Original Investigation

Motivational factors predict quit attempts but not maintenance of smoking cessation: Findings from the International Tobacco Control Four country project

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Abstract

Aim: To explore whether measures of motivation to quit smoking have different predictive relationships with making quit attempts and the maintenance of those attempts.

Methods: Data are from three wave-to-wave transitions of the International Tobacco Control Four (ITC-4) country project. Smokers' responses at one wave were used to predict the likelihood of making an attempt and among those trying the likelihood of maintaining an attempt for at least a month at the next wave. For both outcomes, hierarchical logistic regressions were used to explore the predictive capacity of seven measures of motivation to quit smoking, controlling for a range of other known or possible predictors.

Results: Bivariate analyses indicate that measures of motivation to quit are predictive of making quit attempts, but they predict relapse among those making attempts. Multivariate analyses identified wanting to quit and frequency of prematurely butting out cigarettes as the main positive predictors of making attempts, but this was reduced by intention and recency of last attempt. For maintenance, premature butting out was the main motivation variable predicting relapse and was essentially unaffected by other measures.

Discussion: The findings show that it is wrong to suggest that all one needs to quit is to be motivated to do so. The reality is that one needs to be motivated to prompt action to stop smoking, but this is not sufficient in and of itself to ensure that cessation is maintained. These findings call attention to the importance of understanding the differential roles that prequit and postquit experiences play in smoking cessation and of providing help to smokers to stay off cigarettes.

Introduction

Both psychological theory and public preconceptions hold that motivation to quit smoking is a critical factor for quit success. Balmford and Borland (2008) found that most smokers believe that wanting to quit is both a necessary and a sufficient condition for successful cessation. All theories of health behavior change, most notably the class of expectancy-value theories, have a role for motivation, although in most cases it is implicit as the concept of motivation is not directly addressed, being substituted by constructs, such as attitudes to the behavior, normative pressures (Fishbein & Ajzen, 1975); susceptibility and severity of harm (Rosenstock, Strecher, & Becker, 1988); and vulnerability (Rogers, 1983) or cons of the behavior to change (Velicer, DiClemente, Prochaska, & Brandenburg, 1985). West's (2006) PRIME theory integrates many of these concepts and concludes that the proximal determinants of behavior are motives and outcome expectancies.

The term motivation is used here as a catch-all term. It includes expressed desire or wanting, concerns about the risks of not acting, and behavioral reactions that imply motivation. All these have an emotional aspect (hot cognitions), as well as beliefs about the long-term value of acting or reasons for acting (calculated or cold cognitions). The empirical evidence supporting a central role for motivation in smoking cessation is mixed. Although there is strong evidence that it is predictive of making quit attempts, this does not seem to translate into prediction of maintenance—or its converse, relapse (e.g., Borland, Owen, Hill, & Schofield, 1991; Hyland et al., 2006; Segan, Borland, & Greenwood, 2002; West, McEwan, Bolling, & Owen, 2001; Zhou et al., 2009). None of the above studies found evidence that motivational factors (including positive expectancies) predicted quit maintenance among those who tried, and some found significant negative associations (e.g., Borland et al.; Hyland et al.). Indeed, the only

positive prediction we could find was in a study of Marlatt, Curry, and Gordon (1988) and then only among those quit for more than 2 years. This research indicates that the very motives driving the making of quit attempts may be at best irrelevant to maintenance and at worst associated with relapse.

There are several possible mechanisms for the finding that motivation is unrelated to quit maintenance. First, motivation may have a threshold-related effect, and if there is enough motivation to generate an attempt (i.e., it is above the threshold; West, 2006), then additional motivation makes no difference to the outcome of the attempt (i.e., no predictive relation for motivational variables). Second, another view holds that if smokers rely too much on motivation to see them though a quit attempt, then they might neglect other effective coping strategies, and this could lead to a negative association of motivation with maintenance. Consistent with this, many smokers believe that wanting to quit is both necessary and sufficient to be successful (Balmford & Borland, 2008). Third, it is possible that those highly motivated to quit may represent a group of highly addicted smokers who would have already quit if they could. This hypothesis would predict a negative relationship with maintenance that would disappear when measures of dependence (e.g., difficulty in quitting) were controlled for. It would also predict that the effect would only appear where the smokers were predominantly dependent and in those who had tried before and relapsed rapidly. Finally, expressed motivation before commencing a difficult task may be independent of the level of motivation experienced while trying to maintain the new behavior pattern (e.g., not smoking). Motivation to maintain change may need to be assessed quite differently and perhaps only after beginning to act. It might also vary considerably over time. Rothman (2000) argued that attempts to change behavior are reasonably understood by expectancy-value theories but that maintenance of change is more determined by the experiences of the new behavioral pattern. Higher expectancies prequit can actually be counter-productive postquit, as unmet expectations can result in disappointment and dissatisfaction with the new behavior, leading to relapse, potentially accounting for the observed negative relationship.

The aim of this study is to explore the nature of differences in the predictive relation between variables that are designed to assess aspects of positive motivation to quit and the initiation of a quit attempt as compared with its maintenance. We also explored these in relation to other potential predictors as found by Hyland et al. (2006). We have studied a broad range of motivational measures so as to assess whether the above-mentioned findings are limited to some aspects of motivation.

