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## Do time perspective and sensation-seeking predict quitting activity among smokers? Findings from the International Tobacco Control (ITC) Four Country Survey

Peter A. Hall<sup>a,\*</sup>, Geoffrey T. Fong<sup>b,c</sup>, Hua-Hie Yong<sup>d</sup>, Genevieve Sansone<sup>b</sup>, Ron Borland<sup>d</sup>, and Mohammad Siahpush<sup>e</sup>

<sup>a</sup>Faculty of Applied Health Sciences, University of Waterloo, Waterloo, Ontario, Canada

<sup>b</sup>Department of Psychology, University of Waterloo, Waterloo, Ontario, Canada

<sup>c</sup>Ontario Institute for Cancer Research, Toronto, Ontario, Canada

<sup>d</sup>The Cancer Council Victoria, Melbourne, Victoria, Australia

<sup>e</sup>University of Nebraska Medical Center, Omaha, Nebraska, United States

### Abstract

Personality factors such as time perspective and sensation-seeking have been shown to predict smoking uptake. However, little is known about the influences of these variables on quitting behavior, and no prior studies have examined the association cross-nationally in a large probability sample. In the current study it was hypothesized that future time perspective would enhance – while sensation-seeking would inhibit – quitting activity among smokers. It was anticipated that the effects would be similar across English speaking countries. Using a prospective cohort design, this cross-national study of adult smokers ( $N=8845$ ) examined the associations among time perspective, sensation-seeking and quitting activity using the first three waves of data gathered from the International Tobacco Control Four Country Survey (ITC-4), a random digit dialed telephone survey of adult smokers from the United Kingdom, United States, Canada and Australia. Findings revealed that future time perspective (but not sensation-seeking) was a significant predictor of quitting attempts over the 8-month follow-up after adjusting for socio-demographic variables, factors known to inhibit quitting (e.g., perceived addiction, enjoyment of smoking, and perceived value of smoking), and factors known to enhance quitting (e.g., quit intention strength, perceived benefit of quitting, concerns about health effects of smoking). The latter, particularly intention, were significant mediators of the effect of time perspective on quitting activity. The effects of time perspective on quitting activity were similar

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\*Corresponding author at: Faculty of Applied Health Sciences, University of Waterloo, 200 University Avenue West, Waterloo, Ontario, Canada N2L 3G1. Tel.: +1 519 888 4567x38110., pahall@uwaterloo.ca (P.A. Hall).

#### Contributors

All authors contributed substantively to the production of this manuscript. GF and RB devised the study design and oversaw the collection of data; HY and MS executed the data analysis; PH and GF devised the research hypotheses, the analytic plan, and took lead role in the writing and editing of the manuscript. GS provided feedback on the manuscript and assisted with writing.

#### Conflict of interest

No conflicts of interest to declare.

across all four English speaking countries sampled. If these associations are causal in nature, it may be the case that interventions and health communications that enhance future-orientation may foster more quit attempts among current smokers.

## Keywords

Time perspective; Sensation-seeking; Quit attempts; Personality; Smoking

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## 1. Introduction

A long history of empirical research has linked personality traits with smoking. Of the personality dimensions investigated, impulsivity and sensation-seeking have both been shown to predict smoking status and initiation (Kahler et al., 2009; Lipkus, Barefoot, Williams, & Siegler, 1994; Mitchell, 1998; Perkins et al., 2008; Perkins, Gerlach, Broge, Grobe, & Wilson, 2000; Spillane, Smith, & Kahler, 2010; Zuckerman, Ball, & Black, 1990). Additionally, studies have linked these traits with quitting-related behaviors, generally showing that higher impulsivity and sensation-seeking are associated with less maintenance of cessation over time (Doran, Spring, McChargue, Pergadia, & Richmond, 2004; Krishnan-Sarin et al., 2007; Perkins et al., 2008; Vanderveen, Cohen, Cukrowicz, & Trotter, 2008).

