Published in final edited form as:

Addict Behav. 2014 July ; 39(7): 1183–1190. doi:10.1016/j.addbeh.2014.03.019.

Time perspective as a determinant of smoking cessation in four countries: Direct and mediated effects from the International Tobacco Control (ITC) 4-Country Surveys

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Abstract

Background—Future oriented time perspective predicts a number of important health behaviors and outcomes, including smoking cessation. However, it is not known *how* future orientation exerts its effects on such outcomes, and no large scale cross-national studies have examined the question prospectively. The aim of the current investigation was to examine the relationship between time perspective and success in smoking cessation, and social cognitive mediators of the association.

Methods—The ITC-4 is a multi-wave, four country survey (Australia, Canada, United States, United Kingdom) of current smokers ($N=9,772$); the survey includes baseline measurements of time perspective, intentions, quit attempts, and self-reported quit status at follow-up over 8 years. We examined the predictive power of time perspective for smoking cessation, as mediated through strength of quit intentions and prior history of quit attempts.

Results—Findings indicated that those smokers with a stronger future orientation at baseline were more likely to have successfully quit at follow-up. This effect was partially explained by intention-mediated effects of future orientation on quit attempts.

Conclusions—Future orientation predicts smoking cessation across four English-speaking countries; the cessation-facilitating effects of future orientation may be primarily due to future oriented individuals' motivated and sustained involvement in the quit cycle over time.

Keywords

time perspective; health behavior; intention; smoking; smoking cessation; temporal

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All authors contributed to (and approved) the final version of this manuscript. PH and GF conceived the manuscript idea and analytic plan; GM refined and implemented the analysis; PH, GF and GM all participated in the writing of the manuscript. GF and the ITC team were responsible for overseeing data collection and management.

The authors have no conflicts of interest to report.

Smoking cessation is an important and commonly aspired to goal among current smokers (CDC, 2011). The substantial health benefits of cessation are often the primary motivation for this. Although prolonged lifetime smoking is associated with approximately 10 years of lost life expectancy—mostly from cancers, respiratory diseases and other smoking-induced illnesses—much of this decrement can be reversed with cessation by midlife (Doll, Peto, Boreham, & Sutherland, 2004; Jha et al., 2013). Despite the well-known benefits of cessation, there is substantial variability in degree of engagement in the quit process—which is typically characterized by repeated attempts and relapses (U.S. Department of Health and Human Services, 2000; Zhou, Nonnemaker, Sherrill, Gilsenan, Coste & West, 2009)—and there is variability in the outcome of any given cessation attempt. For instance, while a large percentage of current smokers describe a desire to quit permanently, only a very small minority (less than 10%) are successful in doing so at any given time (CDC, 2011). As such, while quit attempts are commonplace when viewed on an annual basis, sustained cessation is not (Borland, Partos, Yong, Cummings, & Hyland, 2012). Clearly, making a quit attempt is not tantamount to sustained cessation, yet entering the quit behavior cycle (characterized by repeated quit attempts and subsequent relapses) may be a necessary precondition to eventual cessation. Understanding what predicts entry into the quit attempt cycle and understanding what predicts eventual cessation are both essential for facilitating secondary prevention of smoking-related morbidity and mortality. Moreover, understanding what the mechanism is by which such effects take place is fundamental for design of effective intervention.

Psychological predictors of smoking

A variety of individual difference variables have been linked to smoking initiation, smoking status (i.e., whether one is a smoker or non-smoker) and smoking cessation, most notably the related constructs of impulsivity and sensation seeking (Doran, Spring, McChargue, Pergadia, & Richmond, 2004; Kahler et al., 2009; Krishnan-Sarin et al., 2007; Lipkus, Barefoot, Williams, & Siegler, 1994; Mitchell, 1999; Perkins, Gerlach, Broge, Grobe, & Wilson, 2000; Perkins et al., 2008; Spillane, Smith, & Kahler, 2010; VanderVeen, Cohen, Cukrowicz, & Trotter, 2008; Zuckerman, Ball, & Black, 1990). A more recent construct of interest is *time perspective*, operationalized as the dispositional tendency to value and behave in accordance with non-immediate contingencies for one's own behavior (Fong & Hall, 2003; Strathman, Gleicher, Boninger, & Edwards, 1994). Time perspective can be differentiated from impulsivity and sensation seeking both based on its conceptualization and its hypothesized neural substrates. Inherently, future orientation refers to a cognitive bias for deliberation about the nature of future outcomes, and valuing them more highly than more immediate contingencies; lack of impulsivity is commonly defined with reference to a tendency to think before acting, without specification of any temporal biases guiding the contents of such thoughts. Moreover, the physiological substrates underlying impulsivity and sensation seeking are well understood to involve evolutionarily old reward systems in the striatum (Colzato, van, Van, & Hommel, 2010), whereas the capacity for mental representation of future events likely involves rostral prefrontal areas (Benoit, Gilbert, & Burgess, 2011). Finally, the hypothesized origin of future orientation and impulsivity/sensation seeking are quite different, with biological theories dominating etiological

accounts of impulsivity/sensation seeking but social learning dominating etiological theories of future orientation (Lamm, Schmidt, & Trommsdorff, 1976; LeShan, 1952; Nurmi, 1987). And so, despite surface level similarity, time perspective and impulsivity/sensation seeking are characterised by different conceptual, physiological and etiological origins.