Methods

Design
This is a prospective cohort study where variables measured at one wave of the cohort are used to predict smoking cessation outcomes (quit attempts or maintenance) at the next wave. We report three replications.

Sample and data collection
Data come from four waves (3–6) of the International Tobacco Control Four (ITC-4) country project, a quasiexperimental longitudinal survey of smokers and subsequent to recruitment as either smokers or recent quitters. The ITC-4 country survey is an annual survey conducted via computer-assisted telephone interview in Canada, UK, USA, and Australia. Using a stratified random-digit dialing procedure, households are contacted and screened for adult smokers (18 years and older) with the next birthday who would agree to participate in the study. Respondents were considered smokers at recruitment if they reported smoking at least 100 cigarettes in their lifetime and smoking at least once in the past 30 days. A detailed description of the ITC study conceptual framework (Fong et al., 2006) and methodology (Thompson et al., 2006) can be found elsewhere.

Data were included from ITC-4 cohort members who provided predictor data in at least one of the three predictor waves (3–5) and outcome data in the next wave (4–6). We have not used data from Waves 1 and 2 as some of the questions were only included from Wave 3 onward (most notably the explicit measure of wanting to quit). Characteristics of the samples used for each of the three wave-to-wave transitions are provided in Table 1.

Predictor measures
Motivation to quit variables (seven variables)
1. Wanting to quit, a measure of explicit motivation measured by "How much do you want to quit smoking?": *not at all* (1), *a little*, *somewhat*, and *a lot* (4).
2. Frequency of stubbing out a cigarette (a microbehavioral indicator of motivation): "In the last month, have you stubbed out a cigarette before you finished it because you thought about the harm of smoking?": *never* (1), *once*, *a few times*, or *lots of times* (4).

Table 1. Sample characteristics for respondents in the three wave-to-wave transitions

	Waves 3–4, $n = 5,369$	Waves 4–5, $n = 4,843$	Waves 5–6, $n = 4,988$
Age (years): M (SD)	46.4 (13.7)	47.3 (13.5)	48.5 (13.3)
% Female	57.1	57.7	57.5
Cigarettes per day: M (SD)	16.9 (10.4)	17.2 (10.2)	17.3 (10.0)
% Recruited each wave			
Wave 1	56.4	43.2	30.8
Wave 2	12.9	9.4	6.5
Wave 3	30.8	20.9	14.3
Wave 4	NA	26.5	16.3
Wave 5	NA	NA	32.2
% Country			
Canada	25.1	25.6	25.0
USA	21.7	23.5	22.7
UK	25.7	24.9	25.3
Australia	27.5	26.0	27.1
% Made a quit attempt by following wave	41.1	38.3	37.3
% Quit >1 month (maintenance) among those who tried[a]	24.6	25.7	25.3

Notes. NA = not applicable.

[a]Excludes respondents quit for less than a month at follow-up ($n = 83$ at Wave 4; $n = 88$ at Wave 5; and $n = 81$ at Wave 6).

3. A measure of concern about the financial cost of smoking was formed from the mean of two questions: "In the last month, how much did you think about the money you spend on smoking?": *never* (1) to *very often* (5) and "In the past 6 months has the price of cigarettes led you to think about quitting?": *not at all* (1) to *very much* (3).

4. A measure of strength of health concerns (modified from Hyland et al., 2006) was derived from the mean of four items: (a) "How worried are you, if at all, that smoking will (a) damage your health in the future?"; ". . . (b) lower your quality of life in the future?", both measured on a 4-point scale from *not at all worried* (1) to *very worried* (4); (c) "In the past 6 months has concern for your personal health led you to think about quitting?" measured from *not at all* (1) to *very much* (3); and (d) "In the last month, how much did you think about the harm your smoking might be doing to you?": *never* (1) to *very often* (5). Cronbach alpha coefficient for this composite measure ranged from .81 to .83 across the three predictor waves.

5. Health outcome expectancy was measured by "How much do you think you would benefit from health and other gains if you were to quit permanently in the next 6 months?", from *not at all* (1) to *extremely* (5).

6. Lifestyle outcome expectancy (only asked from Wave 4, so is only included in two of the three replications) was assessed by: "If you were to quit smoking, would your ability to enjoy life be: improved a lot (5), improved a little, stay the same, made a little worse, or made much worse (1)?".

7. Overall attitude to smoking: "What is your overall opinion of smoking?": coded from 1 (*very positive*) to 5 (*very negative*). This can be thought of as an indicator of the balance between wanting to smoke and quit. It is included in this set of variables because it was found to a strong predictor of making a quit attempt in Hyland et al. (2006).

Demographic variables

Demographic variables included age (18–24, 24–39, 40–54, and 55+ years), gender, country of residence (Canada, USA, UK, or Australia), and socioeconomic status as indicated by reported household income and highest level of education (see Hyland et al. 2006, for a full description of how education and income were derived).

Tobacco dependence variables

Dependence was assessed using the Heaviness of Smoking Index (HSI; range 0–6). The HSI was created as the sum of two categorical measures: number of cigarettes smoked per day (coded: 0: 0–10 cigarettes/day (CPD), 1: 11–20 CPD, 2: 21–30 CPD, and 3: 31+ CPD) and time to first cigarette (coded: 0: 61 min or more, 1: 31–60 min, 2: 6–30 min, and 3: 5 min or less). The HSI was then recoded into three categories of dependence: low: 0–1, moderate: 2–3, and high: 4–6. Baseline smoking frequency was also included (daily and less than daily). An additional indicator of dependence was length of the longest attempt ever (never, less than 1 week, 1 week to 1 month, 1 month to 6 months, and more than 6 months).

