i> = .495
Society disapproves [1:strongly disagree – 5: strongly agree]	4.04 ( <i>SD</i> = 0.75)	4.00 ( <i>SD</i> = 1.02)	<i>t</i> (44)=0.16; <i>p</i> = .875
People want you to quit smoking [1:strongly disagree – 5: strongly agree]	4.33 ( <i>SD</i> = 0.71)	4.32 ( <i>SD</i> = 0.95)	<i>t</i> (44)=0.06; <i>p</i> = .951
Regret having started smoking [1:strongly disagree – 5: strongly agree]	3.87 ( <i>SD</i> = 1.39)	4.27 ( <i>SD</i> = 1.12)	<i>t</i> (44)=1.06; <i>p</i> = .295
Implicit Association Test for Smoking (mean latency difference)	103.50 ( <i>SD</i> = 291.39)	140.47 ( <i>SD</i> = 317.17)	<i>t</i> (44)=0.41; <i>p</i> = .682

<sup>9</sup> A requirement for Chi-Squared tests is that the expected counts for each cell be greater than 5. In this case, there is only a single person in the CA condition with a history of mental illness, thus making the Chi-Squared analysis not possible.

**Manipulation check and mood.** As predicted, the results revealed that smokers in the CA condition reported the value that they wrote about had influenced their lives more ( $M = 4.75$  vs.  $M = 3.57$ ;  $t(43) = 5.12$ ;  $p < .001$ ) and that their chosen value was more important to them ( $M = 4.75$  vs.  $M = 3.52$ ;  $t(43) = 4.78$ ;  $p < .001$ ), compared to those in the control condition. Furthermore, there was no difference in mood between the CA and control conditions ( $M = 7.45$  vs.  $M = 7.76$ ;  $t(44) = 0.66$ ;  $p = .513$ ) immediately after being exposed to the experimental manipulation, which helps rule out the possibility that the affirmation simply caused an increase in positive mood.

### **Cross-sectional effects of the contingent affirmation intervention at Time 1.**

***Smoking-related outcomes.*** To test whether the CA manipulation was successful in reducing the motivation to smoke, I asked smokers to predict whether they would smoke after the study, which they responded to on a 5-point Likert scale (1: strongly disagree – 5: strongly agree). An independent samples t-test revealed that those in the CA condition were marginally less likely to intend to smoke immediately after the study ( $M = 3.79$ ), compared to the control group ( $M = 4.43$ ),  $t(44) = 1.77$ ;  $p = .08$ . Consistent with this finding, those in the CA condition (12.5%,  $n = 3$ ) were significantly less likely than the control condition (50%,  $n = 11$ ) to actually smoke immediately after the study ( $OR = .14$ ;  $CI = [0.03-0.62]$ ;  $p = .009$ ), as surreptitiously observed by a researcher. This latter behavioural finding provides a direct replication of Studies 3 and 4.

### **Relation with implicit and explicit attitudes at Time 1.**

***Relations across conditions.*** I had measures of both implicit attitudes and explicit attitudes in this study. As in Study 2, I predicted a small or negligible correlation between implicit and explicit measures of smoking attitudes. As expected, when collapsed across the

CA and control conditions, the association between implicit and explicit attitudes was not significant,  $r = 0.11$ ,  $p = .478$ .

A binary logistic regression analysis revealed that implicit attitudes at Time 1 did not predict whether smokers would smoke after the study ( $OR = 1.72$ ;  $CI = [0.90-3.25]$ ;  $p = .13$ ), although this pattern was trending. Explicit attitudes also failed to predict whether participants smoked outside ( $OR = 1.23$ ;  $CI = [0.62-2.45]$ ;  $p = .556$ ). However, as expected, explicit attitudes were related to self-reported intentions to quit smoking ( $r = -0.44$ ;  $p = .002$ ) and perceived subjective norms of smoking ( $r = 0.47$ ;  $p < .001$ ). This pattern of results is consistent with findings from previous studies, which suggest that explicit attitudes are relatively good predictors of smokers' self-reported intentions to quit smoking, and that explicit attitudes might also be contaminated by smokers' perceptions of social norms surrounding smoking.

### **Time 2: One month follow-up session.**

***Sample at Time 2.*** The retention rate between wave 1 and wave 2 was fairly good for both the CA group (88%;  $n = 21$ ) and the control group (87%;  $n = 20$ ), and there was no group difference in attrition ( $t(45) = 0.06$ ;  $p = .957$ ). To examine the longitudinal effects of our CA intervention, I examined group differences at Time 2—one month after their initial session at Time 1. Table 10 contains the results from these analyses.

***Smoking-related outcomes.*** Those in the CA condition made more quit attempts (30%) than those in the control condition (16.7%), but this difference did not reach statistical significance. Furthermore, 22% of those in the CA condition who made an attempt to quit between Time 1 and Time 2 had sustained their quit attempt successfully until Time 2, whereas none in the control condition successfully maintained their quit attempt. Again, these

results are consistent with the results in Study 4 in that more people in the CA condition are successfully quitting than in the control condition. However, there was once again small number of participants in this study, which suggests that further research with larger samples might be necessary to increase confidence in these results.<sup>10</sup>

When examining daily smoking consumption, however, smokers in the CA condition had significantly reduced their daily smoking consumption at follow-up. Paired samples t-tests revealed that smokers in the CA group had a significant decrease in daily cigarette consumption from Time 1 to Time 2 ( $d = -3.74$ ;  $t(18) = 3.61$ ;  $p = .002$ ), whereas the daily cigarette consumption did not significantly change across time for those in the control condition ( $d = -0.37$ ;  $t(18) = 0.34$ ;  $p = .739$ ). Not surprisingly, an independent samples t-test showed that this reduction in daily cigarette consumption was greater for the CA group than the control group ( $t(38) = 2.41$ ;  $p = .021$ ). Consequently, among those who were still smoking at Time 2, smokers in the CA group were consuming fewer cigarettes ( $M = 11.53$ ), compared to the control group ( $M = 16.58$ ;  $t(36) = 2.01$ ;  $p = .052$ ). Furthermore, smokers in the CA condition had a greater sense of perceived behavioural control (self-efficacy) for being able to stay quit if they were to try to quit smoking in the next 6 months, and they were less likely to report craving cigarettes (“cigarette would taste good now”; see Table 10). Those in the CA condition also reported thinking about quitting marginally more between the first and second sessions ( $M = 15.29$  and  $M = 3.33$ , respectively;  $t(36) = 1.82$ ;  $p = .084$ ).

---

<sup>10</sup> When we pooled data from Study 4 and Study 5, the failure in random assignment persisted. Larger studies are necessary to ensure effective random assignment.

Table 10

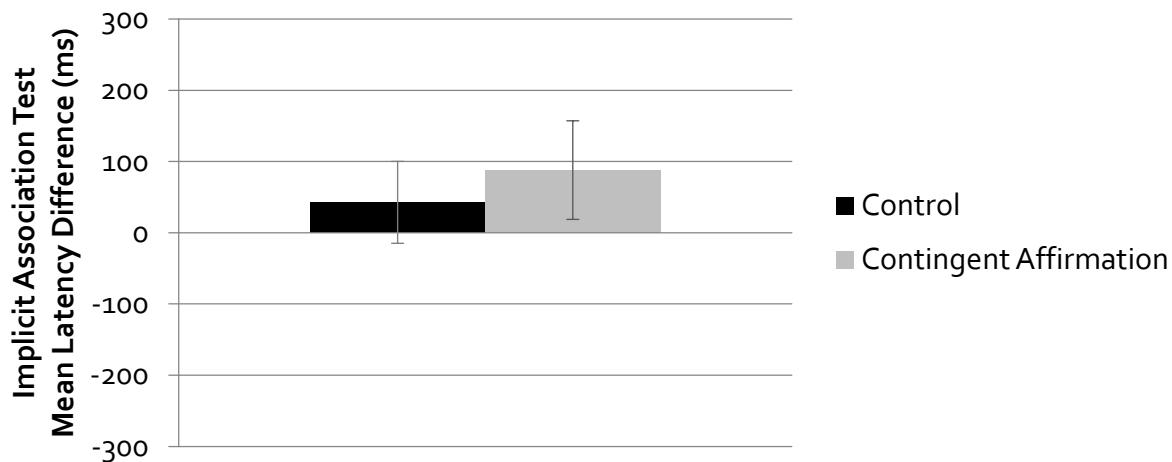
*Group Differences at Time 2 in Study 5*