In part, impulsivity and sensation seeking have been of interest in relation to smoking because they suggest that a hyper-responsivity to the rewarding qualities of smoking (or tobacco specifically) might be responsible for inter-individual variability in susceptibility to addiction. Prior studies confirming such empirical links continue to be of interest to researchers and practitioners alike, but for different reasons. Researchers have found the possibility of physiologically-based personality traits to be conceptually interesting when considering the etiology of addictive processes, while practitioners have been drawn in by the prospect of tailoring interventions to the characteristics of individuals or groups based on such personality factors. Given the precedent set by sensation-seeking and impulsivity, they are currently the benchmark by which other personality dimensions must be compared when predicting smoking-related behaviors and outcomes.

### 1.1. Time perspective

One individual difference variable that has been relatively understudied in the domain of smoking is *time perspective*. Time perspective can be defined as the tendency to consider and value present versus future consequences of one's own actions (Fong & Hall, 2003; Strathman, Gleicher, Boninger, & Edwards, 1994; Zimbardo & Boyd, 1999). Those with a present-oriented time perspective are primarily oriented to immediate contingencies for their behavior, whereas those with a more future-oriented time perspective are disproportionately influenced by long-term considerations. Given that smoking carries significant long-term health risks, it has been argued that those with a less future-oriented perspective might be prone to smoking uptake. Conversely, because smoking cessation carries significant health benefits that are to be realized in the future, a future-oriented focus might increase the likelihood of quit attempts among current smokers (Adams, 2009b).

Time perspective can be differentiated from impulsivity on a conceptual level, and in terms of its hypothesized neural versus social underpinnings. On a conceptual level impulsivity reflects a tendency to act quickly with little deliberation over contingencies (short- or long-term), and individual differences therein – particularly the dysfunctional variant of impulsivity – are thought to be closely linked to the operation of subcortical structures in the striatum (Colzato, van den Wildenberg, van der Does, & Hommel, 2010). Time perspective, on the other hand, refers to a tendency to reflect on either short- or long-term contingencies, and to place differential value on anticipated outcomes in each of these temporal categories.

From its earliest beginnings, time perspective has been thought to be more social in origin than biological (Lamm, Schmidt, & Trommsdorff, 1976; LeShan, 1952; Nurmi, 1987). Nonetheless, even the ability to represent future events mentally likely involves the higher cortical structures such as the rostral prefrontal cortex (Benoit, Gilber, & Burgess, 2011), rather than the subcortical regions implicated in impulsivity. Given these distinctions both in conceptualization and in the hypothesized neural substrates, it is reasonable to examine the predictive ability of facets of impulsivity (including sensation-seeking) and time perspective separately.

## 1.2. Evidence linking time perspective with smoking

Prior studies have indeed found an empirical association between time perspective and various forms of substance use, including smoking (Adams, 2009a; Adams & Nettle, 2009; Apostolidis, Fieulaine, Simonin, & Rolland, 2006; Fieulaine & Martinez, 2010; Henson, Carey, Carey, & Maisto, 2006; Keough, Zimbardo, & Boyd, 1999). However, most existing studies involving smokers have focused on smoking status or maintained cessation among those engaged in a structured quit attempt (Goto, Takahashi, Nishimura, & Ida, 2009; Yoon et al., 2007), but not on frequency of quit attempts among current smokers more broadly. Moreover, no existing studies have examined the association cross-nationally in large, representative probability samples. The one existing study examining quit attempts found that, when using a financial planning measure of time perspective, those whom had a shorter time horizon were more likely to be smokers, and less likely to quit compared to their more future-oriented counterparts (Adams, 2009a).

Currently very little is known about the relationship between time perspective and quit-related behaviors among current smokers cross-nationally, and even less is known about possible mediating variables for the association. Moreover, many existing studies examining the relationship between personality variables and smoking behaviors typically suffer from methodological and sampling limitations, including cross-sectional designs, small sample sizes of unknown representativeness, and failure to adjust for demographic variables and other factors that might confound the association between time perspective and smoking related behaviors. Although some exceptions exist (e.g., Adams, 2009a), such methodological limitations make it difficult to fully judge the robustness of the effect of time perspective on quitting.

### 1.3. The current study

The primary aims of this study were to: 1) examine the association between time perspective and quitting activity among current smokers, 2) examine the uniformity of this association across multiple countries, and 3) explore potential mediators for any effects. Based on prior research, it was predicted that both time perspective and sensation-seeking would be associated with quitting activity, but in opposite directions. Specifically, a more future-oriented time perspective would predict increased, while sensation-seeking would predict decreased, quitting activity among smokers over the follow-up interval. It was further anticipated that these associations would be similar in magnitude among the four English-speaking countries surveyed.

