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FUNCTIONAL BELIEFS ABOUT SMOKING AND QUITTING ACTIVITY AMONG ADULT SMOKERS IN FOUR COUNTRIES: FINDINGS FROM THE INTERNATIONAL TOBACCO CONTROL FOUR-COUNTRY SURVEY

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Abstract

Objective—To examine the psychometric properties, distributions and predictive utility for quitting behaviour of six functional beliefs about smoking among adult smokers.

Design—Data was from the first three waves of the International Tobacco Control Four-Country Survey (ITC-4), a random digit dialed telephone survey of a cohort of over 8,000 adult current smokers from UK, US, Canada and Australia followed up annually.

Main Outcome measures—Quitting attempts and the success of such attempts at the next wave.

Results—The six functional belief measures are modestly correlated with each other and are moderately stable over time. Smoking for enjoyment and life enhancement were significantly negatively related to quitting attempts, at least partly mediated by quitting intention and dependence. Smoking for stress management appeared to reduce quit success among those who tried, an effect mediated by quitting self-efficacy and dependence. Smoking for weight control, social facilitation and as an aid to concentration were not independently associated with cessation.

Conclusion—Positive reasons for smoking may discourage quitting, but stress management is the only function that appears to prospectively predict quit success. Interventions should target those beliefs, and review the value of intervening on beliefs that are unrelated to cessation outcomes.

Keywords

functional beliefs about smoking; quit attempts; smoking cessation

INTRODUCTION

Smoking serves, or is believed to serve, many functions for smokers such as helping with weight control, making socializing easier, providing pleasure/enjoyment, and enhancing concentration. For smokers, these beliefs are potentially important influences on behavior,

whether they are true or not. They are thought by some to be just as important as the pharmacological factors in contributing towards the maintenance of the smoking habit (Gilbert et al., 2000). Interest in smoking motives and/or functions has a long history. Since the 1960s, behavioural researchers have developed scales for assessing smoking motivation/function (e.g., Brandon & Baker, 1991; Horn, 1969; Ikard et al., 1969; Spielberger, 1986). Much of this earlier work was centred on using the scales to help classify smokers into different types of smokers (e.g., addiction smokers, negative affect smokers, weight control smokers). It was argued that accurate identification of smokers into types would help to direct treatment and ensure effectiveness. Subsequent research, however, has questioned the utility and validity of these measures (Shiffman, 1993). Data from self-monitoring studies showed that smoking motives assessed using standard questionnaire do not always correspond to those from self-monitoring data. The disparity may be due to recall bias of questionnaire data as most smokers may not be accurate in determining the reasons they smoke and may tend to remember only events that are salient. Studies examining the relation between scale scores and cessation activity have also produced mixed findings. In general, evidence, mainly from cessation intervention studies, suggests that smoking motivations assessed using standard questionnaire are related to difficulty in both initiating cessation and long-term maintenance (Shiffman, 1993). There is also some evidence of socio-demographic variation. Oei et al. (1991) found in a cessation clinic sample that older smokers were more likely to smoke for pleasure or relaxation compared to their younger counterparts. Women have been reported to smoke more for weight control (Charlton, 1984; French et al., 1994; Gilbert et al., 2000), negative affect regulation and pleasure (Livson & Leino, 1988) than men. It is difficult to know to what extent these findings generalize to population-based samples of smokers.

There are only a few population-based studies of smoking motivations or functions. Rose et al. (1996) examined the predictive utility of a set of six smoking motives derived from the Smoking Motives Scale (Horn, 1969) in a sample of young adults (aged 24–32 years old) who had previously participated in a school-based survey. They found affect control smoking was positively related to making a quit attempt, but not quit success, while stimulation smoking was negatively related to quitting success only. Smoking for sensorimotor effect was the only motive positively related to both quit attempt and quitting success but in interaction with other variables (e.g., gender). It is notable that not all smoking motives were found to inhibit quitting. Using a national sample of UK adult smokers, West et al. (2001) examined prospectively a set of beliefs about the functional values of smoking as predictors of quit attempts and success of attempts. They found only belief about enjoyment of smoking was significantly negatively related to making a quit attempt but not to successful cessation assessed at one-year follow-up. Other smoking motivation related beliefs such as cigarettes give confidence in social situations, giving up smoking would lead to unacceptable weight gain, could not cope without cigarettes, and smoking is main source of pleasure were not significant predictors for both quitting initiation and success. It is difficult to know how robust are the findings of the above two population-based studies and also the extent to which they can be generalized to other countries of similar cultural and sociodemographic backgrounds. The present study seeks to

address this knowledge gap using a large dataset from four countries of similar social and cultural backgrounds.