	One month follow-up		Statistical Analysis
	Contingent Affirmation <i>n=21</i>	Control <i>n=19</i>	
Implicit attitudes for smoking (milliseconds)	87.92 ( <i>SD</i> = 317.17)	42.65 ( <i>SD</i> = 250.62)	<i>t</i> (38)=0.50; <i>p</i> = .622
Change in IAT score between Time 1 and Time 2 (milliseconds)	-38.67 ( <i>SD</i> = 409.08)	-66.15 ( <i>SD</i> = 406.48)	<i>t</i> (38)=0.21; <i>p</i> = .833
Smoking opinion [1: very neg – 5: very pos]	2.38 ( <i>SD</i> = 0.80)	2.21 ( <i>SD</i> = 0.92)	<i>t</i> (38)=0.63; <i>p</i> = .535
Smoking status (% current smokers vs. social, ex- or non-smoker)	76.2% ( <i>n</i> = 16)	89.5% ( <i>n</i> = 17)	$\chi^2(1)=$ 1.22; <i>p</i> = .270
Smoking frequency (% at least once a day)	90.5% ( <i>n</i> = 18)	94.7% ( <i>n</i> = 18)	$\chi^2(1)=$ .001; <i>p</i> = .970
Cigs per day	<b>11.53</b> ( <i>SD</i> = 6.40)	<b>16.58</b> ( <i>SD</i> = 8.90)	<i>t</i> (36)=2.01; <i>p</i> = .052
Difference in CPD from wave 1 to wave 2	<b>-3.74</b> ( <i>SD</i> = 4.11)	<b>-0.37</b> ( <i>SD</i> = 4.75)	<i>t</i> (38)=2.41; <i>p</i> =.021
Quit attempts in past 30 days (% yes)	30.0% ( <i>n</i> = 6)	16.7% ( <i>n</i> = 3)	N/A
If attempted to quit in past 30 days, are you still quit (% still quit)	33.3% ( <i>n</i> = 2)	0.0% ( <i>n</i> = 0)	N/A
Quit intentions (% intend to quit within 6 mths)	55.0% ( <i>n</i> = 11)	31.6% ( <i>n</i> = 6)	$\chi^2(1)=$ 2.17; <i>p</i> = .14
Self efficacy for quitting [1:Not at all sure – 5: Extremely sure]	<b>2.90</b> ( <i>SD</i> = 1.26)	<b>2.21</b> ( <i>SD</i> = 1.27)	<i>t</i> (38)=1.70; <i>p</i> = .092
Frequency of thinking about quitting in past month	<b>15.29</b> ( <i>SD</i> = 29.54)	<b>3.33</b> ( <i>SD</i> = 6.00)	<i>t</i> (38)=1.82; <i>p</i> = .084
Correct recall of instructions given with bracelet or key chain (% correct)	76.2% ( <i>n</i> = 16)	0.0% ( <i>n</i> = 0)	N/A
Cig would taste good now [1: Strongly disagree– 5: strongly agree]	<b>2.71</b> ( <i>SD</i> = 1.06)	<b>3.42</b> ( <i>SD</i> = 0.84)	<i>t</i> (38)=2.33; <i>p</i> = .025
Cig would calms when stressed [1: Strongly disagree– 5: strongly agree]	4.52 ( <i>SD</i> = 0.61)	4.22 ( <i>SD</i> = 0.85)	<i>t</i> (38)=1.35; <i>p</i> = .185
Smoke when life gets stressful [1: Strongly disagree– 5: strongly agree]	4.54 ( <i>SD</i> = 0.86)	4.00 ( <i>SD</i> = 0.75)	<i>t</i> (38)=1.31; <i>p</i> = .199

**Explicit attitudes for smoking.** I found no group difference in smokers' overall opinion about smoking. Thus, the intervention did not appear to have an impact on the measure of explicit attitudes.

***Implicit attitudes for smoking.*** Unlike in Study 4, I did not find evidence that smokers' implicit associations for smoking at Time 2 were less positive for those in the CA group ( $M = 87.92$ ) than those in the control group ( $M = 42.65$ ),  $t(34) = 0.50$ ;  $p = .622$  (see Figure 6 for the graphical representation of group IAT scores). It may be that there was not enough time for participants' implicit attitudes in the CA condition to change, but these results might also suggest that the impact of the CA manipulation may not have been mediated through changes in implicit attitudes. One possibility is that the CA manipulation may have affected the relation between implicit attitudes and smoking behaviour (cigarettes consumed per day) without directly affecting implicit attitudes. To test this hypothesis, I ran a regression analysis to examine the possible interaction between condition and implicit attitudes on daily cigarette consumption at Time 2, while controlling for implicit attitudes at Time 1. Regression analyses revealed a marginally significant interaction between condition and implicit attitudes at Time 2 ( $\beta = 0.83$ ,  $p = .068$ ). When I ran the regression analysis separately for each condition, I found that there was a marginal positive association between implicit attitudes and daily cigarette consumption in the control condition ( $\beta = .34$ ,  $p = .085$ ), but there was no association between implicit attitudes and daily cigarette consumption in the CA condition ( $\beta = -.14$ ,  $p = .572$ ). These results are consistent with the idea that the CA manipulation may have decreased the amount that people smoked by interrupting the influence that smokers' implicit attitudes have on their behaviour.

*Figure 6. IAT scores as a function of experimental condition at Time 2 in Study 5.*



### **Time 3: Four month follow-up session.**

**Sample.** Four months after their initial in-lab session, participants were contacted for a third and final follow-up telephone interview (Time 3). If they agreed to complete this second follow-up questionnaire, their names were entered into a draw for a \$50 gift certificate from a popular Canadian coffee shop (Tim Horton's). Twenty-one smokers from the CA condition and 14 smokers from the control condition were retained at Time 3.

**Group differences in smoking-related outcomes.** To examine whether the effects of the CA manipulation persisted until Time 3—a period of 4 months after having been exposed to the brief affirmation manipulation—we examined group differences on relevant smoking-related outcomes (see Table 11). Between Time 2 and Time 3, 36.8% of the participants in the CA condition (7 people) made a quit attempt compared to 28.6% (4 people) in the control condition. Given the small *ns* in this study, I was not able to find a significant difference in the percentage of people who were able to successfully sustain their quit attempt at Time 3. However, among those who were still smoking, smokers in the CA were smoking fewer

cigarettes per day ( $M = 9.68$ ;  $SD = 6.40$ ) than were those in the control ( $M = 14.85$ ;  $SD = 7.23$ ;  $t(31) = 2.13$ ;  $p = 0.042$ ). In addition, a larger proportion of those in the CA group reported having intentions to quit within the next 6 months (72.2%), compared to the control condition (38.5%;  $\chi^2(1) = 3.53$ ;  $p = 0.060$ ). Finally, at Time 3, those in the CA condition were also marginally less likely to think that a cigarette would taste good ( $M = 2.63$ ;  $SD = 1.02$ ), compared to the control condition ( $M = 3.23$ ;  $SD = 0.83$ ;  $t(31) = 1.91$ ;  $p = 0.066$ .

Table 11

*Group Differences at Time 3 in Study 5*

	4 month follow-up		Statistical Analysis
	Contingent Affirmation <i>n=19</i>	Control <i>n=14</i>	
Smoked in last 30 days (% yes)	94.7 ( <i>n</i> = 18)	92.9 ( <i>n</i> = 13)	$\chi^2(1) = 0.05$ ; <i>p</i> = 0.824
Smoking frequency (% at least once a day)	78.9 ( <i>n</i> = 15)	92.9 ( <i>n</i> = 13)	$\chi^2(1) = 0.05$ ; <i>p</i> = 0.824
Smoking status (% current smoker)	68.4 ( <i>n</i> = 13)	92.3 ( <i>n</i> = 12)	$\chi^2(1) = 2.58$ ; <i>p</i> = 0.108
New Year's resolution to quit (% yes)	15.8 ( <i>n</i> = 3)	14.3 ( <i>n</i> = 2)	$\chi^2(1) = 0.01$ ; <i>p</i> = 0.905
Quit attempts in past 3 mths (% yes)	36.8 ( <i>n</i> = 7)	28.6 ( <i>n</i> = 4)	$\chi^2(1) = 0.25$ ; <i>p</i> = 0.618
Back to smoking or still quit (% still quit among those who had made a quit attempt)	14.3 ( <i>n</i> = 1)	25.0 ( <i>n</i> = 1)	$\chi^2(1) = 0.20$ ; <i>p</i> = 0.658
Quit intentions (% intend to quit within 6 mths)	<b>72.2 (<i>n</i> = 13)</b>	<b>38.5 (<i>n</i> = 5)</b>	$\chi^2(1) = 3.53$ ; <i>p</i> = 0.060
Cigs per day <sup>11</sup>	<b>9.68 (<i>SD</i> = 6.40)</b>	<b>14.85 (<i>SD</i> = 7.23)</b>	$t(30) = 2.13$ ; <i>p</i> = 0.042
Craving ("Cigarette taste good now") [1: strongly disagree – 5: strongly agree]	<b>2.63 (<i>SD</i> = 1.01)</b>	<b>3.23 (<i>SD</i> = 0.83)</b>	$t(31) = 1.91$ ; <i>p</i> = 0.066
Smoking opinion [1: very neg – 5: very pos]	1.89 ( <i>SD</i> = 0.66)	2.23 ( <i>SD</i> = 0.73)	$t(31) = 1.36$ ; <i>p</i> = 0.183