Prior research on time perspective, health behaviors and mediators

Like impulsivity, time perspective has been applied to predicting various health outcomes, including smoking and other substance use behaviors (Adams, 2009a; Adams & Nettle, 2009; Apostolidis, Fieulaine, Simonin, & Rolland, 2006; Fieulaine & Martinez, 2010; Henson, Carey, Carey, & Maisto, 2006; Keough, Zimbardo, & Boyd, 1999). In general, more future oriented time perspective appears to predict more healthy behavior patterns. For example, Henson and colleagues (Henson et al., 2006) examined the association among time perspective facets and a series of health risk and health protective behaviors (substance use, seatbelt use, sexual behaviors and exercise) in a convenience sample of 1,568 healthy young adults, using bootstrapping methods to quantify the total effects. Findings suggested that future orientation predicted more exercise, more consistent condom use, and negatively predicted all substance use variables. In the case of smoking specifically, several studies have confirmed that those with a more future oriented time perspective are less likely to be smokers (Adams, 2009a; Henson et al., 2006; Sansone et al., 2013), and among current smokers, more likely to quit (Adams, 2009a; Brown & Adams, 2013).

Despite the apparently reliable effects of time perspective on health related behavior performance—including smoking—very few studies have attempted to examine the mediational pathways through which time perspective exerts its effects. One theoretical framework, temporal self-regulation theory (Hall & Fong, 2013), posits that time perspective should exert its effect on behaviors via intention strength; that is, future oriented individuals engage in healthier behaviors because of their stronger motivation (i.e., intentions) to do so; such stronger intentions, in turn, are thought to be generated by their greater sensitivity to the long-term (or nonimmediate) contingencies for their own behavior. There are only two prior studies that have examined intention as a mediator of the effect of time perspective on health behaviors, both of which have found support for the link (Hall, Fong, & Cheng, 2012; Hall et al., 2012). In our earlier analysis of a much more limited subset of this data (3 years; Hall et al., 2012), we found that future orientation predicted quit attempts, but the data was not yet complete for the full follow-up interval (now nearly 10 years cumulatively). To date no existing studies have examined the link between time perspective and cessation, as explained by intention-mediated engagement in relevant health behaviors (i.e., quit attempts).

The current study

The aim of the current study was to: 1) examine the association between time perspective and smoking cessation in a large, representative population sample of current smokers in four English language countries, 2) test mediation of the time perspective cessation effect through engagement in quit related behaviors, 3) test the influences of time perspective on quit attempts as mediated through intention. It was hypothesized that those with a stronger

future orientation would be more likely to have achieved cessation, in part because they were more likely to be making more frequent quit attempts during the follow-up interval. The tendency of future oriented individuals to engage in more quit-related behaviors, in turn, was hypothesized to be driven by stronger motivation to quit (i.e., stronger quit intention) among more future-oriented individuals.

Methods

Participants & Procedure

Participants selected for the current analysis were respondents (baseline $N=9,772$) who have participated in at least 3 waves in the first 8 waves of the International Tobacco Control Four Country Surveys (ITC-4; years 2002–2012). Table 1 shows the distribution of participants by their recruitment waves and number of participated waves. The average time span between each wave is approximately 15 months. The ITC-4 is an ongoing longitudinal cohort study of adult smokers with the following inclusion criteria: aged 18 years or older, self-identified as a current monthly smoker (i.e., one who smokes every month) of cigarettes (manufactured or roll-your-own), and having smoked at least 100 cigarettes in one's lifetime. Participants were recruited into the ITC-4 using random digit dialing, with replenishment for those lost to follow-up (see Fong et al., 2006; Thompson et al., 2006 for detailed descriptions of sampling methods). Characteristics of the baseline sample are presented in Table 2. Survey fieldwork was completed using the Computer-Assisted Telephone Interview (CATI) in English (or French in Canada), with strict guidelines for ensuring comparable implementation in all four countries. Each household contacted was screened for adult smokers with the next birthday who would agree to participate; those who agreed participated in a 45-minute phone survey seven days later, and were reimbursed (equivalent of 10USD) as compensation for time and effort. Those completing the interview were asked to respond to a series of questions about their smoking behaviors, attitudes, intentions and awareness of various smoking policies and facts. The study protocol received ethical clearance from Research Ethics Boards in each of the four countries in which it was conducted: Canada (University of Waterloo); United States (University of Illinois-Chicago); Australia (The Cancer Council Victoria); United Kingdom (University of Strathclyde). A full description of the ITC project and methods is available online at <http://www.itcproject.org>.