This paper uses data from the International Tobacco Control Policy Evaluation study (ITC), a cohort study of smokers to explore the role of functional beliefs about smoking in general adult smoking populations, exploiting the longitudinal design of the study to examine prospectively the predictive utility of these measures for cessation.

METHODS

Study population

Data for the present study was drawn from the first three waves of the International Tobacco Control Four Country Survey (ITC-4). The ITC-4 is a random digit dialed telephone survey of adult smokers (aged 18 years and older) recruited from UK, US, Canada and Australia. Over 8,000 are interviewed each wave with retention of ex-smokers. There is replenishment of those lost to follow up. For analysis purposes, we employed only current smokers defined as those who reported having smoked at least 100 cigarettes in their lifetime and who had smoked at least once in the last 30 days at baseline wave. More details of the methods can be found in Thompson et al. (2006). Respondents are being followed-up every year. Average inter-survey intervals were 7 months (Waves 1–2) and 13 months (Waves 2–3). A flowchart showing the recruitment and attrition at each wave for the total sample (including quitters) and current smokers is shown in Figure 1. The survey fieldwork was conducted in English, or in French if desired in the Francophone areas of Canada. Using stratified random-digit dialing technique, households were contacted and screened for adult smokers who would agree to participate in the study. In households with multiple smokers, the next birthday method was used to randomly select one for participation. Those who agreed were rescheduled for an in-depth 35-minute phone survey a week later and were sent a cheque or voucher to compensate for their time. The study protocol was cleared for ethics by the Institutional Review Boards or Research Ethics Boards in each of the 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).

Measures

Independent variables

Smoking functional beliefs measures: Functional beliefs about smoking were assessed at each wave using a 5-point likert scale to assess how much they agree or disagree with each of six statements: “You enjoy smoking too much to give it up” (enjoyment/pleasure), “Smoking calms you down when you are stressed or upset” (stress management), “Smoking helps you concentrate better” (concentration aid), “Smoking is an important part of life” (life enhancement), “Smoking helps you control your weight” (weight control), and “Smoking makes it easier for you to socialize” (social enhancement).

Outcome variable

Subsequent quitting activity: At wave 2 and similarly at wave 3, respondents were asked the question “Have you made any attempts to stop smoking since we last talked with you?” to which they answered yes/no as an indication of quitting attempts following previous wave. Among those who reported having made a quit attempt, they were also asked whether they were now back smoking or still stopped as an indication of quitting success. For the purposes of analysis, we defined quit attempts as those which lasted for at least 24 hours (otherwise treated as no attempt) based on reported length of last quit attempt. Quit success was defined as those who reported being abstinence for at least a month based on the findings of Velicer and Prochaska (2004). We excluded those who were quit for less than a month from the analyses.

Other variables

Demographic measures: Socio-demographic variables including age, gender, education, income, and minority status were measured. However, because of differences in education and income systems between countries, we had to systematize the categorization across countries into three broad categories (low, moderate and high) so that they are roughly comparable across countries. For minority status, a different question was asked in Australia (language spoken at home) as compared to asking about racial/ethnic group in the other three countries. This allowed the derived categories: Identified minority, and Other.

Key predictors of quitting: This set of predictors of quitting has been reported elsewhere (see Hyland et al., 2006). It includes the following: Intention to quit, self-efficacy of quitting, outcome expectancy of quitting, worries about health and quality of life, overall attitude about smoking, tried to quit within last year, longest time off smoking, heaviness of smoking index (HSI), and baseline smoking frequency. Each of these variables was assessed at each wave for smokers who reported still smoking.