**Predictive power of implicit attitudes.**

***Correlations between implicit and explicit attitudes.*** A central aim of this paper has been to compare the predictive utility of implicit measures of smoking-related attitudes to the traditional self-report measures of explicit attitudes. I attempted to examine this phenomenon

<sup>11</sup> The analysis of daily consumption was based on participants who reported still smoking. Data from those who reported having quit was excluded from the calculations of daily cigarette consumption.

by testing the longitudinal relations of both implicit and explicit attitudes on a set of key smoking-related outcome measures. In particular, I was interested in assessing whether implicit attitudes could predict concurrent and subsequent smoking behaviour, which included past quitting attempts, success in those attempts, current daily cigarette consumption, and subsequent quitting intentions.

Table 12 reports the correlations between implicit attitudes at Time 1 on outcome variables at Times 1 and 2. Results show that, collapsed across both conditions, implicit attitudes at Time 1 are not related to the dependent variables at Time 1. In contrast, I found the expected relation between explicit attitudes at Time 1 and quitting intentions at Time 1.

Surprisingly, I found that implicit attitudes at Time 1 were inversely related to daily cigarette consumption at Time 2. I don't have a clear explanation for this finding, other than to speculate that this was a random association partly due to the small sample size of the study. Explicit attitudes at Time 1, however, were associated with having made a quit attempt between sessions, and with having intentions to quit smoking at Time 2.

Table 12

*Correlations between Measures of Implicit and Explicit Attitudes at Time 1 on Relevant Smoking-Related Variables Across Time in Study 5*

Outcome variables at Time 1	Contingent Affirmation Condition		Control Condition		Both Conditions	
	Attitudes at Time 1					
	IAT Score	Explicit Attitude	IAT Score	Explicit Attitude	IAT Score	Explicit Attitude
	<i>n</i> = 24		<i>n</i> = 22		<i>n</i> = 46	
Quit attempt in past 6 months	0.31	0.04	0.07	-0.47*	0.19	-0.23
Daily cigarette consumption	0.14	0.19	-0.11	0.23	0.02	0.21
Quitting intentions within 6 months	0.10	-0.39 <sup>†</sup>	0.15	-0.38 <sup>†</sup>	0.12	-0.38**
Outcome variables at Time 2	IAT Score	Explicit Attitude	IAT Score	Explicit Attitude	IAT Score	Explicit Attitude
	<i>n</i> = 19		<i>n</i> = 17		<i>n</i> = 36	
Quit attempt in past 1 month	0.02	-0.51	0.40	-0.24	0.20	-0.36*
Successfully quit	0.09	-0.40	N/A	N/A	0.01	-0.12
Daily cigarette consumption	-0.24	-0.16	-0.42 <sup>†</sup>	0.11	-0.34*	-0.01
Quitting intentions within 6 months	-0.22	-0.37	0.16	-0.40 <sup>†</sup>	-0.02	-0.36*

<sup>†</sup>  $p < .10$ ; \*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$

Table 13 presents the results of the correlations between the measure of implicit attitudes at Time 2 and the same four smoking-related outcomes at Time 2 and Time 3. Implicit attitudes at Time 2 did not significantly predict any of the smoking outcomes at Time 2 or at Time 3. In contrast, explicit attitudes once again predicted quitting intentions at Time 2, and quitting attempts at Time 3.

Table 13

*Correlations between Measures of Implicit and Explicit Attitudes at Time 2 on Relevant Smoking-Related Variables at Times 2 and 3 in Study 5*

<b>Outcome variables at Time 2</b>	<b>Contingent Affirmation Condition</b>		<b>Control Condition</b>		<b>Both Conditions</b>	
	<b>Attitudes at Time 2</b>					
	<b>IAT Score</b>	<b>Explicit Attitude</b>	<b>IAT Score</b>	<b>Explicit Attitude</b>	<b>IAT Score</b>	<b>Explicit Attitude</b>
	<b><i>n</i> = 19</b>		<b><i>n</i> = 17</b>		<b><i>n</i> = 36</b>	
Quit attempt in past 1 month	-0.31	-0.29	0.16	0.08	-0.12	-0.10
Successfully quit	-0.07	-0.47	N/A	N/A	-0.01	-0.20
Daily cigarette consumption	-0.14	-0.12	0.37 <sup>†</sup>	-0.02	0.08	-0.10
Quitting intentions within 6 months	-0.10	-0.43	-0.50*	-0.29	-0.23	-0.32*
<b>Outcome variables at Time 3</b>	<b>IAT Score</b>	<b>Explicit Attitude</b>	<b>IAT Score</b>	<b>Explicit Attitude</b>	<b>IAT Score</b>	<b>Explicit Attitude</b>
	<b><i>n</i> = 19</b>		<b><i>n</i> = 14</b>		<b><i>n</i> = 33</b>	
	-0.13	-0.09	-0.28	-0.71**	-0.17	-0.34*
Successfully quit	0.61	0.26	N/A	N/A	0.32	0.21
Daily cigarette consumption	-0.07	-0.02	0.59*	0.12	0.14	-0.01
Quitting intentions within 6 months	-0.25	-0.29	-0.29	0.21	-0.24	-0.03

<sup>†</sup>  $p < .10$ ; \*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$

***Impact of intervention on relation of implicit attitudes with smoking outcomes.*** In examining implicit attitudes at Time 2, there was no evidence that the CA condition changed participants' implicit attitudes. I expected such a change to occur over time, and perhaps over a greater length of time such a change would occur, but I was unable to observe such a change

in this study. Nevertheless the CA manipulation may have had its effect on smoking behaviour (i.e., cigarettes consumed per day) by reducing the relation between implicit attitudes and smoking behaviour. To test this hypothesis, I examined the relation between smokers' implicit attitudes at Time 2 and their smoking behaviour at Time 3. As before, I examined the possible interaction between implicit attitudes at Time 2 and condition in predicting smoking consumption at Time 3, while controlling for implicit attitudes at Time 1. Replicating my earlier finding, I found a marginal interaction ( $\beta = .94, p = .055$ ). I then ran the regression analyses separately for each condition and found that there was once again a significant positive relation between implicit attitudes and daily cigarette consumption in the control condition ( $\beta = .57, p = .052$ ), but not in the CA condition ( $\beta = -.05, p = .822$ ). These findings again suggest that the CA manipulation might have the potential to interrupt the influence of implicit associations on the tendency to smoke.

## **Discussion**

Using data from a longitudinal analysis of smokers across three waves, I was able to successfully replicate the core effects of my Contingent Affirmation intervention. Specifically, I showed that those who were exposed to the CA manipulation were less likely to smoke shortly after the manipulation, and were smoking fewer cigarettes at both follow-up sessions. Furthermore, I was able to show that the potential impact of the CA might be in the way that it disconnects the relation between implicit attitudes and smoking behaviour.

I did not, however, replicate the findings from Study 4 showing that the CA affirmation affects the mean levels of implicit attitudes among smokers. Similarly, I wasn't able to replicate the finding demonstrating that those who were exposed to the CA were more likely to

make a quit attempt, and to successfully sustain that quit attempt—although the results were in the predicted direction on this latter measure.

There are several explanations for why these discrepancies might have occurred. First, it might be that there were extraneous factors that made the effects of the intervention more effective in Study 4 than Study 5. For instance, Study 5 sessions were conducted shortly before and after the Christmas holidays. One factor that may have made it more difficult to detect an effect of the CA condition was New Year's resolutions among the participants in the control condition. Of the three people in the control condition who made a successful quit attempt, two had made a New Year's resolution to quit smoking. This perhaps higher-than-baseline level of quitting in the control condition may have made it more difficult to detect an effect of the CA condition.