Measures

All measures used in the current study are described in detail at <http://www.itcproject.org>.

Time perspective

Time perspective was quantified by the response to the survey item, “You spend a lot of time thinking about how what you do today will affect your life in the future.” This item was taken (and adapted) from the Time Perspective Questionnaire (Fong & Hall, 2003), a 13-item self-report inventory assessing individual differences in the tendency to value and behave in accordance with temporally distal outcomes. Higher scores on the item in question indicate higher levels of future orientation. Responses were given on a 1 to 5 scale, with

lower scores indicating higher levels of agreement. Responses were dichotomized such that those who agreed or strongly agreed on the question were taken to have future time perspective (value=1) and others have no future time perspective (value=0).

Intentions

Quit intentions were assessed using the following item: “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?” Responses were given in accordance with the following scale: 1=any intention (within the next month, next 6 months, or sometime in the future); 0=no intention.

Quit attempts

Quit attempts were assessed using the following item: “Have you made any attempts to stop smoking since we last talked with you?”, referring to the prior survey wave in relation to the current. Only those whom had made an attempt that lasted at least 24 hours were taken to have made a quit attempt for the purpose of our analysis. History of engagement in quit attempts (or accumulated quit attempts) is defined as number of waves that a participant have had quit attempts before successfully quit or before the last survey wave. Cessation is defined as quit at the previous survey date and ever after.

Sensation Seeking

Sensation seeking was assessed using the following four items: “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). Participants utilized as 1 to 5 scale for responses with lower scores indicating higher levels of agreement. Since each of these four items measures a certain aspect of sensation seeking and they are correlated with each other, they were combined to generate a single sensation seeking index so that the analysis models are conceptually and statistically sound. The scores were standardized and averaged together to create a single sensation seeking index. The internal consistency reliability for the items was acceptable ($\alpha=.79$). It was then median divided to form a dichotomized variable with the following scale: 1 = high levels of sensation seeking; 0= otherwise.

Time in sample

To account for the impact of prior experiences with different participation lengths in the ITC surveys, a time-in-sample variable was created as number of waves since recruitment. Assuming that the impact of participation waves on responses was non-linear, the variable is treated as a class variable in the modeling process that follows.

Warning label policies

Defined as 1 = waves 2-6 UK respondents (UK enhanced text warning implemented); 2 = waves 7 and 8 UK respondents (UK graphic warning implemented); 3 = waves 5-8 AU respondents (AU graphic warning implemented); 4 = otherwise (no change).

Other covariates

Subjective ratings of health were assessed using, “In general, how would you describe your health?”; Responses were given on a 1 to 5 scale, with higher scores indicating better health conditions. Measures of years of education, income, and the heaviness of smoking index (Heatherton, Kozlowski, Frecker, Rickert, & Robinson, 1989; Heatherton, Kozlowski, Frecker, & Fagerstrom, 1991) are described elsewhere (see <http://www.itcproject.org/surveys>).

Data Analysis

The data analyses were generated using SAS/STAT software, Version 9.2 of the SAS System for Windows (Copyright ©2002 – 2008 by SAS Institute Inc.). Descriptive statistics and zero order correlations were calculated in the first phase, including country comparisons for smoking cessation and time perspective. For the primary and mediational analyses (second and third phases), separate statistical models were created for different pathway testing. For Models 1, 2, and 3, survey logistic models (Lehtonen & Pahkinen, 2004) were applied using 9,772 respondents who have been surveyed for at least three consecutive waves (Table 1). For each respondent, instead of using all data points at each participation wave, a cessation end-status data point is taken for the analysis. If the respondent did not successfully quit smoking, the last existing survey wave of this respondent was used; if the respondent did quit successfully (i.e., achieved cessation), the wave at the respondent’s first cessation point was used. The putative mediator, previous accumulated quit attempts (as defined in the measures section), was calculated to this wave point. The previous wave time-variant factors were also extracted and linked to the current wave. Models 1 and 2 test the total effect of time perspective on cessation by controlling for different time-invariant and the previous wave time-variant factors. Model 3 tests the potential mediation effect of previous accumulated quit attempts on the time perspective-smoking cessation association by adding in the variable of accumulated quit attempts previous to successful quitting (as the putative mediator). Mediation is suggested if the effect of accumulated quit attempts on cessation is significant and the total effect of time perspective on cessation identified in Model 2 is significantly reduced in Model 3. To complete the mediational test, the association between time perspective and quit attempts was also tested in Model 4. Given the dichotomous mediator and responses and the use of the generalized linear models with logit link functions, the constituent paths for mediation is nonlinear, and it was not possible to construct the indirect effect as a single quantity as it is a function of both the exposure and the mediator variables. Therefore, in the current analysis, mediation is asserted when the constituent paths are all significant in the same direction and the total effect is significantly reduced (or become insignificant) after the mediator is introduced (Baron & Kenny, 1986).