We also assessed use of quit smoking medications on the last quit attempt (yes and no) and use of cessation services (Clinics, Quitlines, etc) in the last year, whether or not specifically related to the last quit attempt.

Variables with a motivational component (not pure measures of motivation to quit: called "motivation related" here; four variables)

- A binary measure of whether the respondent had made a quit attempt in the previous year (i.e., before the predictor wave) with having done so indicating increased past motivation.
- Self-efficacy, assessed by, "If you decided to give up smoking completely in the next 6 months, how sure are you that you would succeed?", with the options: *not at all sure* (1), *slightly sure*, *moderately sure*, *very sure*, and *extremely sure* (5). Self-efficacy estimates can include an assessment of perceived motivation to put in effort as well as capacity to do so.
- Intention to quit assessed on a 4-point scale: *planning in the next month* (4), *planning beyond 1 month but within 6 months*, *planning beyond 6 months*, and *not planning to quit* (1). Intention to quit is typically seen as a consequence of motivation.
- Motivation to smoke. Based on the average of smokers' responses to the following two statements: "You enjoy smoking too much to give it up" and "Smoking is an important part of your life," both coded from 1 (*strongly disagree*) to 5 (*strongly agree*).

Outcome measures

The two outcome measures assessed at follow-up were whether or not respondents reported making a quit attempt in the interval between waves and among those who tried whether they had achieved at least 1-month abstinence at the follow-up (maintenance). Those quit for less than 1 month were excluded. We also redid the analyses using a 6-month sustained abstinence criterion, thus restricting the analyses to those who made their attempts at least 6 months prior to the follow-up assessment.

Analyses

Initially, we explored whether the predictor variables could be treated as continuous or whether there were nonlinearities that would demand treating them as sets of ordinal categories. In all cases, the two models gave equivalent results, so we report the simpler analyses treating each as quasilinear.

Hierarchical multivariate logistic regression was used to examine the association between each predictor variable separately and the two outcomes of making quit attempts and maintenance among those who tried. At the first step, each motivational predictor was entered along with the demographic variables. The set of motivational predictor variables were entered together on the second step. A third and fourth step controlled for the mixed motivation-related set (self-efficacy, intention, motivation to smoke, and recency of last attempt) and the dependence-related set (HSI, daily/non-daily smoking, and length of longest previous quit attempt), respectively. These last two steps were also conducted in reverse order. In addition, where the significance of the focal motivational predictors changed markedly, we conducted additional analyses to identify the variable or variables that produced the effects. Significance was set at $p < .05$. Analyses were performed using SPSS version 14.0.

Results

Summary statistics for each motivational predictor are presented in Table 2. Average levels on all predictors were similar across

Table 2. Mean (*SD*) scores on motivation and selected other predictors for each wave-to-wave transition

Variable (range)	Waves 3–4	Waves 4–5	Waves 5–6
Wanting to quit (1–4)	3.00 (1.14)	2.99 (1.15)	3.00 (1.14)
Frequency of stubbing out (1–4)	1.69 (1.07)	1.70 (1.09)	1.68 (1.07)
Concern about financial cost (1–5)	2.88 (0.93)	2.86 (0.92)	2.82 (0.92)
Health concerns (1–4)	2.71 (0.85)	2.71 (0.84)	2.57 (0.96)
Health outcome expectancy (1–5)	3.67 (1.18)	3.61 (1.18)	3.64 (1.20)
Lifestyle outcome expectancy (1–5)	NA	3.84 (1.04)	3.85 (1.04)
Overall attitude to smoking (1–5)	3.55 (0.90)	3.55 (0.90)	3.55 (0.92)
Motivation to smoke (1–5)	3.17 (0.95)	3.19 (0.95)	3.24 (0.97)
Intention to quit (1–4)	2.87 (0.95)	2.85 (0.96)	2.84 (0.97)
Self-efficacy (1–5)	2.43 (1.25)	2.45 (1.24)	2.42 (1.24)

Notes. NA = not applicable.

waves. Table 3 shows the interitem correlation matrix among the seven core motivation-to-quit variables and the additional motivation-related variables (showing ranges across the three replications). Correlations above the diagonal are for the subsample who made quit attempts and are restricted to the seven focal measures. Those below the diagonal are for the entire sample. As expected, the seven measures were all positively correlated and had expected associations with the other motivation-related measures.

All motivation-to-quit variables were significantly associated with making a quit attempt in all three wave-to-wave transitions after controlling for demographic factors (Table 4, Column 1). In analyses not reported here, we tested for by-country interactions with the motivation-to-quit variables and outcomes but found none. When all the motivation-to-quit variables were added together (Column 2), Want to quit and frequency of prematurely butting out were the only two predictors that remained significant in all three replications. Want to quit was mainly responsible for the other measures dropping out. Adding the

motivation-related variables attenuated the size of the effects of want to quit and frequency of prematurely butting out (Column 3), mainly due to effects of intention to quit and recency of last quit attempt. The addition of the dependence measures at the final step had no real effect (Column 4). All effects were in the expected direction. The dependence measures were negatively related to making a quit attempt as expected (Hyland et al., 2006), and among the motivation-related measures, having made a quit attempt the year before, having less motivation to smoke, and having an intention to quit sooner were all positively associated with making a quit attempt.