Finally, it was anticipated that the effects of time perspective on quit attempts would be mediated through behavioral intention. One of the only prior studies examining social-cognitive mediators of the effects of time perspective on health behavior suggested that time perspective may exert its influence through enhanced intention to perform healthy behaviors (Hall, Fong, & Cheng, 2011). As quitting behavior could be construed as a health related behavior, we expected that this might hold true here as well, and so this variable was our focal mediator. Given that a variety of other social cognitive constructs could mediate the relationship, perhaps more so than sociodemographic variables, we sought to examine multiple mediation through several other variables, including costs/benefits of smoking, and perceived harm of smoking.

In order to examine the hypothesized associations we utilized data from the International Tobacco Control Four Country Survey (ITC-4; Fong et al., 2006; Thompson et al., 2006), a prospective study involving more than 8000 adult smokers in four English language countries. We utilized Waves 1 to 3 of the ITC-4 data for the current analysis.

## 2. Methods

### 2.1. Participants and recruitment procedures

Data for the present study came from respondents who participated in the first three waves of the International Tobacco Control Four Country Survey (ITC-4), a longitudinal cohort study of adult smokers (inclusion criteria: aged 18 years and older, self-identified as a current monthly smoker of manufactured or roll-your-own cigarettes, and having smoked at least 100 cigarettes in their lifetime) recruited from Australia, Canada, United Kingdom, and the United States using a random digit dialed telephone survey (Fong et al., 2006; Thompson et al., 2006) with replenishment of those lost to the study at follow-up.

Data collection for Waves 1, 2, and 3 was conducted between October and December 2002, May and September 2003, and June and December 2004, respectively. For the purpose of this study, those respondents who provided data on at least two consecutive waves, one serving as predictor and the other as outcome, were included. Across the three survey waves, a total of 10,772 smokers were recruited but only 7883 were successfully followed up at least once and thus, were able to be included in the present study. The characteristics of those included and excluded from the study are presented in Table 1. Of those included, 4265 participants provided two sets of predictor-outcome data and the rest provided one set.

The mean inter-survey interval was 8 months between Waves 1 and 2 and 13 months between Waves 2 and 3. The survey fieldwork was conducted using computer-assisted telephone interview (CATI) in English, and also in French if desired in the Francophone areas of Canada. Strict protocols were developed and implemented to ensure equivalence of methods across the four countries. Using stratified random-digit dialing technique, households were contacted and screened for adult smokers with the next birthday who would agree to participate in the study. Those who agreed were rescheduled for an in-depth 45-minute phone survey a week later and were sent a check or voucher (equivalent to \$10USD) to compensate for their time. These participants were asked to respond to questions related to tobacco control policies, smoking behavior and associated psychosocial predictors. The study protocol was cleared for ethics by the Institutional Review Boards or Research Ethics Boards in each of the four countries: the University of Waterloo (Canada), Roswell Park Cancer Institute (U.S.), University of Illinois-Chicago (U.S.), University of Strathclyde (U.K.), and The Cancer Council Victoria (Australia). A full description of the ITC-4 methodology, including sampling procedures and sample profile is available at <http://www.itcproject.org>.

## 2.2. Measures

The wording of the ITC-4 Survey was standardized across countries, with only minor variation to reflect local norms or colloquial speech. All surveys were conducted in English or French.

**2.2.1. Personality variables—*Time perspective*** was assessed using a single item from the Time Perspective Questionnaire (TPQ; Fong & Hall, 2003). Respondents were asked to rate on a 5-point Likert scale how much they agree or disagree with the statement “You spend a lot of time thinking about how what you do today will affect your life in the future”; higher scores were taken to reflect a stronger trait. Responses were dichotomized such that those agreeing were taken to have future time perspective versus otherwise. The TPQ scale has demonstrated adequate reliability and validity, and the item drawn from it has a strong item-total correlation with the full scale (Fong & Hall, 2003).