Differing from the static cessation status, quit attempts and intentions are dynamic (i.e., they may go on and off throughout the surveys). Therefore, Models 4, 5 and 6 used generalized linear latent curve models (Bollen & Curran, 2006) to estimate the trajectory of quit attempts/intentions and the potential impact of time perspective over all time points. A lagged exposure-response association is tested for quit attempts by linking the previous wave time-variant exposures to the current wave quit attempts. Assuming a linear trajectory,

the time trend is measured by the ITC survey waves and the effects of the ‘wave’ variable and other explanatory variables on responses were treated as a function of a mean and a disturbance to account for individual differences. Interactions between ‘wave’ and other explanatory variables, including time perspective, quit intentions, and countries, were also tested. No interactions between ‘wave’ and time perspective and between ‘wave’ and quit intentions/attempts were found. They were therefore not included in the final models. Model 4 tests the total effect of time perspective on quit attempts by controlling for time-invariant and previous wave time-variant exposures. Model 5 tests the potential mediation effect of previous quit intentions on the time perspective-quit attempt association by adding in the previous wave intention to quit variable. Similarly, to complete the mediation, Model 6 tests the association between time perspective and quit intention by controlling for both time-invariant and time-variant exposures. Figure 1 shows the path diagram of the latent curve model (Model 5). Removing the previous quit intentions variable (QI) from Figure 1 results in the diagram reverting to Model 4. The latent structure of Model 6 is similar to Figure 1 with the outcome being quit intention and the lagged exposure-outcome paths of the time-varying variables being replaced by same-wave exposure-outcome paths.

In order for a linear unconditional latent curve model to be identified, at least three measurements should be taken for each respondent. For conditional models constructed in this analysis, they would be identified as long as the corresponding unconditional models are identified and all exogenous variables are manifest. Therefore, to avoid identification issues and to consider the lagged exposure, 5,786 smoker respondents (including 25,578 records) who have been surveyed for at least four consecutive waves were included (smokers who participated in at least four waves in Table 1). The first three (four for Models 4–6) wave longitudinal weights of selected respondents rescaled to the sum of their sample size at recruitment is used for the analyses, so that respondents may represent the population at the time of recruitment and be comparable over waves.

Results

Smokers in all four countries were predominantly middle aged and there was a higher proportion of females (57%) than males (43%; Table 2). About half of the participants had low education at recruitment and half of them have moderate or higher education. Participants were approximately equally distributed among low, moderate and high household income groups. Participants smoked on average 17.6 cigarettes per day and the Heavy Smoking Index (HIS) was 2.7 on average. Overall, Australia (parameter=0.16; *CI*: -0.02 to 0.33), Canada (parameter=0.09; *CI*: -0.10 to 0.29), and the United Kingdom (parameter=0.02; *CI*: -0.16 to 0.19) subsamples’ smoking cessation rates did not differ significantly from the grand mean; however, the United States subsample had significantly lower cessation rates in relation to the grand mean (parameter=-0.26; *CI*: -0.49 to -0.04).

Time perspective was positively correlated with quit intention strength ($r=.31, p < .001$), quit attempts ($r=.14, p < .001$) and sensation seeking ($r=.13, p < .001$); time perspective was negatively associated with heaviness of smoking index scores ($r=-.06, p < .001$). Additionally, there were significant correlations between time perspective and demographic indicators: age was negatively associated with time perspective ($r=-.15, p < .001$), and

females sex was associated with higher time perspective scores ($r=.05$, $p < .01$). Income, however, was not significantly correlated with time perspective scores ($r=.02$, $n.s.$).

Total effects

The primary analysis (Table 3) examined the association between time perspective and smoking cessation in partially adjusted (controlling for demographics, time in sample and country; Model 1) and fully adjusted models (additional control for tobacco policy milieu, socio-economic status, heaviness of smoking index, and self-rated health; Model 2). In both models, a more future oriented time perspective was associated with increased likelihood of cessation; that is, the association between time perspective and cessation was robust to adjustment for demographics and a variety of smoking confounders. Additional adjustment for individual differences in sensation seeking did not affect the significance of the time perspective effect (parameter=0.17; CI: 0.03 to 0.31 after adding in the sensation seeking variable in Model 1). An additional analysis using an effect coding scheme to test country effects shows that the strength of the association between time perspective and cessation did not vary significantly by country: in addition to the main effect, the strength of the time perspective effect for Australia (parameter=-0.10; CI: -0.33 to 0.13), Canada (parameter=-0.11; CI: -0.35 to 0.13), United Kingdom (parameter=0.04; CI: -0.20 to 0.28) and the United States (parameter=0.17; CI: -0.11 to 0.45) all did not differ significantly from the grand mean.