We now turn to predictors of short-term quit maintenance among those who made attempts. Table 5 (Column 1) shows that after controlling for demographics, five of the motivation-to-quit variables were significantly inversely associated with reporting being quit for at least a month at follow-up in at least two of the three wave-to-wave transitions. That is, higher motivation was predictive of relapse. When all motivation-to-quit variables were added together (Column 2), want to quit and the financial cost measure both remained significant in two waves. These two may be interrelated as each was responsible for the other becoming nonsignificant in the waves when both did not predict. The addition of the motivation-related measures (Column 3) resulted in want to quit becoming nonsignificant, with intention to quit and the recency of last quit attempt responsible, as was found for predicting quit attempts. The measures of dependence were responsible for financial cost becoming nonsignificant, as shown in Column 4 (all had equal impact). Of the variables not in the core motivational set, those independently predictive of short-term quit maintenance in the final model were recency of last attempt (no quit attempt in the last year; two waves), higher self-efficacy (one), lower HSI (all three), having a longest attempt of 6 months or more (two), and being a nondaily smoker (one wave).

Additional analyses were run to examine the association between each predictor variable and maintenance after controlling for the use of stop-smoking medications (including Nicotine Replacement Therapy) to quit and the use of cessation

Table 3. Correlations between variables motivating quit attempts (range over the three wave-to-wave transitions; above diagonal for the first seven variables only: those making quit attempts; and below diagonal: total sample)

	1	2	3	4	5	6	7
Want to quit	—	.21–.27	.27–.32	.53–.56	.40–.42	.32–.36	.29–.33
Premature butting out	**.29–.32**	—	.16–.18	.29–.37	.16–.19	.12–.18	.13–.20
Financial cost	**.37–.39**	**.21–.21**	—	.36–.39	.25–.28	.20–.22	.13–.15
Health concern	**.63–.64**	**.35–.39**	**.42–.42**	—	.48–.51	.40–.41	.41–.42
Health outcome expectancy	**.47–.49**	**.21–.24**	**.31–.33**	**.53–.55**	—	.44–.44	.25–.31
Lifestyle outcome expectancy	**.43–.43**	**.18–.21**	**.26–.27**	**.45–.46**	**.47–.48**	—	.24–.24
Overall attitude to smoking	**.37–.39**	**.18–.22**	**.20–.21**	**.44–.46**	**.31–.34**	**.28–.29**	—
Intention to quit	**.63–.64**	**.28–.32**	**.27–.28**	**.49–.51**	**.36–.37**	**.33–.35**	**.30–.31**
Motive to smoke	**−.31 to −.29**	**−.22 to −.17**	−.09 to −.07	**−.20 to −.19**	**−.19 to −.17**	**−.20 to −.18**	**−.20 to −.19**
Self-efficacy	.03–.06	.05–.09	−.04 to −.01	−.03 to −.01	.01–.03	.04–.04	.02–0.4
Tried in the last year	**−.36 to −.34**	**−.24 to −.22**	**−.17 to −.16**	**−.29 to −.27**	**−.19 to −.18**	**−.19 to −.19**	**−.17 to −.16**
Heaviness of Smoking Index	**−.43 to −.35**	**−.14 to −.12**	.08–.10	−.03–.00	.02–.02	.00–**.05**	−.03–.02
Longest attempt	**.22–.23**	**.08–.13**	**.08–.10**	**.16–.17**	**.10–.11**	**.09–.10**	**.10–.12**

Notes. Bold text indicates statistically significant at *p* < .05.