*Sensation-seeking* was assessed by asking respondents to indicate degree of agreement (using similar 5-point scale) with the following four statements: “You like to explore strange places” (item 1), “You like to do thrilling things” (item 2), “You like new and exciting experiences, even if you have to break the rules” (item 3), and “You like to be with friends who are exciting and unpredictable” (item 4). These four items were combined by averaging their scores to form the sensation-seeking scale (score range=1–5; Cronbach’s alpha= 0.74) with higher scores indicating stronger trait. Responses were dichotomized in a manner identical to the time perspective variable.

**2.2.2. Demographics—**Socio-demographic variables such as age, gender, education, and marital status were measured in accordance with the census categories in each country. For Australia, the US, and Canada, annual household income was assessed using the following categories: “under \$30,000”, “\$30,000–59,999”, and “\$60,000 and over.” In the UK survey, the following categories were used: “£15,000 or under”, “£15,001–30,000”, and “£30,000

and over.” Because of differences in education systems between countries, the categorization across countries was reduced to three broad categories (low, moderate and high) so that they were roughly comparable across countries. For income, an additional category was created for those who refused to provide income.

**2.2.3. Quit enhancing variables**—Intention to quit was assessed using the question “Are you planning to quit smoking within the next month, next 6 months, sometime in the future (beyond 6 months) or not planning to quit?”

Concerns about present and future damages caused by smoking to health were assessed using the questions “To what extent has smoking damaged your health?” and “How worried are you that smoking will damage your health in the future?” Both questions employed a 4-point scale, the former using the following response categories: “Not at all”, “Just a little”, “A fair amount” and “A great deal” and the latter using categories such as “Not at all worried”, “A little worried”, “Moderately worried” and “Very worried”.

A similar pair of questions asked about the impact of smoking on quality of life. Respondents were asked, “To what extent, if at all, has smoking lowered your quality of life?” and “How worried are you, if at all, that smoking will lower your quality of life in the future?” The response categories were the same as for the preceding two questions on health damage.

Perceived health benefits of quitting smoking was evaluated using the question “How much do you think you would benefit from health and other gains if you were to quit smoking permanently in the next 6 months?” A 5-point scale from “Not at all” to “Extremely” was used for responding to this question.

Knowledge of smoking harm was assessed using five yes–no questions where the scores were combined and averaged to form a scale (Cronbach’s  $\alpha=.67$ ): “Based on what you know or believe, does smoking cause the following — heart disease in smokers, stroke in smokers, impotence in male smokers, lung cancer in smokers and lung cancer in nonsmokers from secondhand smoke.”

Respondents were also asked about frequency of thoughts on the following using response categories from “never” to “very often”: “Think about the danger or other bad things about smoking”, “Think about the harm your smoking might be doing to you”, “Think about the harm your smoking might be doing to other people”, and “Think about the money you spend on smoking”. Because the first three items were conceptually similar, they were combined by averaging their responses to form the thoughts about smoking harm scale (score range=1–5; Cronbach’s  $\alpha=0.76$ ).

**2.2.4. Quit inhibiting variables**—Heaviness of smoking index, an ‘objective’ behavioral measure of nicotine dependence (Borland, Yong, O’Connor, Hyland, & Thompson, 2010; Heatherton, Kozlowski, Frecker, Rickert, & Robinson, 1989), was derived from respondents’ answers to two questions, the most predictive items of the longer Fagerstrom Test for Nicotine Dependence (Heatherton, Kozlowski, Frecker, & Fagerstrom, 1991): “How soon after waking do you usually have your first smoke?” and “On average, how

many cigarettes do you smoke each week, including both factory-made and roll-your-own cigarettes?” Responses for the first question were coded into the following categories: 0=greater than 60 min, 1=31 to 60 min, 2=6 to 30 min and 3=5 min or less. Those of the second question were coded in terms of number of cigarettes smoked per day as follows: 0=0 to 10 cigarettes, 1=11 to 20 cigarettes, 2=21 to 30 cigarettes, and 3=more than 30 cigarettes. Summing the scores of the two questions provides the scores for the heaviness of smoking index, which range from zero to six. Perceived value of smoking is another composite scale derived from taking an average of the scores from the following six items (Cronbach’s alpha=0.62): “You enjoy smoking too much to give it up”, “Smoking calms you down when upset or stressed”, “Smoking helps you concentrate better”, “Smoking is an important part of life”, “Smoking helps you control your weight” and “Smoking makes it easier for you to socialize”. Respondents were asked to indicate their level of agreement with each statement using a 5-point scale from strongly agree to strongly disagree. Thinking about enjoyment of smoking was assessed using the question: “In the last month, how often, if at all, did you think about how much you enjoy smoking” and the response categories were: “Never”, “Rarely”, “Sometimes”, “Often” and “Very Often”. Overall self-rated health status was assessed using the question: “In general, how would you describe your health?” Using a 5-point scale, the respondents indicated their health status from “poor” to “excellent”.