Another potential limitation of Study 5 was that the control group might have also experienced an unintended affirmation from reflecting on the bracelets or key chains. The instructions were to reflect upon the value that they wrote about during their initial session whenever they glanced at the bracelet or key chains. However, at Time 2, when asked to recall the instructions given with the bracelet or key chains, about 75% of participants in the control condition indicated that they thought of values that were personally relevant when looking at the bracelet or key chains. I even had a few participants report that they felt that the value that they thought about—a value that they had initially rated as being the ninth most important out of a list of 11 possible values—had become more important to them as they thought about it more between sessions.

Finally, we had a relatively small sample size in both Study 4 and Study 5. This was due to the difficulty and high cost of recruiting potential participants for this study. Although

many of the patterns were trending in the expected direction, there was often a failure to reach significance because of the small sample size in each study. My long-term goals are to continue investigating interventions that have the capacity to affect sustainable change by changing smokers' implicit associations for smoking. I intend to continue investigating the role of implicit processes on smoking behaviour, as well as the potential impact that affirmation interventions have on changing the associations between those implicit processes and smoking. For this, I will need much larger samples of smokers to replicate these findings and capture the mediating processes underlying our effects.

## **General Discussion**

### **Important Contributions of this Research**

Health behaviour models have long relied on the use of explicit attitudes to help predict subsequent behaviour. In this paper, I have provided clear evidence that implicit attitudes are better predictors of smoking behaviour than explicit attitudes.

In three studies, I demonstrated that commonly used measures of explicit attitudes failed to predict cigarette consumption. However, explicit attitudes were successful at predicting whether a person intended to quit, and made a subsequent quitting attempt—although they did not predict whether a person would successfully sustain that quit attempt. These findings are consistent with research on many of the predictive models of health behaviour, such as the Theory of Planned Behaviour (Ajzen, 1991).

In contrast, implicit attitudes were better at predicting short-term and long-term smoking behaviour. Although implicit attitudes generally did not predict quitting intentions or quitting attempts, they did generally predict cigarette consumption, post-study smoking behavior, and whether smokers who had made a quit attempt were able to successfully sustain their quit attempts. This study thus contributes to the literature on health behaviour by identifying the different types of smoking-related cognitions and behaviours that can be predicted by implicit and explicit attitudes.

Another important contribution of this research is the attempt to more directly target smokers' implicit attitudes. Specifically, I attempted to create an intervention that was designed to interrupt the influence that implicit attitudes have on smoking. This intervention builds on work showing that smokers often smoke as a response to stress, and thus might learn to use smoking as a means of coping with stress and negative affect. However, some of the negative affect associated with the guilt of not wanting to smoke can also be beneficial in

helping smokers quit. Traditional affirmation manipulations might be indiscriminant in the type of negative affect they buffer against. Therefore, I created an affirmation intervention (which I called a *Contingent Affirmation*) that helps buffer smokers from stress, while also providing a contingency of only being able to affirm them when they are acting in accordance with their health goals.

In Studies 4 and 5, I provided some promising preliminary findings that lend support to this form of intervention. First, I was able to show strong reductions in the likelihood of smoking shortly after being exposed to the contingent affirmation manipulation. Although the observed effects of the affirmation on cigarette consumption persisted for up to 6 months after the initial exposure, the affirmation seemed to have produced more consistent reductions in short-term smoking behaviour. This is in line with other work that has utilized affirmation manipulations to improve health behaviour (e.g., Finez & Sherman, 2012).

In addition, I was able to provide preliminary support for the intended effect of the CA on smokers' subsequent implicit attitudes for smoking. However, this pattern did not emerge consistently in Studies 4 and 5. Whereas Study 4 demonstrated that the CA has the potential to make smokers' attitudes more negative, Study 5 suggests that the CA can interrupt the relation between implicit attitudes and smoking. I intend to conduct future research using this intervention to better understand how the CA might affect implicit attitudes.

## **Limitations**

There were some limitations in Studies 3, 4, and 5 that deserve further discussion. Study 3 included a sample of participants whose smoking history was unclear, and also highly heterogeneous. This is likely to occur anytime a sample of university or college students are recruited, because there is such diversity in their smoking habits. In addition, it is likely that

younger smokers have not yet had a chance to self-identify as smokers, even though their smoking patterns would suggest otherwise. Consequently, the effects of the intended stress and affirmation manipulations could not reliably be assessed. We remedied this issue in Studies 4 and 5 by selecting only adult smokers from the community.

Another limitation concerned the failure of random assignment in Study 4, as well as having small sample sizes in Studies 4 and 5. Specifically, although the CA condition unambiguously reduced smoking immediately after the experiment and smoking consumption over time, it was not possible to establish statistically significant differences on sustained quitting. Consequently, further research with a larger sample size is required to conclusively demonstrate that the contingent affirmation can successfully increase sustained quitting.

In addition, the mechanism by which contingent affirmation leads to reductions in observed smoking needs further investigation. Study 4 provided some evidence that contingent affirmation might change people's implicit attitudes, but Study 5 suggests that contingent affirmation affects smoking behavior by reducing the impact of implicit attitudes on smoking behavior. Both potential mechanisms seem plausible and potentially important. Sorting out which mechanism (or establishing both as mechanisms) is clearly an important topic for further research.

### **Alternative Explanations**

Affirmation interventions have consistently produced meaningful changes on a wide range of health and psychological outcomes (for a review, see Sherman & Cohen, 2006). However, the mechanism by which these affirmations produce those effects is not always clear.

In this paper, I have proposed that affirmation manipulations have the potential to affect smokers' implicit attitudes by providing smokers with a way to manage their stress. In particular, I proposed that my revised *Contingent Affirmation* manipulation could help buffer against stress, but only if they also refrained from smoking. To do this, I asked participants to think of an affirming value that they share with a close-other who is supportive of their intentions to quit. However, this introduces two possible mechanisms behind the observed effects. First, it may be that simply priming loved ones can have the stress-reducing effects that help smokers break the dependence of smoking to regulate their stress. Alternatively, reminding smokers of their intentions to quit (which they share with others) might be what is causing the reductions in consumption, and the greater success in cessation attempts. To effectively untangle these potential mechanisms, future research using carefully constructed experimental studies is needed.

### **Implications for Health Interventions**

This research has important implications for health interventions. Existing interventions are typically designed to change people's unhealthy behaviours by changing their explicit attitudes (usually through the dissemination of information about the health risks associated with the target behaviour). However, my research shows that health behaviour interventions that specifically target implicit attitudes might be more effective at creating sustainable health behaviour change.

Consistent with this reasoning, there are currently some effective health policies that may indirectly affect smokers' implicit attitudes—although the cause of these effects is rarely attributed to changing smokers' implicit attitudes. For instance, it may be that graphic warning labels, such as those found in Canada, have been tremendously successful at getting people to

stop smoking by creating a direct association between smoking and vivid, fear-arousing, and unpleasant images. Through repeated exposure to this association between cigarettes and negative, emotionally-arousing images, smokers' implicit attitudes have likely become more negative, and thus their motivation to smoke has reduced. Similarly, smoking bans that relegate smokers to smoke in uncomfortable and unpopular corners might similarly have been successful at helping smokers reduce their smoking precisely because of the more negative implicit associations they create (e.g., feeling cold while smoking).

In addition, this research highlights the importance of targeting the initial stress that often leads smokers to light up. In the research highlighted in this paper, I argue that an effective means of reducing the impulse to smoke is to first target smokers' responses to stress through surreptitious means. However, any form of intervention that can help smokers better cope with their stress can hold a similarly promising potential to help smokers quit smoking. Unfortunately, other forms of stress interventions can often be resource intensive, and often rely on the deliberative compliance of those in the intervention. In contrast, the benefit of affirmation manipulations used in this paper include the fact they can affect people's response to stress without any deliberative effort; and because they have the potential to create a recursive process which is theorized to operate by changing people's construal of their social worlds at an unconscious level. Thus, although I don't provide any direct empirical evidence for this, it is possible that utilizing an implicit strategy of coping with stress might be the more effective means of targeting those implicit associations that are associated with the impulse-driven behaviour of smoking.