Statistical Analysis

SPSS for Windows, Version 13.0 was used for all analyses involving both cross-sectional and longitudinal data. Means reported in the table were computed from data weighted to the age and sex distributions of the population where the sample came from in each of the four countries. All other analyses were first conducted on unweighted data and then repeated on weighted data. The results did not differ and so reported estimates were based on unweighted data.

Cross-sectional analyses—We examined mean differences in levels of endorsement of functional beliefs by country, age and sex using multivariate analysis of variance (MANOVA) and then subjected to post-hoc Newman-Keul tests for pairwise comparison. We repeated the same analyses on waves 2 and 3 data where we also included time in survey as a covariate.

Longitudinal analyses—To explore predictors of cessation, we used sequential logistic regression analyses where we tested the role of these six smoking function variables as independent predictors of subsequent quitting activity (that is, quit attempts and quit

success). In step 1, we entered into the model all six smoking function variables of current smokers to predict making a subsequent quit attempt reported at wave 2. Then in step 2, we included in the predictive model the socio-demographic variables to determine the effects of smoking function variables on quitting after adjusting for possible confounding variables. In step 3, we added a set of key predictors of quitting identified by Hyland et al. (2006) into the model. This last step allows us to test the independent effect of the smoking function variables over and above those of Hyland on quit attempt. We repeated these analyses for quitting success among a subgroup of smokers who had made a quit attempt. We also tested for possible moderating effects of country, age and sex on the relationship between each of the smoking function variables and quitting outcomes in the model. This was done by adding into the model a set of interaction terms derived from the cross-product of country, age and sex with each of the six functional beliefs.

RESULTS

Inter-item correlations, means and retest reliability of the six functional belief items

The inter-item correlations of the six smoking functional belief items were modestly related ($r = 0.10\text{--}0.36$ across the three waves; all $p < .001$, see Table 1 for Wave 1) and these six items had similar mean scores across the three waves (see Table 1). Correlations were also similar when analysed separately by country, gender and age category (data not shown). All items are moderately stable over time with correlations between items across waves between 0.4 and 0.6.

Mean differences in functional beliefs about smoking by country, age and sex

Combined results based on cross-sectional analyses of wave 1, wave 2 and wave 3 data revealed that there were significant main effects of age, sex, and country and also significant interaction effects of age by sex, age by country and sex by country on levels of the six functional beliefs (see Table 2). Functional beliefs about smoking for enjoyment, concentration aids, life enhancement and weight control increased with age while smoking for social enhancement decreased with age. Female smokers consistently showed a greater endorsement of beliefs about smoking for stress management, life enhancement and weight control than male smokers, with the reverse for belief about smoking for social enhancement. Interestingly, there was also an age by sex interaction for weight control belief with the sex differences diminishing significantly at aged 55 and older. In general, UK smokers had higher mean scores on all functional beliefs except for stress management belief where US had the highest mean scores. Sex differences in levels of endorsement of weight control beliefs were not as notable in Australia and UK as in Canada and US. The endorsement of the concentration aid belief increased with age at a much greater rate in Australia and UK than it did in the US and Canada while the endorsement of the stress management belief increased with age at the greatest rate for Canada and least for Australia.

For all of the above analyses, we also included time in survey and found that the scores of the newly recruited respondents were similar to that of those recruited in earlier waves.

Functional beliefs about smoking as predictors of quitting

Preliminary analyses indicated that 36.7% had made a quit attempt between Waves 1 and 2 (41.2% between Waves 2 and 3) and of these, 19.6% succeeded for at least a month (24.4% at Wave 3). Bivariate analyses showed that smoking for enjoyment, concentration aids, life enhancement and weight control were significantly and negatively related to making quit attempts in both cohorts (Waves 1 to 2, and Waves 2 to 3), but smoking for social enhancement and stress management were not.