**2.2.5. Quit attempts and quit maintenance**—At each follow-up survey, respondents who answered “Yes” to the question “Have you made any attempts to stop smoking since we last talked with you?” and whose quit attempts lasted for at least 24 h were taken as having made a quit attempt. Among those who reported having made a quit attempt, they were also asked whether they were now back smoking or still stopped and those still stopped for at least one month since the started were taken as an indication of quitting success.

### 2.3. Statistical analysis

Stata version 11 was used for all analyses. We conducted analysis using both weighted and unweighted data and given the results did not differ appreciably, we report all findings based on unweighted data unless otherwise specified. Pearson’s chi-square tests and t-tests (where appropriate) were employed to examine differences in socio-demographic and personality prevalence rate between the sample included and those excluded from the present study. In order to maximize the sample for analysis and also to account for the correlated nature of the repeated measurements, we used generalized estimating equations (GEE) with unstructured correlation pattern and binomial distribution for the dichotomous outcome variables for computing parameter estimates (Liang & Zeger, 1993). The design consists of two baseline waves (1 and 2) and two outcome waves (2 and 3), thus allowing for two pairs of prediction for respondents who were present across all 3 waves. The p-values for the parameter estimates were computed using robust variance (Hanley, Negassa, Edwardes, & Forrester, 2003). Using GEE models, we estimated the odds ratios for each personality variable of interest on quitting attempts and quit maintenance of one month or more. For modeling, stepwise procedure was employed to assess the effects of adjusting for socio-demographic variables and other relevant quit enhancing and quit inhibiting variables. In order to determine the extent to which any of the set of quit enhancing and quit inhibiting variables

served as mediators for the effect of the personality factors on outcomes and also their relative importance, we employed the procedure by Kenny (2008) for a formal test of mediation effect involving binary outcomes. We employed bootstrapping procedure with 500 replications to obtain bias-corrected 95% confidence intervals. Further analyses were also undertaken to test for the moderating effect of country for the association between personality variables and outcomes by adding into the model a product term between country and the personality variables and test for interaction effect.

### 3. Results

#### 3.1. Sample characteristics

Table 1 compared the baseline characteristics of the respondents who were successfully followed up at least once across the three waves of data collection versus those lost to the study following the recruitment wave. Respondents who were successfully followed up and included in our analytic sample were more likely to be older, female, have higher income, be married, and come from Australia but less likely to be from the US than those who dropped out of the study after their baseline wave. However, those who dropped out of the study were more likely to have a future-oriented time perspective (65% versus 60%) and have higher mean score on sensation-seeking scale than those retained.

#### 3.2. Personality factors as predictors of quitting activity

Overall, 38.3% of the total sample reported making a quit attempt between two adjacent waves and of these, about 20.2% reported being able to quit for at least one month.

Using a series of models in a stepwise fashion (as presented in Table 2), we examined the independent predictive relationships between the two personality factors and quitting outcome variables. Starting with Model 1, as expected, respondents with a future-oriented time perspective were more likely to make a quit attempt (OR=1.57, 95% CI=1.46, 1.70,  $p < .001$ ). However, sensation-seeking was unrelated to quit attempts (OR=1.02, 95% CI=0.97, 1.07). The independent effect of future time perspective on quit attempts remained significant even after controlling for socio-demographic variables including year recruited and survey wave (see Model 2).

We conducted similar analyses examining quit maintenance for at least 1 month, but failed to find an association with either time perspective or sensation-seeking (not shown).

#### 3.3. Uniformity of the effect across countries

We examined for possible moderating effect of country for making quit attempts and quit maintenance by adding into the model as a fifth step cross-product terms between time perspective and country, but no significant interaction effects were found for either outcome. These findings suggest that the effect of time perspective on quitting activity did not vary significantly across countries.