## **Future Research**

I intend to continue researching more effective ways of targeting implicit attitudes. In particular, I plan to create stronger contingent affirmation manipulations that will more directly target smokers' implicit attitudes. For example, rather than thinking about a shared goal with a loved one who wants them to quit smoking, I might have participants vividly imagine a potential health risk that they might acquire through their continued smoking. Another alteration might be to provide additional reminders about their contingent affirmation, such as providing a case for their cigarette packs that instructs them to "Remember the Values." This would increase the chances that smokers are regularly reminded to think about their affirmation, especially when they might most need that reminder (i.e., when they are experiencing an urge to smoke).

Such interventions hold the promise of providing a new route to smoking cessation. They aim to reduce the cozy feeling described in the opening quotation or at least break the hold that the cozy feeling has on people's smoking behaviour. In modern Western societies, smokers don't want to smoke and know they should not smoke. But this conscious knowledge does not allow them to quit. It is the impulse to smoke that draws smokers in again and again, and if this impulse (i.e., implicit attitude) can be tamed, smoking cessation should be much easier.

## References

- Ajzen, I. (1988). *Attitudes, personality, and behavior*. Homewood, IL, US: Dorsey Press, Homewood, IL. Retrieved from  
<http://search.proquest.com.proxy.lib.uwaterloo.ca/docview/617675576?accountid=14906>
- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50(2), 179-211. Retrieved from  
<http://search.proquest.com.proxy.lib.uwaterloo.ca/docview/618094184?accountid=14906>
- Ajzen, I., & Fishbein, M. (1977). Attitude-behavior relations: A theoretical analysis and review of empirical research. *Psychological Bulletin*, 84(5), 888-918.  
doi:<http://dx.doi.org/10.1037/0033-2909.84.5.888>
- American Cancer Society. Craving a smoke? Take a walk instead.  
[https://www.cancer.org/docroot/NWS/content/NWS\\_1\\_1x\\_Craving\\_a\\_Smoke\\_Take\\_a\\_Walk.asp](https://www.cancer.org/docroot/NWS/content/NWS_1_1x_Craving_a_Smoke_Take_a_Walk.asp). Accessed May 21, 2013.
- Armitage, C. J., Harris, P. R., Hepton, G., & Napper, L. (2008). Self-affirmation increases acceptance of health-risk information among UK adult smokers with low socioeconomic status. *Psychology of Addictive Behaviors*, 22(1), 88-95.  
doi:<http://dx.doi.org/10.1037/0893-164X.22.1.88>
- Baer, J. S., & Lichtenstein, E. (1988). Classification of smoking relapse episodes: An exploration of individual differences. *Journal of Consulting and Clinical Psychology*, 56, 104-110.

Bargh, J. A., Chaiken, S., Govender, R., & Pratto, F. (1992). The generality of the automatic attitude activation effect. *Journal of Personality and Social Psychology*, 62(6), 893-912.  
doi:<http://dx.doi.org/10.1037/0022-3514.62.6.893>

Bem, D. J. (1972). Constructing cross-situational consistencies in behavior: Some thoughts on alker's critique of mischel. *Journal of Personality*, 40(1), 17-26. Retrieved from <http://search.proquest.com.proxy.lib.uwaterloo.ca/docview/615835766?accountid=14906>

Binson, D., Canchola J.A., Catania J.A., (2000) Random selection in a national telephone survey: a comparison of the Kish, next-birthday, and last-birthday methods. *Journal of Official Statistics*, 16, 53–60.

Borland, R., Yong, H. H., Balmford, J., Cooper, J., Cummings, K. M., O'Connor, R., McNeill, A., Zanna, M. P., Fong, G. T. (2010). Motivational factors predict quit attempts but not maintenance of smoking cessation: Findings from the International Tobacco Control four country project. *Nicotine & Tobacco Research*, 12(Supplement 1), S4-S11.

Buhrmester, M. D., Kwang, T., & Gosling, S. D. (2011). Amazon's Mechanical Turk: A new source of inexpensive, yet high-quality, data? *Perspectives on Psychological Science*, 6, 3-5.

Centers for Disease Control and Prevention. (2011). Quitting smoking among adults—United States, 2001-2010. *Morbidity and Mortality Weekly Report*, 60(44), 1513–9.

Charlton, A. (1984). Children's opinions about smoking. *The Journal of the Royal College of General Practitioners*, 34(266), 483-487. Retrieved from <http://search.proquest.com.proxy.lib.uwaterloo.ca/docview/81223377?accountid=14906>

Chassin, L., Presson, C. C., Sherman, S. J., Seo, D., & Macy, J. T. (2010). Implicit and explicit attitudes predict smoking cessation: Moderating effects of experienced failure to control

smoking and plans to quit. *Psychology of Addictive Behaviors*, 24(4), 670-679.

doi:<http://dx.doi.org/10.1037/a0021722>

Cohen, G. L., Garcia, J., Apfel, N., & Master, A. (2006). Reducing the racial achievement gap: A social-psychological intervention. *Science (New York, N.Y.)*, 313(5791), 1307-1310.

Retrieved from

<http://search.proquest.com.proxy.lib.uwaterloo.ca/docview/68811108?accountid=14906>

Cohen, G. L., Garcia, J., Purdie-Vaughns, V., Apfel, N., & Brzustoski, P. (2009). Recursive processes in self-affirmation: Intervening to close the minority achievement gap. *Science*, 324(5925), 400-403. Retrieved from

<http://search.proquest.com.proxy.lib.uwaterloo.ca/docview/621932848?accountid=14906>

Cox, L. S., Tiffany, S. T., & Christen, A. G. (2001). Evaluation of the brief questionnaire of smoking urges (QSU-brief) in laboratory and clinical settings. *Nicotine & Tobacco Research : Official Journal of the Society for Research on Nicotine and Tobacco*, 3(1), 7-16. Retrieved from

<http://search.proquest.com.proxy.lib.uwaterloo.ca/docview/76987637?accountid=14906>

Creswell, J. D., Welch, W. T., Taylor, S. E., Sherman, D. K., Gruenewald, T. L., & Mann, T. (2005). Affirmation of personal values buffers neuroendocrine and psychological stress responses. *Psychological Science*, 16(11), 846-851. doi:<http://dx.doi.org/10.1111/j.1467-9280.2005.01624.x>

Crowne, D. P., & Marlowe, D. (1960). A new scale of social desirability independent of psychopathology. *Journal of Consulting Psychology*, 24(4), 349-354.

doi:<http://dx.doi.org/10.1037/h0047358>

Cummings, K. M., Jaen, C. R., & Giovino, G. (1985). Circumstances surrounding relapse in a group of recent exsmokers. *Preventive Medicine*, 14, 195-202.

Cunningham, W. A., Preacher, K. J., & Banaji, M. R. (2001). Implicit attitude measures: Consistency, stability, and convergent validity. *Psychological Science*, 12(2), 163-170.  
doi:<http://dx.doi.org/10.1111/1467-9280.00328>

Dal Cin, S., MacDonald, T. K., Fong, G. T., Zanna, M. P., & Elton-Marshall, T. (2006). Remembering the message: The use of a reminder cue to increase condom use following a safer sex intervention. *Health Psychology*, 25(3), 438-443.  
doi:<http://dx.doi.org/10.1037/0278-6133.25.3.438>

Dobbs J, Marsh A (1985) *Smoking among secondary school children in 1984*. London: HMSO  
Dovidio, J. F., & Gaertner, S. L. (2000). Aversive racism and selection decisions: 1989 and 1999. *Psychological Science*, 11(4), 315-319. Retrieved from  
<http://search.proquest.com.proxy.lib.uwaterloo.ca/docview/72565352?accountid=14906>  
Dovidio, J. F., Kawakami, K., & Gaertner, S. L. (2002). Implicit and explicit prejudice and interracial interaction. *Journal of Personality and Social Psychology*, 82(1), 62-68.  
doi:<http://dx.doi.org/10.1037/0022-3514.82.1.62>

Dovidio, J. F., Kawakami, K., Johnson, C., Johnson, B., & Howard, A. (1997). On the nature of prejudice: Automatic and controlled processes. *Journal of Experimental Social Psychology*, 33(5), 510-540. Retrieved from  
<http://search.proquest.com.proxy.lib.uwaterloo.ca/docview/619210710?accountid=14906>  
Dozois, D. N., Farrow, J. A., & Miser, A. (1995). Smoking patterns and cessation motivations during adolescence. *International Journal of the Addictions*, 30, 1485–1498.

Eagly, A. H., & Chaiken, S. (1993). *The psychology of attitudes*. Fort Worth, TX: Harcourt Brace Jovanovich.

Environics Research Group. (1999). *Assessment of perceived health risks due to smoking*.