Table 4. Predictors of quit attempts

Core predictor variable	Other variables included at each step			
	Step 1. Demographic set	Step 2. Plus other motivation to quit variables	Step 3. Plus motivation-related set	Step 4. Plus dependence set
Wanting to quit				
Waves 3–4	**1.83** (1.72–1.94)	**1.61** (1.49–1.73)	**1.23** (1.13–1.35)	**1.22** (1.11–1.33)
Waves 4–5	**1.92** (1.8–2.05)	**1.62** (1.50–1.76)	**1.24** (1.12–1.37)	**1.25** (1.13–1.38)
Waves 5–6	**1.99** (1.86–2.12)	**1.73** (1.60–1.88)	**1.33** (1.21–1.47)	**1.31** (1.19–1.45)
Frequency of butting out				
Waves 3–4	**1.43** (1.35–1.50)	**1.21** (1.14–1.28)	**1.10** (1.04–1.18)	**1.08** (1.02–1.16)
Waves 4–5	**1.49** (1.41–1.57)	**1.24** (1.17–1.32)	**1.14** (1.06–1.21)	**1.12** (1.05–1.20)
Waves 5–6	**1.35** (1.28–1.43)	**1.12** (1.06–1.19)	1.04 (0.97–1.11)	1.03 (0.96–1.10)
Financial cost				
Waves 3–4	**1.32** (1.24–1.41)	0.96 (0.89–1.04)	0.98 (0.90–1.06)	0.99 (0.92–1.08)
Waves 4–5	**1.42** (1.33–1.52)	1.03 (0.95–1.11)	1.03 (0.94–1.12)	1.07 (0.98–1.16)
Waves 5–6	**1.35** (1.26–1.45)	0.97 (0.90–1.06)	0.96 (0.89–1.05)	0.98 (0.90–1.06)
Health concern				
Waves 3–4	**1.82** (1.69–1.96)	1.05 (0.95–1.17)	0.98 (0.88–1.09)	0.98 (0.88–1.10)
Waves 4–5	**1.98** (1.83–2.15)	1.10 (0.98–1.11)	1.04 (0.92–1.18)	1.03 (0.91–1.16)
Waves 5–6	**1.99** (1.83–2.16)	**1.17** (1.04–1.31)	1.11 (0.98–1.25)	1.10 (0.97–1.24)
Health outcome expectancy				
Waves 3–4	**1.43** (1.35–1.50)	**1.10** (1.03–1.18)	**1.09** (1.02–1.16)	**1.10** (1.03–1.18)
Waves 4–5	**1.41** (1.33–1.49)	1.04 (0.97–1.12)	1.04 (0.96–1.12)	1.05 (0.98–1.14)
Waves 5–6	**1.39** (1.32–1.46)	1.00 (0.93–1.07)	1.01 (0.94–1.08)	1.01 (0.94–1.09)
Lifestyle outcome expectancy				
Waves 3–4	NA	NA	NA	NA
Waves 4–5	**1.45** (1.36–1.54)	1.07 (0.99–1.15)	1.03 (0.95–1.11)	1.04 (0.96–1.12)
Waves 5–6	**1.43** (1.34–1.52)	1.06 (0.99–1.14)	1.02 (0.94–1.10)	1.03 (0.95–1.11)
Overall attitude to smoking				
Waves 3–4	**1.43** (1.34–1.53)	1.07 (1.00–1.16)	1.05 (0.97–1.13)	1.05 (0.97–1.13)
Waves 4–5	**1.45** (1.35–1.56)	1.06 (0.97–1.15)	1.03 (0.95–1.11)	1.03 (0.94–1.12)
Waves 5–6	**1.46** (1.36–1.56)	1.08 (0.99–1.16)	1.04 (0.96–1.13)	1.05 (0.97–1.14)

Notes. NA = not applicable.

Figures are odds ratios, and 95% *CI*s are in parentheses. Bold text indicates statistically significant at $p < .05$. Step 1 involves seven separate analyses for each wave, while Steps 2–4 are single analyses per wave. Waves 3–4 ($n = 5,064$ valid + 305 missing), Waves 4–5 ($n = 4,585$ valid + 258 missing), and Waves 5–6 ($n = 4,633 + 355$ missing).

services. These were added to the final step with the dependence-related variables. Neither variable altered the association between maintenance and any of the predictors appreciably. Reported use of stop-smoking medications was independently associated with maintaining a quit attempt in both Waves 4–5 (*OR* [odds ratio] 1.38, $p = .005$) and in waves 5–6 (*OR* = 1.49, $p = .001$). However, reported use of other forms of cessation help was not.

We explored the possibility that the time elapsed between measuring the predictor variables and making a quit attempt was a potential moderator of the association between motivation and maintenance. For instance, it is plausible that more highly motivated people might attempt to quit sooner thereby having more time to relapse than those who were less motivated. The outcome variable was defined as any attempt that lasted at least 1 month, regardless of smoking status at follow-up, beginning in the 6 months following assessment of the predictor variables (possible only from Wave 4 onwards). We essentially found the same patterns as above. In the Wave 4–5 transition ($n = 565$), none of the core motivational variables were significantly associated with maintenance. In the Wave 5–6 transition ($n = 543$), reported wanting to quit was negatively associated with maintenance after controlling for all variables (*OR* = 0.64, $p = .025$). Lifestyle outcome expectancy after quitting was negatively associated, remaining significant after controlling for demographic variables only (*OR* = 0.77, $p = .041$).

Still restricted to the 6 months following measurement, we increased the outcome variable to 6-month sustained abstinence and found essentially the same results. In the Wave 4–5 analyses, want to quit was significantly predictive when controlling for demographics and all motivation-to-quit variables (*OR* = 0.78, $p = .35$) and borderline with the addition of the dependence variables (*OR* = 0.78, $p = .052$). In the Wave 5–6 analyses, only want to quit (*OR* = 0.79, $p = .020$) and concerns over the financial cost (*OR* = 0.78, $p = .018$) were predictive, and only after controlling for demographics, the effects were becoming nonsignificant when other variables were added.