### 3.4. Mediators of the time perspective effect on quitting behavior

The attenuation of the effect of future time perspective starting from Model 3 indicates mediation of time perspective effects by the quit enhancing and quit inhibiting variables (particularly the former). The results of the test of indirect effects indicated that 84% of the total effect of future time perspective on quit attempts were mediated by the quit enhancing variables as a group: quit intention strength (accounting for 37%), perceived benefit of quitting (6%), concern about health damage (8%), perception that smoking had damaged quality of life (11%), thoughts about the harm of smoking (18%), nicotine dependence (3%) and perceived value of smoking (1%) (Table 3).

## 4. Discussion

We found that individual differences in time perspective predict quit attempts prospectively in a representative sample of current smokers from four countries. This association remained significant after controlling for relevant demographic variables and the magnitude of the association was similar across the four countries surveyed. Secondary analyses indicated that the effect of time perspective on quitting activity was partially mediated by quit enhancing social-cognitive variables (particularly intention strength).

The ITC study represents a significant increment in sampling sophistication over existing studies of personality and smoking behavior. Our conclusions and estimates of the relation between time perspective/sensation-seeking and quitting behavior can be generalized to the population of smokers in Canada, United States, United Kingdom, and Australia. Specifically, then, our findings support the conclusion that time perspective rather than sensation-seeking is related to quitting behavior among adult smokers in these four countries.

This study simultaneously provides a first cross-national test of the predictive power of time perspective for quitting behavior. Our findings are consistent with the few prior large scale studies examining the relationship between time perspective and quit behavior (e.g., Adams, 2009a), but extends them to include cross-country comparisons. An additional contribution of our study is the mediational analysis, which has identified intention strength as an important mediator of the effects of time perspective on quitting behavior, a finding that has been reported previously with respect to other health behaviors and populations of interest (Hall et al., 2011).

The findings of the current study add meaningfully to the growing body of empirical research on time perspective and smoking behaviors. We know from some of this research that those smokers with a more future-oriented time perspective are more likely to quit, and once they quit they are more likely to maintain this status (Adams, 2009b). Prior to the current study, however, the mechanism by which time perspective generates more quit attempts and other cessation-related outcomes was unknown. Our findings suggest that a future-oriented time perspective may generate such outcomes by strengthening behavioral intentions.

Several prior studies using slightly different operationalizations of time perspective have come to similar conclusions regarding time horizons and smoking behavior, albeit in more limited samples. For instance, Goto and colleagues found that less delay discounting of future rewards predicted reduced likelihood of relapse among current smokers whom have initiated cessation (Goto et al., 2009). Yoon and colleagues likewise found that delay discounting predicted continued abstinence following cessation from smoking among pregnant women (Yoon et al., 2007). Both studies were well-executed and prospective in design, though smaller in sample ( $N_s=689$  and 48 respectively). Our cross-national findings with larger samples add to these existing findings with a precise and generalizable quantification of the effect of time perspective on quitting activity in smokers, using a self-reported measure of time perspective that could be easily incorporated into large population surveillance surveys or easily administered clinical questionnaires for use by health care professionals.

The finding that sensation seeking did not predict quitting attempts may be somewhat surprising, given that prior studies have linked sensation seeking with smoking (Doran et al., 2004; Kahler et al., 2009; Krishnan-Sarin et al., 2007; Lipkus et al., 1994; Mitchell, 1998; Perkins et al., 2000; Perkins et al., 2008; Spillane et al., 2010; Vanderveen et al., 2008; Zuckerman et al., 1990). However, most prior studies involving sensation seeking have examined smoking status or cessation, and not quit attempts specifically. In addition, our analysis effectively pits time perspective directly against sensation seeking, which has not previously been done. Although each variable may predict quitting attempts in separate analyses, time perspective performs better in the direct competitive test (in a relative sense). Future research must be conducted to examine how well sensation seeking fares in such competitive tests in relation to smoking status and sustained cessation over the long-term.

Strengths of the current study include the use of a large scale, multi-national probability sample, and the prospective nature of the study design. Limitations include the use of truncated measures of the primary personality constructs (a single-item measure, in the case of time perspective), and the use of relative metrics for approximating socio-economic status to enhance comparability across countries, which may introduce some error in measurement. In addition, though we assessed quit attempts, we did not assess biochemically validated cessation. Further to this point, we did not find that time perspective successfully predicted self-reported quitting over the medium-term. However, the latter finding should be taken with caution given that we did not follow participants over an extended period of time, and therefore our power to detect true abstinence effects may have been limited. Such analysis will require consideration of later waves of ITC-4 data as they are completed.