Direct and Mediated effects

The next phase of analyses tested whether history of engagement in quit attempts mediated the relationship between time perspective and cessation. As presented in Models 2, 3, and 4, there was strong evidence of mediation, with history of quit attempts explaining the entirety of the association between time perspective and cessation (Table 3).

A final set of analyses examined the influence of time perspective on quit attempts, as mediated through intention strength (Models 4, 5, and 6). Results indicated a strong fixed relationship between time perspective and quit attempts (Table 4, Model 4) after controlling for time influences, as well as between time perspective and intention strength (Model 6, log odds=0.86, 95% CI:0.75-0.98). Intention strength, in turn, predicted quit attempts (Table 4, Model 5). Finally, as predicted, when controlling for the latter effect, the association between time perspective and quit attempts was significantly reduced from 0.33 to 0.22 (Table 4, Model 5; 33.3% attenuation), indicating partial mediation.

Discussion

Using longitudinal data from a large, representative sample of current smokers in four English speaking countries, we examined the prospective association between time perspective and smoking cessation, and tested a mediational model to explain the effect. As hypothesized, those smokers who were more future-oriented were more likely to attain cessation at follow-up. Importantly, consistent involvement in quit-related behaviors primarily explained this effect: only those were engaged in the quit cycle in a sustained way (i.e., had a prior history of engaging in quit attempts) were likely to have achieved cessation

at follow-up. The effect of future orientation on quit attempts, in turn, was mediated by intention strength.

This study is the most comprehensive test of the association between time perspective and smoking outcomes to date, including almost 10,000 smokers from four countries and considering 8 years of prospective follow-up data. Most importantly, however, we have established support for an explanatory model linking time perspective to cessation through intention-mediated engagement in quit attempts. The current findings add to the prior examinations of time perspective and cessation by providing a larger and more representative sample of smokers, cross-national replication, and a test of an a-priori mediational model based on an established theoretical framework. Additionally, the use of latent growth curve modeling for the intentions analysis is an increment in statistical sophistication over prior modelling procedures in the published literature, as it allows us to make use of all of the data available across multiple waves of data collection over 8 years of follow-up. The current findings also extend our prior findings (Hall et al., 2012) to include for almost a full decade of follow-up data, and—most importantly—extend the effects to prediction of smoking cessation (not only quit attempts).

There are several implications of the present findings, both for population- and individual-level approaches to smoking cessation. Given the link between quit cycle engagement and ultimate cessation, the utility of enhancing future orientation on the population level may be to get people engaged in the quit cycle. This is not a foregone conclusion, given that some might argue that those smokers who quit unsuccessfully could feel discouraged and less likely to make another attempt, thereby exiting the quit cycle prematurely. In contrast, the current model suggests that engagement in the quit cycle is strongly related to ultimate cessation, and future orientation facilitates such sustained engagement. As such, our findings suggest that public health communications aimed at facilitating cessation should promote future orientation and encourage sustained and repeated quit attempts (even if any single attempt should not be expected to be successful).

On the level of individual intervention, it may be important for an individual smoker to adopt a future oriented perspective, and communications by physicians and other behavior change agents should aim to foster this. Likewise, informing a smoker about the importance of maintaining engagement in the quit cycle by making repeated cessation attempts over extended periods of time is potentially useful. That is, it would be useful to help an individual smoker to appreciate that each quit attempt is “a shot” at full blown cessation, and that sustained quit efforts are likely to be successful eventually. Taking a probabilistic—rather than deterministic— perspective may be important in this respect. For example, with any low probability event, making more attempts gives more chances to achieve the desired outcome (“No matter how strong the opposing team is, you can’t win the game if you don’t play ball!”).

In addition, identification of those smokers with a more limited future orientation might be useful for targeting tailored interventions in a cost-effective manner. For example, Gellert and colleagues found that planning was selectively more beneficial for enacting health protective behaviors among those with a more limited time perspective (Gellert,

Ziegelmann, Lippke, & Schwarzer, 2012). As such, identification of smokers with a more limited future orientation might enable selective deployment of planning interventions for these individuals, in order to facilitate enhanced chances of successful cessation.