Discussion

The findings from this study confirm that factors that motivate smokers to make a quit attempt are very different from those

Table 5. Predictors of quit maintenance

Core predictor variable	Other variables included at each step			
	Demographic set	Plus other motivation to quit variables	Plus motivation-related set	Plus dependence set
Want to quit				
Waves 3–4	**0.89** (0.78–0.99)	0.95 (0.83–1.09)	0.96 (0.82–1.13)	1.00 (0.85–1.17)
Waves 4–5	**0.81** (0.72–0.91)	**0.83** (0.71–0.96)	0.90 (0.75–1.08)	0.90 (0.75–1.08)
Waves 5–6	**0.77** (0.68–0.87)	**0.86** (0.74–0.99)	0.95 (0.80–1.14)	0.96 (0.80–1.15)
Freq of butting out				
Waves 3–4	**0.91** (0.83–0.99)	0.94 (0.85–1.03)	0.93 (0.84–1.02)	0.90 (0.81–1.00)
Waves 4–5	**0.88** (0.80–0.97)	0.90 (0.82–1.00)	0.90 (0.81–1.01)	**0.89** (0.80–0.99)
Waves 5–6	**0.83** (0.74–0.92)	**0.87** (0.78–0.97)	**0.89** (0.79–0.99)	**0.85** (0.76–0.96)
Financial cost				
Waves 3–4	**0.81** (0.72–0.91)	**0.83** (0.73–0.94)	**0.84** (0.74–0.96)	0.89 (0.78–1.01)
Waves 4–5	**0.82** (0.72–0.93)	**0.85** (0.74–0.98)	**0.87** (0.75–0.99)	0.91 (0.79–1.05)
Waves 5–6	0.89 (0.78–1.02)	1.01 (0.88–1.17)	1.04 (0.90–1.20)	1.12 (0.96–1.30)
Health concern				
Waves 3–4	**0.87** (0.77–0.99)	1.04 (0.86–1.25)	1.04 (0.86–1.26)	1.04 (0.86–1.26)
Waves 4–5	0.89 (0.77–1.03)	1.17 (0.95–1.44)	1.22 (0.99–1.51)	1.20 (0.97–1.49)
Waves 5–6	**0.72** (0.62–0.83)	0.82 (0.66–1.00)	0.86 (0.70–1.07)	0.85 (0.68–1.05)
Health outcome expectancy				
Waves 3–4	0.92 (0.83–1.01)	0.98 (0.87–1.10)	0.97 (0.86–1.09)	0.99 (0.88–1.12)
Waves 4–5	0.95 (0.85–1.05)	1.06 (0.93–1.21)	1.05 (0.92–1.20)	1.08 (0.94–1.23)
Waves 5–6	**0.88** (0.79–0.97)	1.00 (0.88–1.14)	0.99 (0.87–1.12)	0.99 (0.86–1.13)
Lifestyle outcome expectancy				
Waves 3–4	NA	NA	NA	NA
Waves 4–5	**0.89** (0.79–0.99)	0.93 (0.82–1.06)	0.92 (0.81–1.05)	0.92 (0.81–1.05)
Waves 5–6	**0.90** (0.80–0.99)	1.00 (0.88–1.14)	1.02 (0.89–1.16)	1.06 (0.92–1.22)
Overall attitude to smoking				
Waves 3–4	0.95 (0.84–1.06)	1.00 (0.88–1.14)	1.00 (0.88–1.14)	1.01 (0.88–1.16)
Waves 4–5	0.90 (0.79–1.02)	0.94 (0.82–1.08)	0.93 (0.80–1.07)	0.95 (0.82–1.10)
Waves 5–6	0.91 (0.81–1.04)	1.04 (0.90–1.19)	1.02 (0.89–1.18)	1.02 (0.88–1.18)

Notes. NA = not applicable.

Figures are odds ratios, and 95% *CI*s are in parentheses. Bold text indicates statistically significant at $p < .05$. Step 1 involves seven separate analyses for each wave, while Steps 2–4 are single analyses per wave. Waves 3–4 ($n = 1,994$ valid + 127 missing), Waves 4–5 ($n = 1,662$ valid + 103 missing), and Waves 5–6 ($n = 1638$ valid + 141 missing).

involved in maintaining abstinence. Thus, to suggest that all one needs to quit is to be motivated to do so is wrong. The reality is that one needs to be motivated to prompt action to stop smoking, but this is not sufficient in and of itself to ensure that one will stop smoking for any length of time. This is not an isolated finding, being consistent with other studies (e.g., Hyland et al., 2006; Zhou et al., 2009) where positive effects for predicting attempts reversed (e.g., Borland et al., 1991; Hyland et al.) or trended (e.g., West et al., 2001; Zhou et al.) toward the motivational measures predicting relapse. Indeed, the findings are very similar to those of Hyland et al. on earlier waves of this study, although the reverse effect of motivational variables on maintenance was clearer for the variables in common.

Before going on to try to understand these results, it is important to consider limitations of the study. Single-item measures were used for several constructs; however, given that we found the expected positive effects for quit attempts, lack of validity of the measures cannot be used to explain the reversal of effects for maintenance. Motivation is changeable, and a positive relationship between motivation and maintenance might have been found if the follow-up period was shorter. We tested

for this to some degree by shortening the period in which quit attempts were included to the 6 months after the predictor wave and found similar trends, albeit with some sense that the particular motivational variables may have changed. This is only a partial control as it involves memory for a period of 6 months or more before the outcomes were measured. This should be less a problem for maintenance than for making attempts, but if it misses a proportion of less memorable attempts (which would include those longer ago and thus closest to the predictors), it could distort the findings.

The finding that measures of motivation predicted quit attempts largely independent of expressed intention to quit is curious. It may be because the motivational variables include a more stable motivational component than the intention measure. Our intention to quit smoking measure asked if the respondent was planning to stop smoking in the next month, 6 months, beyond that, or not at all. We assessed the predictiveness of quit intention across periods of around 1 year. It is plausible that more of the effects would be mediated through intention, at least for making attempts, if the period being asked about was more consistent with the intention question. We can

think of no mechanisms by which any likely biases in self-report (largely differential memory) might explain this finding.