One final limitation has to do with the magnitude of effect size for time perspective in relation to quit attempts, which would be classified as small using common interpretive conventions (Cohen's  $d=.25$ ). However, this effect size range is similar to the effects of common medical interventions and pharmacotherapeutic agents on outcomes in the medical literature.

## 4.1. Implications

The finding that time perspective, as an individual difference variable, predicts quit attempts prospectively is of considerable practical importance. Unlike other personality variables – including sensation-seeking – there is good evidence to suggest that future time perspective and its social-cognitive precursors can be augmented through targeted intervention (Hall & Fong, 2003; Hall & Fong, 2007). It is possible therefore that time perspective interventions may help to increase quitting activity by increasing the extent to which smokers think about their smoking in terms of the long-term benefits vs. the harms of continued smoking. To be sure, this framing of the decision for smokers is not novel, but the results here highlight the potential of such strategies to help smokers to quit.

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**HIGHLIGHTS**

- Personality traits have previously been shown to predict smoking-related behaviors.
- Time perspective has not been extensively studied as a predictor of quit attempts.
- We found that a future-oriented time perspective predicted increased quit attempts.
- The association between time perspective and quit attempts was invariant by country.

**Table 1**

Characteristics of respondents followed up versus NOT followed up.

	<u>Followed up</u> <i>N</i> = 7883	<u>NOT followed up</u> <i>N</i> = 2889	<b>p-value for group differences</b> (followed up versus NOT followed up)
Age group (%)			
18–24	11.0	21.6	<.001
25–39	30.7	37.9	
40–54	36.4	28.1	
55+	21.9	12.4	
Sex — female (%)	55.6	50.9	<.001
Income (%)			
Low	30.1	34.6	<.001
Medium	34.6	32.6	
High	28.2	23.5	
Not disclosed	7.1	9.2	
Education (%)			
Low	53.8	55.4	.083
Medium	33.0	32.9	
High	13.2	11.6	
Marital status (%)			
Single	25.3	35.7	<.001
Married	41.6	31.8	
Others	33.1	32.5	
Country (%)			<.001
US	22.1	37.4	
Canada	25.9	23.9	
UK	25.8	21.6	
Australia	26.3	17.1	
Time perspective — spend lots of time thinking about what you do today will affect your life in the future (% agreeing)	60.2	64.8	<.001
Sensation-seeking scale Mean (SD)	3.27 (.83)	3.38 (.85)	<.001
Cohort ( <i>N</i> )			<.001
Wave 1 (2002)	6762	2296	
Wave 2 (2003)	1121	593	

NB. Percentages are based on unweighted data except for time perspective estimate which is based on weighted data; sensation-seeking scale score ranges from 1 to 5 with higher score indicating stronger trait; *n* for followed up sample represents those who provided at least one outcome data at follow-up.

**Table 2**

GEE analysis predicting making quit attempts at the next wave.