The finding that future orientation was associated with greater enactment of a risk reduction behavior (making quit attempts) is consistent with many other studies linking future orientation (or less present orientation) with lower levels of health risk behavior (Adams, 2009a; Adams & Nettle, 2009; Apostolidis et al., 2006; Brown & Adams, 2013; Fieulaine & Martinez, 2010; Hall et al., 2012; Henson et al., 2006; Keough et al., 1999). Moreover, the finding that intention strength mediates this effect is consistent with several other studies showing the same, selective intention-mediating effects with exercise and dietary behavior (Hall, Fong & Cheng, 2012). As such, support is growing for the proposition that future orientation exerts its beneficial effects on health-related behaviors via its motivation enhancing potential. This proposition is consistent with conceptualizations of future orientation by several early accounts (Strathman, Gleicher, Boninger, & Edwards, 1994; Zimbardo & Boyd, 1999) and more recent theoretical frameworks, such as temporal self-regulation theory (Hall & Fong, 2013), which posits such intention-mediated effects explicitly.

Limitations

Despite the strengths of the current investigation in terms of sample size/representativeness, there are a number of limitations that bear mention as well. First, given the correlational design, it is not possible to state that the direct or indirect effects of time perspective on smoking behaviors are causal. However, the prospective nature of the data gives more confidence in directionality than cross sectional data could, and non-experimental methods are obviated by the cross-national population research methodology. Despite this, there are prior data from smaller studies to support the contention that effects of time perspective on other behaviors is causal, and that it may be mediated through intention (Hall & Fong, 2003; Hall, Fong & Cheng, 2012). Second, smoking cessation is self-reported, and so we cannot assume complete accuracy of the smoking cessation outcome, which again is true of any population level study of this nature.

Finally, our measure of time perspective was a single item measure, and therefore likely less reliable than multi-item versions of the scale. The same limitation applies to other constructs as well (including quit intentions), which were also assessed with a limited number of items, due to the logistical constraints of being part of a large population-level telephone survey with a large number of unrelated items included. For this reason, we can't be sure of the precise magnitude of some of the effects observed, as they could be attenuated in the current study due to unreliability of measurement. Future studies should attempt to utilize multi-item measures of time perspective and other constructs to more accurately quantify magnitude of effect.

Future Directions

Future directions for research could include examination of the causal status of the effects of time perspective on quit intention and smoking cessation via the design of time perspective

smoking cessation interventions for small groups, or controlled population studies of the same nature. In addition, time perspective could be examined as a moderator of the effect of policy interventions (aimed at highlighting long term or more immediate outcomes) for facilitating smoking cessation or quit attempts. Finally, more studies are required in order to examine the relative predictive validity of different approaches to measuring time perspective (single item measures, multi item scales, and delay discounting items; see Adams, 2009b for a discussion).

Conclusions

In the current study we found support for the contention that future oriented time perspective predicts cessation among smokers. The beneficial effect of time perspective appears to be to encourage more faithful and sustained engagement in the quit attempt cycle, an effect that is mediated by the intention-strengthening consequence of future orientation. Several implications for individual and population level health behavior change were discussed. Future studies should examine the causal status of the time perspective links with both quit motivation and eventual cessation using experimental methodology and randomized smoking cessation trials.

Acknowledgments

This research was supported by grants from the Canadian Institutes for Health Research (57897, 79551, 115016), Robert Wood Johnson Foundation (045734), US National Cancer Institute (P50 CA111236, R01 CA100362), Cancer Research U.K. (C312/ A3726), Canadian Tobacco Control Research Initiative (014758), National Health and Medical Research Council of Australia (265903), Australian Commonwealth Department of Health and Ageing, Ontario Institute for Cancer Research and Canadian Cancer Society Research Institute. We also acknowledge support from the Propel Centre for Population Health Impact at the University of Waterloo.

The authors wish to acknowledge the efforts of the ITC 4-Country team, and all those who participated in the surveys.

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Highlights

- Future oriented time perspective predicts smoking cessation.
- The effects of time perspective are mediated through quit attempts.
- Enhancement of intention to quit may be facilitated by future orientation.

Figure 1. Path diagram of Model 5

Note: QA – Quit attempts; QI – quit intention; TP – time perspective; HSI – heaviness of smoking index; TIS – time in sample; INC – income; *i* – individual *i*; *t* = 2, 3, ..., 8, representing waves. $QA_{i,t} \sim \text{binary}(p_{i,t})$ and $QA^*_{i,t} = \text{logit}(p_{i,t})$. μ_α and μ_β are the intercept and slope (wave) parameters in Table 4. γ_{country} represents the country and wave interaction terms in Table 4. All other μ s represent corresponding fixed parameters in Table 4. ζ s are individual-level random effects. Only statistically significant paths are included. Mediation effects were tested by adding in/taking off the QI paths. In this figure, μ_{TP} is the direct fixed effect of time perspective on QA and μ_{QI} is the Mediated/indirect effect of intention strength on QA in Model 5. If taking off the QI paths, the figure represents Model 4 and μ_{TP} in this case becomes the total fixed effect of time perspective on QA.