Table 3 presents the results of the logistic regression analysis of wave 1 smoking functions of current smokers in predicting subsequent quitting activity (quit attempts regardless of success) at wave 2. We first adjusted for shared variance of the other 5 functional beliefs. Then adjusted for socio-demographic variables in step 2, and found smoking for enjoyment/pleasure and life enhancement remained highly significant predictors (see Table 3), but when other known predictors of cessation (Hyland et al., 2006) were added at step 3, smoking for enjoyment was the only significant independent predictor. We explored further which of the Hyland's set of predictors were important mediators using procedures developed by Baron and Kenny (1986) to examine the direct and indirect effects of the smoking function variables on quit attempt. We found (data not shown) both dependence (as measured by the Heaviness of smoking index) and intention to quit were important mediators that fully accounted for the effect of life enhancement belief on quit attempt, and that intention to quit accounted for part of the enjoyment belief effect. Using only the current smokers at wave 2 (both cohort and replenishment), the effect of enjoyment on quit attempt was replicated in the waves 2 to 3 longitudinal data, up to step 3 where it disappeared (mediated by intention to quit and also overall attitudes to smoking), none of the six beliefs being significant independent predictors in that analysis.

Presented in Table 4 are the results of the relationship between the six functional beliefs reported at wave 1 and quitting success at wave 2 among those who had made a quit attempt between waves. Bivariate analyses indicated that only the belief that "smoking is an important part of life" was significantly negatively related to this outcome. However, multivariate analyses, controlling for demographics and the other functional beliefs, indicated that both life enhancement and stress management beliefs were significant independent predictors (see Table 4). After adding in the key set of known predictors of quitting, only stress management remained significant (albeit marginally). Further exploration suggests that the effect of life enhancement motive was fully mediated by dependence (Heaviness of smoking index) while that of stress management was partially mediated by both dependence and quitting self-efficacy. When repeated using data from waves 2 and 3, we were only able to partly replicate the effect of smoking for stress management on quitting; it remained significant after adjusting for socio-demographics but became non-significant after adding in the set of known predictors of quitting (see Table 4). As before, both dependence and quitting self-efficacy were important mediators but this time dependence fully mediated the effect of stress management belief (data not shown). Evidence of survey sampling effect was found for this replication model with those from the baseline cohort being more likely to succeed in their quit attempt as compared to those newly recruited at wave 2.

In analyses not shown here, we explored further the relative contribution of the stable (trait-like) and the unstable (state-like) components of the smoking function in relation to quitting outcomes. We did this by including in the regression model for the wave 2 to wave 3 replication both the difference scores between wave 1 and wave 2's functional beliefs, as an index of the state component, and the wave 2 functional beliefs, reflecting the trait component after partialing out the state component effect.

We found both the trait and the state scores for enjoyment smoking were significantly and negatively related to making a quit attempt (p 's $<.001$) but only the trait effect remained after controlling for Hyland's variables ($p<.05$). The state effect for this functional belief was fully mediated by intention to quit. The results for quit success were similar to the earlier replication analyses with the state effect for stress management not having any effect on outcome; only the trait measure being significant after adjusting for socio-demographic factors ($p<.05$) but became non-significant after controlling for Hyland's variables. For all analyses mentioned above we examined 2-way interaction effects between each of the six functional beliefs and variables such as country, age and sex for both quit attempt and quit success and found none. These results indicated that country, age and sex did not moderate the relationship between each of the six smoking function measures and the two quitting outcomes.

DISCUSSION

Using data from four predominantly English-speaking countries, the results from the present study suggest that the six functional belief measures are conceptually distinct (as indicated by the low inter-item correlation) and that they are moderately stable over a period of more than a year. The research utility of these measures for population-based studies is further strengthened by the fact that the psychometric properties of these measures do not appear to vary by age, gender and country.

In interpreting the results of this study, we need to keep two things in mind. Firstly, that our measures of the functional beliefs were taken before the person quit. It is likely that these beliefs will be affected by experiences post quitting, among those who try, and thus post-quitting measures would be more likely to predict outcomes. However, for making attempts it is the pre-quit beliefs that are critical as they are presumed to inhibit attempts directly. In other words, to the extent that they inhibit attempts, they prevent experiences which could modulate them. Secondly, as single-item measures, they may lack sensitivity, so it remains possible that more sensitive measures might reveal effects where we failed to find them.