	<b>Making quit attempts OR (95% CI)</b>			
	<b>Model 1</b>	<b>Model 2</b>	<b>Model 3</b>	<b>Model 4</b>
Personality variables:				
Future time perspective	1.57 (1.46–1.70)***	1.56 (1.44–1.68)***	1.15 (1.05–1.25)**	1.14 (1.04–1.24)**
Sensation-seeking scale	1.02 (0.97–1.07)	0.99 (0.95–1.05)	1.00 (0.95–1.06)	1.01 (0.96–1.06)
Socio-demographics:				
Age group				
18–24	–	Ref	Ref	Ref
25–39	–	0.64 (0.55–0.75)***	0.65 (0.56–0.76)***	0.71 (0.61–0.83)***
40–54	–	0.55 (0.47–0.64)***	0.57 (0.49–0.68)***	0.68 (0.58–0.81)***
55+	–	0.61 (0.51–0.73)***	0.78 (0.65–0.94)**	0.93 (0.77–1.12)
Sex				
Male	–	Ref	Ref	Ref
Female	–	1.11 (1.02–1.21)*	0.98 (0.89–1.07)	0.97 (0.88–1.06)
Income				
Low	–	Ref	Ref	Ref
Medium	–	0.97 (0.88–1.08)	0.96 (0.86–1.08)	0.95 (0.85–1.06)
High	–	1.02 (0.91–1.15)	1.01 (0.89–1.14)	0.98 (0.87–1.12)
Not disclosed	–	0.78 (0.65–0.93)**	0.85 (0.69–1.03)	0.85 (0.70–1.03)
Education				
Low	–	Ref	Ref	Ref
Medium	–	1.05 (0.95–1.16)	1.00 (0.91–1.11)	0.98 (0.88–1.08)
High	–	1.24 (1.09–1.42)**	1.19 (1.04–1.37)*	1.13 (0.99–1.30)
Marital status				
Single	–	Ref	Ref	Ref
Married	–	0.92 (0.82–1.04)	0.88 (0.78–0.99)*	0.87 (0.77–0.99)*
Others	–	1.08 (0.96–1.21)	1.06 (0.94–1.19)	1.06 (0.93–1.19)
Year recruited				
2002	–	Ref	Ref	Ref
2003	–	0.85 (0.74–0.97)*	0.83 (0.72–0.96)*	0.87 (0.75–1.01)
Survey wave				
1	–	Ref	Ref	Ref
2	–	1.38 (1.29–1.48)***	1.46 (1.35–1.57)***	1.43 (1.33–1.55)***
Country				
US	–	Ref	Ref	Ref
Canada	–	0.78 (0.69–0.88)***	0.81 (0.72–0.92)**	0.79 (0.70–0.90)***
UK	–	0.74 (0.65–0.83)***	0.82 (0.73–0.93)**	0.80 (0.71–0.91)**



	Making quit attempts OR (95% CI)			
	Model 1	Model 2	Model 3	Model 4
Australia	–	0.81 (0.72–0.91) ***	0.87 (0.78–0.99) *	0.86 (0.76–0.97) *
Quit enhancing variables:				
Quit intention	–	–	2.46 (2.20–2.76) ***	2.30 (2.05–2.59) ***
Perceived health benefits of quitting	–	–	1.07 (1.02–1.12) **	1.07 (1.03–1.12) **
Knowledge of smoking harm	–	–	0.99 (0.82–1.19)	0.89 (0.74–1.08)
Perceived health damage	–	–	0.97 (0.92–1.03)	0.99 (0.94–1.06)
Worries re future health damage	–	–	1.08 (1.02–1.15) *	1.08 (1.02–1.15) *
Perceived quality of life damage	–	–	1.11 (1.05–1.17) ***	1.13 (1.07–1.19) ***
Worries re future quality of life damage	–	–	1.05 (0.99–1.11)	1.06 (0.99–1.12)
Thoughts about smoking harm	–	–	1.19 (1.13–1.25) ***	1.17 (1.11–1.23) ***
Thoughts about money spent	–	–	0.99 (0.96–1.03)	1.03 (0.98–1.07)
Quit inhibiting variables:				
Heaviness of smoking index	–	–	–	0.87 (0.84–0.89) ***
Perceived smoking function	–	–	–	0.85 (0.79–0.91) ***
Thoughts re smoking enjoyment	–	–	–	0.98 (0.95–1.01)
Self-rated health status	–	–	–	0.97 (0.92–1.02)

NB. Analytic sample  $N$  is smaller than 7883 because of missing data with the smallest  $N$  being 7516. Total person-wave observations=12,077 with the smallest being 11,291 due to missing data.

\* Significant at  $p < .05$ .

\*\* Significant at  $p < .01$ .

\*\*\* Significant at  $p < .001$ .

**Table 3**

Spearman's correlation among future time perspective, mediators and quit attempts.

	<b>Future time perspective</b>	<b>Making quit attempts</b>
Future time perspective	–	0.13
Quit intention	0.25	0.26
Perceived health benefits of quitting	0.24	0.17
Worries re future health damage	0.33	0.20
Perceived quality of life damage	0.23	0.14
Thoughts about smoking harm	0.31	0.20
Heaviness of smoking index	–0.05	–0.12
Perceived smoking function	–0.05	–0.12

NB. All coefficients are significant at  $p < .001$ .