Prepared for Health Canada. Retrieved from

<http://legacy.library.ucsf.edu/tid/tel70g00/pdf;jsessionid=9F1929CA1687D97E84C8453469692CE3.tobacco03>

Fazio, R. H. (1995). *Attitudes as object-evaluation associations: Determinants, consequences, and correlates of attitude accessibility*. (pp. 247-282). Hillsdale, NJ, England: Lawrence Erlbaum Associates, Inc, Hillsdale, NJ. Retrieved from

<http://search.proquest.com.proxy.lib.uwaterloo.ca/docview/618783153?accountid=14906>

Fazio, R. H., Jackson, J. R., Dunton, B. C., & Williams, C. J. (1995). Variability in automatic activation as an unobtrusive measure of racial attitudes: A bona fide pipeline? *Journal of Personality and Social Psychology*, 69(6), 1013-1027. doi:<http://dx.doi.org/10.1037/0022-3514.69.6.1013>

Fazio, R. H., & Olson, M. A. (2003). Implicit measures in social cognition research: Their meaning and uses. *Annual Review of Psychology*, 54, 297-327.

doi:<http://dx.doi.org/10.1146/annurev.psych.54.101601.145225>

Finez, L., & Sherman, D. K. (2012). Train in vain: The role of the self in claimed self-handicapping strategies. *Journal of Sport & Exercise Psychology*, 34(5), 600-620.

Retrieved from

<http://search.proquest.com.proxy.lib.uwaterloo.ca/docview/1312430607?accountid=14906>

Fiske, S. T. (1998). Stereotyping, prejudice, and discrimination. In D. T. Gilbert, S. T. Fiske, & L. Gardner (Eds.), *The Handbook of Social Psychology*, 2(4), 357–411. Boston, MA: McGraw-Hill.

Fong GT, Cummings KM, Borland R, et al. (2006). The conceptual framework of the International Tobacco Control (ITC) Policy Evaluation Project. *Tobacco Control*, 15(Supplement 3), iii3e11.

Fong, G. T., Hammond, D., Laux, F. L., Zanna, M. P., Cummings, K. M., Borland, R., & Ross, H. (2004). The near-universal experience of regret among smokers in four countries: Findings from the international tobacco control policy evaluation survey. *Nicotine & Tobacco Research*, 6, 341-351. doi:<http://dx.doi.org/10.1080/14622200412331320743>

Friese, M., Hofmann, W., & Wiers, R. W. (2011). On taming horses and strengthening riders: Recent developments in research on interventions to improve self-control in health behaviors. *Self and Identity*, 10(3), 336-351.

doi:<http://dx.doi.org/10.1080/15298868.2010.536417>

Gerrard, M., Gibbons, F. X., Houlihan, A. E., Stock, M. L., & Pomery, E. A. (2008). A dual-process approach to health risk decision making: The prototype willingness model. *Developmental Review*, 28(1), 29-61.

doi:<http://dx.doi.org/10.1016/j.dr.2007.10.001>

Gilbert, D., G., & Wesler, R. (1989). Emotion, anxiety, and smoking, in : Ney. T., Gale, A. (Eds) *Smoking and Human Behavior* (Chichester, Wiley).

Goldstein, J. (1991). The stigmatization of smokers: An empirical investigation. *Journal of Drug Education*, 21, 167–182.

Greenwald, A. G., & Banaji, M. R. (1995). *Implicit social cognition: Attitudes, self-esteem, and stereotypes* Retrieved from

<http://search.proquest.com.proxy.lib.uwaterloo.ca/docview/62761645?accountid=14906>

Greenwald, A. G., Klinger, M. R., & Liu, T. J. (1989). Unconscious processing of dichoptically masked words. *Memory & Cognition*, 17(1), 35-47. Retrieved from  
<http://search.proquest.com.proxy.lib.uwaterloo.ca/docview/78845054?accountid=14906>

Greenwald, A. G., McGhee, D. E., & Schwartz, J. L. K. (1998). Measuring individual differences in implicit cognition: The implicit association test. *Journal of Personality and Social Psychology*, 74(6), 1464-1480. doi:<http://dx.doi.org/10.1037/0022-3514.74.6.1464>

Greenwald, A. G., Poehlman, T. A., Uhlmann, E. L., & Banaji, M. R. (2009). Understanding and using the implicit association test: III. meta-analysis of predictive validity. *Journal of Personality and Social Psychology*, 97(1), 17-41. doi:<http://dx.doi.org/10.1037/a0015575>

Harris, P. R., Mayle, K., Mabbott, L., & Napper, L. (2007). Self-affirmation reduces smokers' defensiveness to graphic on-pack cigarette warning labels. *Health Psychology*, 26(4), 437-446. doi:<http://dx.doi.org/10.1037/0278-6133.26.4.437>

Health Canada. (2001). Baseline surveys: the health effects of tobacco and health warning messages on cigarette packages. *Prepared by Environics Research Group*.

Heatherton TF, Kozlowski LT, Frecker RC, Rickert W, Robinson J. (1989). Measuring the heaviness of smoking: Using self-reported time to the first cigarette of the day and number of cigarette per day. *British Journal of Addiction*, 84, 791–800.

Hofmann, W., Gschwendner, T., Friese, M., Wiers, R. W., & Schmitt, M. (2008). Working memory capacity and self-regulatory behavior: Toward an individual differences perspective on behavior determination by automatic versus controlled processes. *Journal*

*of Personality and Social Psychology*, 95(4), 962-977.

doi:<http://dx.doi.org/10.1037/a0012705>

Kahler, C. W., Daughters, S. B., Leventhal, A. M., Gwaltney, C. J., & Palfai, T. P. (2007).

Implicit associations between smoking and social consequences among smokers in cessation treatment. *Behaviour Research and Therapy*, 45(9), 2066-2077. Retrieved from <http://search.proquest.com.proxy.lib.uwaterloo.ca/docview/68154326?accountid=14906>

Kassel, J. D., Stroud, L. R., & Paronis, C. A. (2003). Smoking, stress, and negative affect:

Correlation, causation, and context across stages of smoking. *Psychological Bulletin*, 129(2), 270-304. doi:<http://dx.doi.org/10.1037/0033-2909.129.2.270>

Kunda, Z. (1990). The case for motivated reasoning. *Psychological Bulletin*, 108, 480-498.

LaPiere RT. (1938). The social significance of measurable attitudes. *American Sociological Review*, 3, 175–82.

Linn, L. S. (1965). Verbal attitudes and overt behavior: A study of racial discrimination. *Social Forces*, 43(3), 353. Retrieved from <http://search.proquest.com.proxy.lib.uwaterloo.ca/docview/1290990634?accountid=14906>

Marlow, D., & Crowne, D. P. (1961). Social desirability and response to perceived situational demands. *Journal of Consulting Psychology*, 25(2), 109-115.

doi:<http://dx.doi.org/10.1037/h0041627>

McGregor, I., Zanna, M. P., Holmes, J. G., & Spencer, S. J. (2001). Compensatory conviction in the face of personal uncertainty: Going to extremes and being oneself. *Journal of Personality and Social Psychology*, 80(3), 472-488. Retrieved from <http://search.proquest.com.proxy.lib.uwaterloo.ca/docview/209803107?accountid=14906>

- McNeill, A. D., Jarvis, M., & West, R. (1987). Subjective effects of cigarette smoking in adolescents. *Psychopharmacology*, 92(1), 115-117. Retrieved from <http://search.proquest.com.proxy.lib.uwaterloo.ca/docview/77604479?accountid=14906>
- Naquin MR, Gilbert GG. (1996). College students' smoking behavior, perceived stress, and coping styles. *Journal of Drug Education*, 26, 367-76.
- Nichter, M., Nichter, M., Carkoglu, A., & Tobacco Etiology Research Network (2007). Reconsidering stress and smoking: a qualitative study among college students. *Tobacco Control*, 16, 211-214. doi: 10.1136/tc.2007.019869
- Nosek, B. A. (2005). Moderators of the relationship between implicit and explicit evaluation. *Journal of Experimental Psychology: General*, 134, 565-584.
- Olson, M. A., & Fazio, R. H. (2001). Implicit attitude formation through classical conditioning. *Psychological Science*, 12(5), 413-417. doi:<http://dx.doi.org/10.1111/1467-9280.00376>
- Olson, M. A., & Fazio, R. H. (2004). Reducing the influence of extrapersonal associations on the implicit association test: Personalizing the IAT. *Journal of Personality and Social Psychology*, 86(5), 653-667. doi:<http://dx.doi.org/10.1037/0022-3514.86.5.653>
- Olson, J. M., & Zanna, M. P. (1993). Attitudes and attitude change. *Annual Review of Psychology*, 44, 117-154. Retrieved from <http://search.proquest.com.proxy.lib.uwaterloo.ca/docview/618341327?accountid=14906>
- Paolacci, G., Chandler, J., & Ipeirotis, P. G. (2010). Running experiments on Amazon Mechanical Turk. *Judgment and Decision Making*, 5, 411-419.