The notion that smoking is maintained by its perceived benefit of smoking is partly supported. Based on the multivariate analyses, it appears that smoking for enjoyment inhibits making quit attempts, but does not seem to affect outcomes, replicating the findings of West et al. (2001). Smoking for life enhancement, on the other hand, seems to act as a barrier to quitting attempts and possibly, quitting success as well. In contrast, smoking for stress management appears to be a barrier to quitting success but does not seem to affect making quitting attempts. This suggests that positive reasons for smoking may be important inhibitors of taking action, but functions that regulate negative aspects of life may be more

important in triggering relapse. Clearly, from an intervention point of view, it is important to consider the specific perceived functional values of smoking for individual smokers so that relevant beliefs can be challenged. This may be done by showing the quitter how the function can be served with more adaptive and healthy alternatives. The independent effect of smoking for enjoyment on quitting attempts over and above the other key predictors of quitting (but only in one replication) is notable. Our analyses indicate that the strongest effect is from the stable component of this belief, but that the variation in the state effect is mediated by intention. We should be cautious in concluding that the effect is related to enjoyment. This statement includes a reference to future quit intention (“too much to give it up”), and so its effect could be because it complements the direct measure of intention used. We plan to assess the role of a pure measure of enjoyment “I enjoy smoking” in subsequent waves of this study.

Perceiving greater value from smoking seems to inhibit quitting. It does this in part through an effect on intentions for those smoking for life enhancement and enjoyment but also on dependence for those smoking for life enhancement. The latter makes sense in that those who subscribe to the belief that smoking is an important part of life are likely to be highly addicted smokers.

Smoking for stress management was the only functional belief that independently predicted quit success. It appears to exert its influence primarily through reducing quitters’ confidence in staying quit (self-efficacy). Making an attempt to quit can be stressful particularly during the acute stage of withdrawal, and anticipating problems here seems to lead to reduced self-efficacy. It also suggests that some quitters are not dealing effectively with stress, or at least are turning quickly to cigarettes to help. Smokers need to ensure they have or be taught alternative coping strategies for managing stress and anxiety (both those related to quitting and in general), so they do not fall back on smoking for relief.

The lack of a relationship with quitting activity for three of the functional beliefs (that is, concentration aids, weight control and social enhancement) suggests that they are either relatively unimportant or that their relationships with quitting are complex. We also cannot reject the possibility that self-report measures of these functions may not be valid indicators of their true effects. Given the dominance of smoke-free workplaces, use of smoking as a concentration aid may no longer be playing any role it might have played when people could work and smoke concurrently. Perhaps the perceived functionality of smoking for weight control isn’t a simple barrier to quitting. This is consistent with the literature that shows a complex relationship between weight concerns, weight gains and quit outcomes (French & Jeffery, 1995). The perceived role as a social facilitator lacked any predictive power. Smoking is now less normative in these countries, so social factors in smoking maintenance among adult smokers may indeed not be important. As noted above, it is also possible, for prediction of success, that perception of many functions may not be validated by experience post-quitting. Where experiences differ from expectations, expectations pre-quitting would not be expected to predict outcomes after quitting.

The finding of an age and sex differences found here largely confirms that of previous studies. The age by sex interaction on the weight control belief is of note, it appears only to

be rated as relatively unimportant for young males. We are not sure how important these demographic differences are for gender and age. Clarke et al. (1993) argued that differences are likely to reflect socio-cultural factors correlated with age and sex rather than purely biological factors.

The higher endorsement of smoking for stress management in the US relative to the other 3 countries may be explicable in the context of September 11 terrorist attacks in the US which took place a year before our baseline wave, as this event has been linked to increased stress in the USA for at least 6 months post the event (Schuster et al., 2001; Silver et al. 2002). Dal Cin et al. (2005) using data from wave 1 of the ITC survey a year after 9/11 found that, although general life stress assessed using the Perceived Stress Scale (Cohen et al., 1983) was similar across the four ITC countries, world-event related stress was found to be significantly higher in the US compared to the other 3 countries, suggesting some increased concern in the US and thus, a need for more stress management.

It is unclear at this point, however, why smokers from UK are much more likely to endorse most of these functional beliefs compared to those from the other 3 countries. Similarly, the mechanisms underlying the country by age and country by sex differences in levels of endorsement of the various functional beliefs are unclear.