Similarly, we think it unlikely that the different effects for motivation are due to a need of smokers to espouse positive thoughts about the value of quitting regardless of doubts. Whereas the more cognitive measures of motivation, such as outcome expectancies, had their effects through expressed wanting, the measure least likely to be subject to expectancy effects (prematurely butting out cigarettes) was most predictive of relapse. Whatever the explanation for the findings, it needs to apply equally to hot and cold motivational processes, as very similar effects were found for expressed wanting as for expectancies.

None of the proposed mechanisms for explaining the difference in predictive power of the motivational variables received strong support. The hypothesis that motivation beyond that which generates a quit attempt is potentially threatening for maintenance because it may be relied on to the exclusion of effective treatments was not supported. The effects were not mediated or moderated by use of help (medication), so we have no evidence for the second mechanism that motivation is being used as a substitute for more effective strategies. It is possible that the measures of motivation we used are unrelated to the capacity of the individual to generate competing thoughts at times when cravings to smoke threaten relapse, that is, that general motivation has no additional benefit beyond some threshold level (which might be indexed by enough to try). Postquitting, it may be the strength of the motivational force at the moment when a craving occurs that is critical, something consistent with West's PRIME model. If so, it suggests that we need to be developing new measures of motivation that are specific to relapse prevention rather than assuming the adequacy of general measures that can be assessed independently of the behavioral state. Such measures will need to be referenced to, or take into account, the actual experiences of being quit and how these might change and/or might be amenable to interventions (including pharmacotherapies and skills development). They might be like Kahler et al. (2007) measure of commitment to quit or of determination to quit (Segan et al., 2002). However, these kinds of measures can really only be assessed once the individual has made a commitment to quit or has actually stopped.

Third, the possibility that those with high motivation are, on average, a group predisposed to relapse due to factors such as higher nicotine dependence and lower self-efficacy was only partially supported. We tested this by controlling for past quitting history, behavioral dependence, and self-efficacy but found that these factors, particularly dependence, had little effect on the associations with the motivation variables. Herd, Borland, and Hyland (2009) found that frequency of strong urges to smoke postquitting was a predictor of relapse after controlling for time quit and prequit measures of dependence (which were not predictive), so some elements of dependence, other than the conventional behavioral measures used here, may be important. Even if dependence did fully account for the reversal of effects, it is hard to see it masking a true positive association between the motivational variables we measured and maintenance. However, high motivation to cease a behavior that one is nonetheless continuing to engage in can be seen as evidence of high internal conflict. The only motivational measure to remain a significant negative predictor of maintenance after controlling for all other variables, frequency of butting out, may be a good

measure of such internal conflict. Those who frequently stub out a cigarette before finishing it may be highly conflicted by the competing desire to quit and to smoke, which would make it more difficult to remain quit once an attempt is made.

The fourth potential mechanism for the reversal of effect, related to the first, was that different motivational factors are important after quitting to those that are assessed beforehand. On a general level, the making of quit attempts seems to be strongly associated with the desire to escape the potential harms of smoking, while the predictors of maintenance may be related to the experienced benefits of a nonsmoking lifestyle and how these relate to future expected benefits. However, the mechanism for this effect proposed by Rothman (2000) was not supported. Rothman's theory would predict that the outcome expectancy variables would become the main negative predictors of maintenance, especially those for outcomes that had not (yet) been realized. However, the strongest negative predictor was frequency of butting out rather than a cognitive measure of outcome expectancy. Further, it is not clear how such a model would explain repeated failures to stay quit. It seems unlikely that smokers would repeat the same pattern of unmet expectations on subsequent quit attempts; rather, each attempt would begin with more accurate expectations.

One consequence of the finding that the motivational variables do not share a common relationship with both attempts and maintenance is that the study of quitting, including the evaluation of smoking cessation interventions, should look at the contribution of the interventions for making quit attempts separately to their contribution to supporting maintenance. Some interventions might contribute to both attempting and maintenance, but others may only contribute to one. In some cases, it is also important to look at the combined or net effect as the reason why smokers who are highly motivated to quit will eventually succeed at marginally greater rates is because trying more often compensates for their reduced chance of success on any given attempt. There may need to be shifts in strategy once the person has quit as some factors that helped stimulate the attempt may reduce the likelihood of long-term maintenance.

The other major implication of the findings is that it provides a clear demonstration that the ability to remain off cigarettes is not something that is strongly under volitional control. The majority of smokers are genuinely dependent on cigarettes and not able to easily refrain from smoking (Giovino, Henningfield, Tomar, Escobedo, & Slade, 1995; PhilipMorrisUSA, 2009). Thus, the notion that all a smoker must do to stop smoking is want to is misleading, wanting to does not seem to facilitate maintenance. This means that there may need to be renewed focus on treatments that help smokers address their biological dependence to nicotine. Normal volitional factors seem to be sufficient to motivate attempts, and these need to be supported and enhanced, but unless we are prepared to accept low quit rates, there is a need to develop more effective interventions to help smokers remain smoke free (Cummings, Fong, & Borland, 2009). Motivation is a complex set of beliefs and inclinations that we don't know enough about, especially postquitting. The findings of this study suggest a need to shift focus once people try to enact a new lifestyle choice to focus on maximizing the immediate benefits they obtain from it, or maintaining the promise that these benefits will occur in time, rather than continuing to focus on the things that motivated the change in the first place. Gain-framed communications might

be more important once a person has actually quit than when they are only contemplating trying (Toll et al., 2007). Strong disease-related messages are potent motivators of making quit attempts (National Cancer Institute, 2008) but may play little role in maintenance.