- Parrott, A. C. (1995). Smoking cessation leads to reduced stress, but why? *International Journal of the Addictions*, 30(11), 1509-1516. Retrieved from  
<http://search.proquest.com.proxy.lib.uwaterloo.ca/docview/618906866?accountid=14906>
- Parrott, A. C. (1999). Does cigarette smoking cause stress? *American Psychologist*, 54(10), 817-820. doi:<http://dx.doi.org/10.1037/0003-066X.54.10.817>
- Parrott, A. C. (2000). Cigarette smoking does cause stress. *The American Psychologist*, 55(10), 1159-1160. Retrieved from  
<http://search.proquest.com.proxy.lib.uwaterloo.ca/docview/72417830?accountid=14906>
- Perdue, C. W., & Gurtman, M. B. (1990). Evidence for the automaticity of ageism. *Journal of Experimental Social Psychology*, 26(3), 199-216. Retrieved from  
<http://search.proquest.com.proxy.lib.uwaterloo.ca/docview/617772496?accountid=14906>
- Schachter, S. (1978). *Pharmacological and psychological determinants of smoking*. In R. E. Thornton (Ed.), *Smoking behaviour: Physiological and psychological influences* (pp. 208-228). Edinburgh, Scotland: Churchill-Livingstone.
- Sheeran, P., Gollwitzer, P. M., & Bargh, J. A. (2013). Nonconscious processes and health. *Health Psychology*, 32(5), 460-473. doi:<http://dx.doi.org/10.1037/a0029203>
- Sherman, D. K., Bunyan, D. P., Creswell, J. D., & Jaremka, L. M. (2009). Psychological vulnerability and stress: The effects of self-affirmation on sympathetic nervous system responses to naturalistic stressors. *Health Psychology*, 28(5), 554-562.  
doi:<http://dx.doi.org/10.1037/a0014663>
- Sherman, D. K., & Cohen, G. L. (2006). *The psychology of self-defense: Self-affirmation theory*. (pp. 183-242). San Diego, CA, US: Elsevier Academic Press, San Diego, CA.  
doi:[http://dx.doi.org/10.1016/S0065-2601\(06\)38004-5](http://dx.doi.org/10.1016/S0065-2601(06)38004-5)

Sherman, S. J., Chassin, L., Presson, C., Seo, D., & Macy, J. T. (2009). The intergenerational transmission of implicit and explicit attitudes toward smoking: Predicting adolescent smoking initiation. *Journal of Experimental Social Psychology*, 45(2), 313-319.  
doi:<http://dx.doi.org/10.1016/j.jesp.2008.09.012>

Sherman, D. A. K., Nelson, L. D., & Steele, C. M. (2000). Do messages about health risks threaten the self? Increasing the acceptance of threatening health messages via self-affirmation. *Personality and Social Psychology Bulletin*, 26(9), 1046-1058.  
doi:<http://dx.doi.org/10.1177/01461672002611003>

Sherman, S. J., Chassin, L., Presson, C., Seo, D., & Macy, J. T. (2009). The intergenerational transmission of implicit and explicit attitudes toward smoking: Predicting adolescent smoking initiation. *Journal of Experimental Social Psychology*, 45(2), 313-319.  
doi:<http://dx.doi.org/10.1016/j.jesp.2008.09.012>

Shiffman, S. (1982). Relapse following smoking cessation: A situational analysis. *Journal of Consulting and Clinical Psychology*, 50, 71-86.

Shopland, D.R., & Brown, C. (1987). Toward the 1990 objectives for smoking: Measuring the progress with 1985 NHIS data. *Public Health Reports*, 102, 68-73.

Stacy, A. W. (1997). Memory activation and expectancy as prospective predictors of alcohol and marijuana use. *Journal of Abnormal Psychology*, 106(1), 61-73.  
doi:<http://dx.doi.org/10.1037/0021-843X.106.1.61>

Stacy, A. W., Bentler, P. M., & Flay, B. R. (1994). Attitudes and health behavior in diverse populations: Drunk driving, alcohol use, binge eating, marijuana use, and cigarette use. *Health Psychology*, 13(1), 73-85. doi:<http://dx.doi.org/10.1037/0278-6133.13.1.73>

Steele, C. M., & Liu, T. J. (1983). Dissonance processes as self-affirmation. *Journal of Personality and Social Psychology*, 45(1), 5-19. doi:<http://dx.doi.org/10.1037/0022-3514.45.1.5>

Steele, C. M. (1988). The psychology of self-affirmation: Sustaining the integrity of the self. In L. Berkowitz (Ed.) *Advances in experimental social psychology*, (Vol 21, pp. 261-302). New York: Academic Press.

Swanson, J. E., Rudman, L. A., & Greenwald, A. G. (2001). Using the implicit association test to investigate attitude-behaviour consistency for stigmatised behaviour. *Cognition and Emotion*, 15(2), 207-230. doi:<http://dx.doi.org/10.1080/0269993004200060>

Taylor, S. E., & Gollwitzer, P. M. (1995). Effects of mindset on positive illusions. *Journal of Personality and Social Psychology*, 69(2), 213-226. Retrieved from <http://search.proquest.com.proxy.lib.uwaterloo.ca/docview/77451393?accountid=14906>

Thompson M. E., Fong G, T., Hammond D , et al. (2006). The methodology of the international tobacco control four-country survey. *Tob Control*, 15(Supplement 3):iii12e18.

Thush, C., & Wiers, R. W. (2007). Explicit and implicit alcohol-related cognitions and the prediction of future drinking in adolescents. *Addictive Behaviors*, 32(7), 1367-1383. doi:<http://dx.doi.org/10.1016/j.addbeh.2006.09.011>.

Tiffany, S. T., & Drobes, D. J. (1991). The development and initial validation of a questionnaire on smoking urges. *British Journal of Addiction*, 86(11), 1467-1476. Retrieved from

<http://search.proquest.com.proxy.lib.uwaterloo.ca/docview/72618613?accountid=14906>

U.S. Department of Health and Human Services. (2004). *The Health Consequences of Smoking: A Report of the Surgeon General*. Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health.

Vohs, K.D., Park, J.K., Schmeichel, B.J. (2013). Self-affirmation can enable goal disengagement. *Journal of Personality and Social Psychology*, 104(1), 14-27.

West, R. (1993). *Beneficial effects of nicotine: Fact or fiction?*. ENGLAND: Retrieved from <http://search.proquest.com.proxy.lib.uwaterloo.ca/docview/75793869?accountid=14906>

WHO Report on the Global Tobacco Epidemic. (2008). *The MPOWER package*. Geneva, World Health Organization.

Wicker, A. W. (1969). Attitudes versus actions: The relationship of verbal and overt behavioral responses to attitude objects. *Journal of Social Issues*, 25(4), 41-78. Retrieved from

<http://search.proquest.com.proxy.lib.uwaterloo.ca/docview/615772192?accountid=14906>

Wiers, R. W., & Stacy, A. W. (2006). Implicit cognition and addiction. *Current Directions in Psychological Science*, 15(6), 292-296. doi:<http://dx.doi.org/10.1111/j.1467-8721.2006.00455.x>

Wittenbrink, B., & Schwartz, N. (Eds). 2007. *Implicit measures of attitudes: Procedures and controversies*. New York: Guilford

Zanna, M. P., & Rempel, J. K. (1988). *Attitudes: A new look at an old concept*. (pp. 315-334). New York Paris, NY, US France: Cambridge University Press Editions de la Maison des Sciences de l'Homme, New York Paris, NY. Retrieved from <http://search.proquest.com.proxy.lib.uwaterloo.ca/docview/617501137?accountid=14906>

## **Appendix A – Self-Affirmation Manipulation Instructions in Study 3**

Below is a list of values.

Please circle the value that is *most* important to you, personally:

business / economics	social life / relationships
art / music / theatre	science / pursuit of knowledge
helping others / volunteering	religious beliefs / religion

---

Please type a few paragraphs explaining why the value you chose is important to you.