The similarity in the predictive ability of the six smoking functions on quitting across the four countries is an important finding as it suggests that despite the country variation in the extent to which the functional beliefs are held, they have very similar impact on smoking behaviour. It also suggests that findings in any one of these four countries are likely to generalize to the others. This may extend to other culturally similar countries (e.g., New Zealand, Ireland).

Another limitation of this study is the relatively long period between collection of the predictor measures and the outcomes and the varying intervals between the measures and the initiation of quit attempts. To the extent that what is important is the short-term component of these beliefs, this is a problem. Nevertheless, our data suggest that at least for the association between enjoyment smoking and making attempts to quit, both the stable (trait-like) component and the more state-like component of this smoking function may be important with the latter effect being mainly mediated through intention to quit. The stable aspect of smoking motivation is likely to be shaped by the smoker's personality while the unstable aspect is likely to be influenced by situational factors (Gilbert et al. 2000; O'Connor, 1986).

Finally, the present study did not examine other aspects of smoking motives (e.g., sensory stimulation) which have been identified in the literature (e.g., Joseph et al., 2003) and they may be important in relation to quitting, and might interact with the functional beliefs studied here. Future studies are needed to explore this further.

In conclusion, this study indicates that positive reasons for smoking seem to have the tendency to inhibit quit attempts while smoking for stress management seems to increase relapse. Interventions that counter these beliefs or which provide preferred alternatives for the functions they serve should be more likely to increase cessation, and/or its success.

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References

- Baron RM, Kenny DA. The moderator-mediator variable distinction in social psychological research: conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*. 1986; 51:1173–1182. [PubMed: 3806354]
- Brandon TH, Baker TB. The Smoking Consequences Questionnaire: the subjective expected utility of smoking in college students. *Psychological Assessment: A Journal of Consulting and Clinical Psychology*. 1991; 3:484–491.
- Charlton A. Smoking and weight control in teenagers. *Public Health (London)*. 1984; 98:277–281.
- Clarke V, White V, Beckwith J, Borland R, Hill D. Are attitudes towards smoking different for males and females? *Tobacco Control*. 1993; 2:201–208.
- Cohen S, Kamarck T, Mermelstein R. A global measure of perceived stress. *Journal of Health and Social Behaviour*. 1983; 24:386–396.
- Dal Cin, S.; Fong, GT.; Lee, W.; Zanna, M.; Hammond, D. Stress due to world events predicts smoking relapse: Findings from the ITC 4-Country Survey. Paper presented at the Society for Research on Nicotine and Tobacco's 11th Annual Meeting and the 7th Annual SRNT European Conference; March 20–23, 2005; Prague, Czech Republic.
- French SA, Jeffery RW. Weight concerns and smoking: a literature review. *Annals of Behavioral Medicine*. 1995; 17 (3):234–244. [PubMed: 24203535]
- French SA, Perry CL, Leon GR, Fulkerson JA. Weight concerns, dieting behavior, and smoking initiation in adolescents: A prospective epidemiologic study. *American Journal of Public Health*. 1994; 84:1818–1820. [PubMed: 7977924]
- Gilbert DG, Sharpe JP, Ramanaish NV, Detwiler FRJ, Anderson AE. Development of a Situation x Trait Adaptive Response (STAR) model-based smoking motivation questionnaire. *Personality and Individual Differences*. 2000; 29:65–84.
- Horn, D. Use of tobacco. US Department of Health, Education and Welfare. National Clearing House for Smoking and Health; 1969.
- Hyland A, Borland R, Li Q, Yong HH, McNeill A, Fong GT, Cummings KM. Individual-level predictors of cessation behaviours among participants in the International Tobacco Control (ITC) Policy Evaluation Study. *Tobacco Control*. 2006; 15(Suppl III):iii83–iii94. [PubMed: 16754952]
- Joseph S, Manafi E, Iakovaki AM, Cooper R. Personality, smoking motivation, and self-efficacy to quit. *Personality and Individual Differences*. 2003; 34:749–758.
- Ikaard FF, Green D, Horn D. A scale to differentiate between types of smoking as related to the management of affect. *International Journal of Addictions*. 1969; 4:649–659.
- Livson N, Leino EV. Cigarette smoking motives: factorial structure and gender differences in a longitudinal study. *The International Journal of the Addictions*. 1988; 23(6):535–544. [PubMed: 3170047]
- O'Connor K. A model of situational preference amongst smokers. *Personality and Individual Differences*. 1985; 6:151–160.
- Oei TPS, Tilley D, Gow K. Differences in reasons for smoking between younger and older smokers. *Drug and Alcohol Review*. 1991; 10:323–330. [PubMed: 16818296]
- Rose JS, Chassin L, Presson CC, Sherman SJ. Prospective predictors of quit attempts and smoking cessation in young adults. *Health Psychology*. 1996; 15(4):261–268. [PubMed: 8818672]