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Declaration of Interests

None declared.

References

Balmford, J., & Borland, R. (2008). What does it mean to want to quit? *Drug & Alcohol Review*, *27*, 21–27.

Borland, R., Owen, N., Hill, D., & Schofield, P. (1991). Predicting attempts and sustained cessation of smoking after the introduction of workplace smoking bans. *Health Psychology*, *10*, 336–342.

Cummings, K. M., Fong, G. T., & Borland, R. (2009). Environmental influences on tobacco use: Evidence from societal and community influences on tobacco use and dependence. *Annual Review of Clinical Psychology*, *5*, 211–236.

Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention and behaviour*. Reading, MA: Addison–Wesley.

Fong, G. T., Cummings, K. M., Borland, R., Hastings, G., Hyland, A., Giovino, G. A., et al. (2006). The conceptual framework of the international tobacco control (ITC) policy evaluation project. *Tobacco Control*, *15*(Suppl. 3), 3–11.

Giovino, G. A., Henningfield, J., Tomar, S. L., Escobedo, L. E., & Slade, J. (1995). Epidemiology of tobacco use and dependence. *Epidemiologic Reviews*, *17*, 48–65.

Herd, N., Borland, R., & Hyland, A. (2009). Predictors of smoking relapse by duration of abstinence: Findings from the International Tobacco Control (ITC) Four Country Survey. *Addiction*, *104*, 2088–2099.

Hyland, A., Borland, R., Yong, H.-H, McNeill, A., Fong, G., O'Connor, R., et al. (2006). Individual level predictors of cessation behaviours among participants in the International Tobacco Control (ITC) Four Country Survey. *Tobacco Control*, *15*(Suppl. 3), 83–94.

Kahler, C. W., LaChance, H. R., Strong, D. R., Ramsey, S. E., Monti, P. M., & Brown, R. A. (2007). The commitment to quitting smoking scale: Initial validation in a smoking cessation trial for heavy social drinkers. *Addictive Behaviours*, *32*, 2420–2424.

Marlatt, G. A., Curry, S., & Gordon, J. R. (1988). A longitudinal analysis of unaided smoking cessation. *Journal of Consulting and Clinical Psychology*, *56*, 715–720.

National Cancer Institute. (2008). *The role of the media in promoting and reducing tobacco use (Tobacco Control Monograph No. 19) (NIH Publication No. 07-6242)*. Bethesda, MD: U.S. Department of Health and Human Services, National Institutes of Health, National Cancer Institute.

PhilipMorrisUSA. (2009). *Website: Smoking & health issues: Addiction*, Retrieved 17 October 2009, from http://www .philipmorrisusa.com/en/cms/Products/Cigarettes/Health _Issues/Addiction/default.aspx

Rogers, R. W. (1983). Cognitive and physiological processes in fear appraisals and attitude change: A revised theory of protection motivation. In J. T. Cacioppo & R. E. Petty (Eds.), *Social psychophysiology: A sourcebook*. New York: Guilford Press, 153–176.

Rosenstock, I. M., Strecher, V. J., & Becker, M. H. (1988). Social learning theory and the health belief model. *Health Education Quarterly*, *15*, 175–183.

Rothman, A. J. (2000). Toward a theory based analysis of behavioral maintenance. *Health Psychology*, *19*, 64–69.

Segan, C. J., Borland, R., & Greenwood, K. (2002). Do transtheoretical model measures predict the transition from preparation to action in smoking cessation? *Psychology and Health*, *17*, 417–435.

Thompson, M. E., Fong, G. T., Hammond, D., Boudreau, C., Driezen, P., Hyland, A., et al. (2006). Methods of the International Tobacco Control (ITC) Four Country Survey. *Tobacco Control*, *15*(Suppl. 3), 12–18.

Toll, B., O'Malley, S., Katulak, N., Wu, R., Dubin, J., Latimer, A., et al. (2007). Comparing gain- and loss-framed messages for smoking cessation with bupropion: A randomized controlled trial. *Psychology of Addictive Behaviors*, *21*, 534–544.

Velicer, W. F., DiClemente, C. C., Prochaska, J. O., & Brandenburg, N. (1985). Decisional balance measure for assessing and predicting smoking status. *Journal of Personality and Social Psychology*, *48*, 1279–1289.

West, R., McEwan, A., Bolling, K., & Owen, L. (2001). Smoking cessation and smoking patterns in the general population: A 1-year follow-up. *Addiction*, *96*, 891–902.

West, R. (2006). *Theory of addiction*. Oxford: Addiction Press, Blackwell Publication.

Zhou, X., Nonnemaker, J., Sherrill, B., Gilsenan, A. W., Coste, F., & West, R. (2009). Attempts to quit smoking and relapse: Factors associated with success or failure from the ATTEMPT cohort study. *Addictive Behaviors*, *34*, 365–373.