Table 1

Sample sizes of participation lengths at each recruitment wave by country

Country	wave of recruitment	# of participation Waves							
		3	4	5	6	7	8	Total	
CA	wave 1 recruits	353	244	150	100	86	268	1201	
	wave 2 recruits	75	49	30	21	74		249	
	wave 3 recruits	70	39	40	109			258	
	wave 4 recruits	57	40	129				226	
	wave 5 recruits	73	173					246	
	wave 6 recruits	275						275	
US	wave 1 recruits	282	173	104	67	49	125	800	
	wave 2 recruits	64	63	28	26	53		234	
	wave 3 recruits	116	61	49	99			325	
	wave 4 recruits	86	64	113				263	
	wave 5 recruits	88	175					263	
	wave 6 recruits	288						288	
UK	wave 1 recruits	351	325	192	121	96	243	1328	
	wave 2 recruits	39	19	17	8	32		115	
	wave 3 recruits	77	56	39	115			287	
	wave 4 recruits	77	43	125				245	
	wave 5 recruits	74	216					290	
	wave 6 recruits	245						245	
AU	wave 1 recruits	297	315	183	132	127	323	1377	
	wave 2 recruits	51	28	27	11	41		158	
	wave 3 recruits	78	66	42	100			286	
	wave 4 recruits	56	39	90				185	
	wave 5 recruits	121	229					350	
	wave 6 recruits	278						278	
Total		3571	2417	1358	909	558	959	9772	

Table 2

Demographic characteristics of the sample

		N=	%
Country	CA	2455	25.1
	US	2173	22.2
	UK	2510	25.7
	AU	2634	27.0
Sex	female	5545	56.7
	male	4227	43.3
Age group	18–24	714	7.3
	25–39	2585	26.5
	40–54	3872	39.6
	55–max	2601	26.6
Income	low	2861	29.3
	moderate	3341	34.2
	high	2919	29.9
	not provided	651	6.7
Education	low	5133	52.7
	moderate	3085	31.7
	high	1528	15.7
Marital status	married	2138	21.9
	separated	4249	43.5
	divorced	3385	34.6
Cohort	wave 1 recruits	4706	48.2
	wave 2 recruits	756	7.7
	wave 3 recruits	1156	11.8
	wave 4 recruits	919	9.4
	wave 5 recruits	1149	11.8
	wave 6 recruits	1086	11.1
Time perspective: spend a lot of time thinking about how what you do today will affect your life in the future	Neither agree nor disagree / Disagree / Strongly disagree	4085	42.0
	Strongly agree/agree	5650	58.0

		N=	Mean	SD
Heaviness of smoking	Heavy smoking index	9675	2.7	1.6
	cigarette per day	9742	17.6	10.3
Sensation seeking	like to explore strange places	9688	2.6	1.1
	like to do thrilling things	9716	2.7	1.1
	like new and exciting experiences	9731	3.1	1.1
	like to be with friends who are exciting and unpredictable	9743	2.7	1.1

Note: CA=Canada; US=United States; UK=United Kingdom; AU=Australia; SD=standard deviation.

Table 3

Direct effects of time perspective on cessation

Parameter	Outcome = cessation		
	Model 1	Model 2	Model 3
Intercept	−2.40 (−2.73–2.07)	−1.64 (−2.23–1.05)	−4.45 (−5.19–3.70)
sex: female vs. male	−0.02 (−0.15–0.12)	−0.02 (−0.15–0.12)	−0.07 (−0.21–0.07)
Age group: 18–24 vs. 55+	−0.43 (−0.72–0.15)	−0.75 (−1.05–0.46)	−0.80 (−1.10–0.50)
Age group: 25–39 vs. 55+	−0.25 (−0.43–0.07)	−0.47 (−0.66–0.28)	−0.46 (−0.65–0.26)
Age group: 40–54 vs. 55+	−0.31 (−0.48–0.15)	−0.38 (−0.55–0.21)	−0.37 (−0.55–0.19)
Country: AU vs. US	0.28 (0.08–0.48)	0.24 (0.04–0.45)	0.15 (−0.06–0.37)
Country: CA vs. US	0.22 (0.02–0.43)	0.17 (−0.04–0.38)	0.07 (−0.15–0.29)
Country: UK vs. US	0.23 (0.02–0.44)	0.18 (−0.03–0.39)	0.23 (0.01–0.44)
Heaviness of smoking index		−0.18 (−0.23–0.14)	−0.12 (−0.17–0.07)
Income: low vs. not provided		0.02 (−0.28–0.32)	−0.01 (−0.32–0.30)
Income: moderate vs. not provided		0.13 (−0.17–0.42)	0.11 (−0.20–0.41)
Income: high vs. not provided		0.25 (−0.04–0.54)	0.21 (−0.09–0.51)
Wave		−0.11 (−0.15–0.07)	−0.11 (−0.15–0.07)
Time in sample: 3 vs. 8	0.49 (0.21–0.77)	0.18 (−0.13–0.49)	1.87 (1.42–2.33)
Time in sample: 4 vs. 8	0.70 (0.41–0.98)	0.45 (0.15–0.76)	1.81 (1.39–2.24)
Time in sample: 5 vs. 8	0.71 (0.40–1.02)	0.52 (0.20–0.83)	1.59 (1.17–2.01)
Time in sample: 6 vs. 8	0.71 (0.39–1.04)	0.62 (0.29–0.95)	1.44 (1.02–1.86)
Time in sample: 7 vs. 8	0.54 (0.17–0.91)	0.49 (0.13–0.86)	0.94 (0.48–1.40)
Health in last wave		0.17 (0.10–0.24)	0.23 (0.16–0.31)
Time perspective	0.17 (0.03–0.31)	0.16 (0.02–0.30)	0.00 (−0.15–0.14)
Quit attempts			0.71 (0.64–0.79)