- Schuster MA, Stein BD, Jaycox LH, Collins RL, Marshall GN, Elliott MN, Zhou AJ, Kanouse DE, Morrison JL, Berry SH. A national survey of stress reactions after the September 11, 2001, terrorist attacks. *New England Journal of Medicine*. 2001; 345:1507–1512. [PubMed: 11794216]
- Shiffman S. Assessing smoking patterns and motives. *Journal of Consulting and Clinical Psychology*. 1993; 61(5):732–742. [PubMed: 8245271]
- Silver RC, Holman EA, McIntosh DN, Poulin M, Gil-Rivas V. Nationwide longitudinal study of psychological responses to September 11. *Journal of the American Medical Association*. 2002; 288:1235–1244. [PubMed: 12215130]
- Spielberger, CD. Psychological determinants of smoking behaviour. In: Tollison, RD., editor. *Smoking and society: toward a more balanced assessment*. Lexington, MA: Heath; 1986. p. 89-134.
- Thompson ME, Fong GT, Hammond D, Boudreau C, Driezen PR, Hyland A, Borland R, Cummings KM, Hasting G, Siahpush M, Mackintosh AM, Laux F. The methodology of the International Tobacco Control Four-Country Survey. *Tobacco Control*. 2006; 15(Suppl III):iii12–iii18. [PubMed: 16754941]
- Velicer WF, Prochaska JO. A comparison of four self-report smoking cessation outcome measures. *Addictive Behaviors*. 2004; 29:51–60. [PubMed: 14667420]
- West R, McEwen A, Bolling K, Owen L. Smoking cessation and smoking patterns in the general population: a 1-year follow-up. *Addiction*. 2001; 96:891–902. [PubMed: 11399220]

Figure 1.
A flowchart showing recruitment and attrition at each wave for overall sample and current smokers.

Table 1

Inter-item correlations, means (SD) and retest correlations of the six smoking function measures^a among current smokers.

	1	2	3	4	5	6
<u>Interitem correlations[*] (Wave 1, N=8,869)</u>						
1. Enjoyment/Pleasure	---					
2. Stress management	0.17	---				
3. Concentration aids	0.24	0.30	---			
4. Life enhancement	0.33	0.18	0.35	---		
5. Weight control	0.14	0.14	0.24	0.24	---	
6. Social enhancement	0.10	0.10	0.21	0.17	0.17	---
<u>Means (SD)</u>						
Wave 1 (n=8,869)	3.33 (1.19)	3.97 (0.96)	2.82 (1.12)	2.90 (1.16)	2.63 (1.16)	2.49 (1.03)
Wave 2 ^b (n=7,760)	3.29 (1.18)	3.93 (0.95)	2.85 (1.13)	2.90 (1.14)	2.62 (1.13)	2.47 (1.02)
Wave 3 ^c (n=7,487)	3.28 (1.18)	3.93 (0.93)	2.85 (1.11)	2.94 (1.13)	2.63 (1.12)	2.49 (0.99)
<u>Between wave Correlations</u>						
Wave 1-Wave 2 (7months apart, n=6,073)	.51	.47	.54	.55	.58	.46
Wave 2-Wave 3 (13months apart, n=4,794)	.49	.48	.55	.56	.54	.46

Note: All correlation coefficients in the table above were significant at $p < .001$;

^{*} Only Wave 1 results are presented since similar results were found for Waves 2 and 3;

^a on a 1–5 scale;

^b include wave 1 replenishment sample;

^c include waves 2 and 3 replenishment sample; means reported in the table above are based on weighed data but not the correlations.