## **Appendix B – Control Group Instructions in Study 3**

Below is a list of values.

Please circle the value that is *least* important to you, personally:

business / economics	social life / relationships
art / music / theatre	science / pursuit of knowledge
helping others / volunteering	religious beliefs / religion

---

Please type a few paragraphs explaining why the value you circled might be important to **someone else**. Do **not** write about why this is *not* important to *you*, please write about how other people would find this an important value.

### **Appendix C – Smoking Belief Items in Study 3**

*For the following, state how much you agree with each statement. Circle the number that best corresponds to your answer.*

**Smoking now will help me relax.**

1	2	3	4	5	6	7
Not at all			Somewhat			Extremely

**Smoking now will energize me.**

1	2	3	4	5	6	7
Not at all			Somewhat			Extremely

**A cigarette will taste good now.**

1	2	3	4	5	6	7
Not at all			Somewhat			Extremely

**Smoking now will satisfy my cravings.**

1	2	3	4	5	6	7
Not at all			Somewhat			Extremely

**Smoking now will help reduce boredom.**

1	2	3	4	5	6	7
Not at all			Somewhat			Extremely

**Smoking now will help me deal with my stress.**

1	2	3	4	5	6	7
Not at all			Somewhat			Extremely

*For the following, please circle the number that best corresponds to your answer on a scale of 1 to 7.*

**Do you enjoy smoking?**

1	2	3	4	5	6	7
Not at all			Somewhat			Extremely

**How important is smoking for you?**

1	2	3	4	5	6	7
Not at all			Somewhat			Extremely

**Do you intend to smoke more or less in the future?**

1	2	3	4	5	6	7
Much less			Smoke the same			Much more

**Do you intend to quit smoking in the future?**

1	2	3	4	5	6	7
Not at all			No change			Absolutely

**Are you going to smoke a cigarette directly after this study?**

1	2	3	4	5	6	7
Absolutely not						Absolutely

**If you decided to give up smoking completely in the next 6 months, how sure are you that you would succeed?**

1	2	3	4	5	6	7
Not at all			Somewhat			Extremely

## Appendix D – Four Month Follow-Up Telephone Script in Study 3

“Hello, my name is \_\_\_\_\_, and I am calling from the University of Waterloo’s Psychology program. The reason I am calling is because you participated in a study on Attitudes about Smoking last term. At that time, we mentioned that we might be contacting to you ask you a couple of follow-up questions. These should take less than one minute, and your name will be entered into a draw for a 40\$ gift certificate from the *UW GiftShop*. Do you have one minute to complete these questions now?”

- If yes: Proceed to Question 1
- If no: “When might it be a better time to call back?” [Jot down time]

1) Have you had a cigarette in the past 30 days?                          Yes                          No

[If Yes] would you say that you smoke at least

- once a day,
- once a week,
- once a month,
- less than once a month

2) [If daily or weekly] How many cigarettes do you smoke per day/week (*depending on their answer above*)?

\_\_\_\_\_ Cigarettes per day                          OR                          \_\_\_\_\_ Cigs  
per week

3) Would you say that you are a....

- a current smoker,
- social smoker,
- ex-smoker,
- or non-smoker

4) Have you made any quit attempts since the last session, about 4 months ago?

Yes                          No

[If Yes] Are you still quit or back to smoking?                          Still Quit                          Back to  
smoking

5) *What is your overall opinion of smoking? Would you say that it is Very positive.... Very negative.*

1	2	3	4	5
Very positive	positive	Neither positive nor negative	negative	Very negative

6) Finally, please state how much you agree with the following statement : ***Society disapproves of smoking, Would you say that you ..***Strongly agree, agree, .... Strongly agree.

1	2	3	4	5
Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree

That is the end of the follow-up questions. We would like to thank you again for your time and participation. We will contact you at this number, should you be the winner of our draw.  
Good bye.

## **Appendix E – Contingent Affirmation Manipulation Instructions in Study 4**

### **Writing Exercise**

#### **WHAT ARE YOUR PERSONAL VALUES?**

Below is a list of characteristics and values, some of them may be important to you; some may be unimportant to you. Please rank them from 1 to 11 according to how important they are to you (“1” being the most important item, “11” being the one that is least important to you). Use each number only once.

Being Good at Art  
Physical Attractiveness  
Creativity  
Independence  
Membership in a Social Group (such as your community, racial group, or school club)  
Music  
Politics  
Relationships with Friends or Family  
Religious Values  
Sense of Humor  
Sports Ability

At this point, we would like you to list three to five people you are close to you, and who want you to quit smoking.

*Write their initials here:*

---

---

---

---

---

Now look at the people you wrote down, and select the one who is most supportive of your intentions to quit smoking. Write down that person’s initial again here:

---

---

Below is a list of characteristics and values. Please circle only one value that you believe is important to the person you selected from the question above, but that is **also very important to you** – that is, circle one value that you share and that is highly important to both of you.

Being Good at Art  
Physical Attractiveness  
Creativity  
Independence  
Membership in a Social Group (such as your community, racial group, or school club)  
Music  
Politics  
Relationships with Friends or Family  
Religious Values  
Sense of Humor  
Sports Ability

Directions:

- 1) Look at the value you circled on the previous page.
- 2) Describe why this value is important to both of **you**.

*Focus on your thoughts and feelings, and don't worry about spelling, grammar, or how well written it is.*

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

Again, look at the value you picked as MOST important to both you and the person you visualized. List the top two reasons why this value is important **to both of you.**

---

1.

2.

*For the following, state how much you agree with each statement. Circle the number that best corresponds to your answer.*

This value has influenced our lives.

- strongly agree
- Agree
- neither agree nor disagree
- Disagree
- strongly disagree

This value is an important part of who we are.

- strongly agree
- Agree
- neither agree nor disagree
- Disagree
- strongly disagree

## **Appendix F – Traditional Affirmation Manipulation Instructions in Study 4**

### **Writing Exercise**

#### **WHAT ARE YOUR PERSONAL VALUES?**

Below is a list of characteristics and values, some of them may be important to you; some may be unimportant to you. Please rank them from 1 to 11 according to how important they are to you (“1” being the most important item, “11” being the one that is least important to you). Use each number only once.

Being Good at Art  
Physical Attractiveness  
Creativity  
Independence  
Membership in a Social Group (such as your community, racial group, or school club)  
Music  
Politics  
Relationships with Friends or Family  
Religious Values  
Sense of Humor  
Sports Ability

Directions:

- 1) Look at the value you picked as most important to you (the value you ranked #1 from the list above).
- 2) Think about times when this value was or would be very important to you.
- 3) Describe why this value is important to you.

*Focus on your thoughts and feelings, and don't worry about spelling, grammar, or how well written it is.*

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

Again, look at the value you picked as MOST important. List the top two reasons why this value is important to you.

---

1.

2.

***For the following, state how much you agree with each statement. Circle the number that best corresponds to your answer.***

This value has influenced our lives.

- strongly agree
- Agree
- neither agree nor disagree
- Disagree
- strongly disagree

This value is an important part of who we are.

- strongly agree
- Agree
- neither agree nor disagree
- Disagree
- strongly disagree

## **Appendix G – Control Group Instructions in Study 4**

### **Writing Exercise**

#### **WHAT ARE YOUR PERSONAL VALUES?**

Below is a list of characteristics and values, some of them may be important to you; some may be unimportant to you. Please rank them from 1 to 11 according to how important they are to you (“1” being the most important item, “11” being the one that is least important to you). Use each number only once.

Being Good at Art  
Physical Attractiveness  
Creativity  
Independence  
Membership in a Social Group (such as your community, racial group, or school club)  
Music  
Politics  
Relationships with Friends or Family  
Religious Values  
Sense of Humor  
Sports Ability

Directions:

- 1) Look at the value you ranked as #9 on the last page.
- 2) Think about times when this value would be important to someone else (like another student at your school or a person you've heard about).
- 3) Describe why this value would be important to someone else.

*Focus on your thoughts and feelings, and don't worry about spelling, grammar, or how well written it is.*

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

Again, look at your #9 value. List the top two reasons why someone else would pick this as their most important value.

---

1.

2.

***For the following, state how much you agree with each statement. Circle the number that best corresponds to your answer.***

This value has influenced our lives.

- strongly agree
- Agree
- neither agree nor disagree
- Disagree
- strongly disagree

This value is an important part of who we are.

- strongly agree
- Agree
- neither agree nor disagree
- Disagree
- strongly disagree