Note: CA=Canada; US=United States; UK=United Kingdom; AU=Australia. Coefficients are followed by 95% confidence interval in parentheses.

Table 4

Direct effects of time perspective on quit attempts

Parameter 5	Outcome = quit attempts	
	Model 4	Model 5
Intercept	−1.01 (−1.47–0.56)	−1.39 (−1.84–0.94)
sex: female vs. male	0.12 (0.04–0.21)	0.09 (0.01–0.17)
Age group: 18–24	0.34 (0.17–0.50)	0.17 (0.00–0.33)
Age group: 25–39	−0.08 (−0.21–0.04)	−0.22 (−0.34–0.11)
Age group: 40–54	−0.16 (−0.27–0.05)	−0.24 (−0.35–0.13)
COUNTRY: AU vs. US	−0.15 (−0.48–0.17)	−0.19 (−0.52–0.14)
COUNTRY: CA vs. US	0.53 (0.23–0.83)	0.47 (0.17–0.76)
COUNTRY: UK vs. US	−0.13 (−0.44–0.19)	−0.03 (−0.35–0.29)
Label policy: 1 vs. 4	0.53 (0.29–0.76)	0.50 (0.26–0.74)
Label policy: 2 vs. 4	0.42 (0.02–0.81)	0.41 (0.00–0.81)
Label policy: 3 vs. 4	−0.32 (−0.54–0.10)	−0.32 (−0.55–0.10)
Former quit attempt	0.95 (0.84–1.07)	0.77 (0.65–0.88)
Time in sample: 2 vs. 8	−0.29 (−0.54–0.05)	−0.31 (−0.55–0.07)
Time in sample: 3 vs. 8	−0.31 (−0.54–0.09)	−0.34 (−0.56–0.11)
Time in sample: 4 vs. 8	−0.15 (−0.36–0.06)	−0.17 (−0.37–0.04)
Time in sample: 5 vs. 8	−0.25 (−0.45–0.05)	−0.27 (−0.47–0.07)
Time in sample: 6 vs. 8	−0.16 (−0.36–0.04)	−0.16 (−0.37–0.04)
Time in sample: 7 vs. 8	−0.22 (−0.43–0.01)	−0.23 (−0.45–0.02)
Heaviness of smoking index	−0.17 (−0.19–0.14)	−0.15 (−0.18–0.13)
Income: low vs. not provided	0.01 (−0.17–0.19)	−0.02 (−0.19–0.15)
Income: moderate vs. not provided	0.07 (−0.10–0.25)	0.03 (−0.14–0.20)
Income: high vs. not provided	0.12 (−0.05–0.30)	0.06 (−0.11–0.24)
Health	−0.15 (−0.19–0.11)	−0.14 (−0.17–0.10)
Wave	0.08 (0.04–0.13)	0.08 (0.03–0.13)
Wave*Country: AU vs. US	0.09 (0.02–0.16)	0.09 (0.02–0.17)
Wave*Country: CA vs. US	−0.10 (−0.16–0.05)	−0.09 (−0.15–0.04)
Wave*Country: UK vs. US	−0.09 (−0.16–0.02)	−0.09 (−0.16–0.02)
Time perspective	0.33 (0.25–0.41)	0.22 (0.15–0.30)
Intention strength		0.91 (0.82–1.00)

Note: CA=Canada; US=United States; UK=United Kingdom; AU=Australia. Coefficients are followed by 95% confidence interval in parentheses.