Table 2

Results¹ based on waves 1, 2 and 3 data for each individual belief about smoking function by age, sex and country.

	Smoking for...					
	Enjoyment/pleasure	Stress management	Concentration aids	Life enhancement	Weight control	Social enhancement
<u>Main effects</u>						
Age	Increases	Decreases ^b	Increases	Increases	Increases	Decreases
Sex	Female ^a	Female	ns	Female	Female	Male
Country	UK > the rest ^a	US > the rest ^a	UK > the rest	UK > the rest ^a	UK > the rest	UK > the rest
<u>Interaction effects</u>						
Age x Sex	ns	ns	ns	ns	More for older male	ns
Age x Country	Increases with age greatest in Australia ^b	Decreases with age greatest for Canada	Increases with age greater for Australia & UK	Increases with age least in UK ^b	ns	ns
Sex x Country	ns	ns	ns	ns	Greater sex difference in Canada & US	Sex difference greatest in Australia ^b
Age x Sex x Country	ns	ns	ns	ns	ns	ns

NB.

¹ Results shown in the table are statistically significant at $p < .01$ for all 3 waves of the survey unless otherwise indicated; means and standard deviations of the six smoking function measures by age, sex and country are available on request from the corresponding author.

^a Statistically significant for two out of three waves, and no negative trend.

^b Statistically significant for one out of three waves, and no negative trends.

ns – statistically not significant for all three waves.

Table 3

Logistic regression analysis predicting subsequent quit attempts at waves 2 and 3 for those smoking at the previous wave.

Wave 1 Predictors	Wave 2 Quit Attempts OR (95% CI) n = 6,212		Wave 3 Quit Attempts OR (95% CI) n = 4,610	
	Step 2 ^a	3 ^b	2 ^{a,c}	3 ^{b,c}
Smoking function measures				
Enjoyment/pleasure	0.72 (0.69–0.76) ***	0.90 (0.85–0.95) ***	0.77 (0.73–0.81) ***	0.96 (0.90–1.03)
Stress Management	1.03 (0.97–1.10)	0.99 (0.93–1.06)	1.05 (0.98–1.12)	1.01 (0.94–1.09)
Concentration aid	0.97 (0.92–1.03)	1.01 (0.95–1.07)	0.97 (0.91–1.03)	1.01 (0.95–1.08)
Life enhancement	0.93 (0.88–0.98) **	0.97 (0.91–1.03)	0.92 (0.87–0.98) *	0.96 (0.89–1.03)
Weight control	1.04 (0.99–1.09)	1.01 (0.95–1.06)	1.05 (0.99–1.11)	1.05 (0.99–1.12)
Social enhancement	1.06 (0.99–1.12)	1.03 (0.97–1.09)	1.01 (0.95–1.08)	0.99 (0.92–1.06)
Nagelkerke R square ^d	0.081	0.252	0.057	0.113

Note:

* significant at $p < .05$;

** $p < .01$;

*** $p < .001$;

^a odds ratios shown are adjusted for age, sex, income, education, ethnicity, and country.

^b odds ratios shown are adjusted for both socio-demographic variables and a set of key predictor variables of quitting - intention to quit, self-efficacy of quitting, outcome expectancy, worries about health and quality of life, overall attitude about smoking, tried to quit within last year, longest time off smoking, heaviness of smoking index, and baseline smoking frequency.

^c odds ratios shown are also adjusted for survey sampling effect (at step 2, $p = .279$; at step 3, $p = .622$).

^d for all predictors included in the model at each step.

Table 4

Logistic regression analysis predicting being abstinent for at least one month subsequently at waves 2 and 3 for those smoking at the previous wave.

Wave 1 Predictors	Wave 2 Quit > 1 month OR (95% CI) n = 2,128		Wave 3 Quit > 1 month OR (95% CI) n = 1,751	
	Step 2 ^a	3 ^b	2 ^a	3 ^b
Smoking function measures				
Enjoyment/pleasure	0.99 (0.90–1.09)	1.03 (0.93–1.14)	0.97 (0.87–1.07)	0.94 (0.84–1.06)
Stress Management	0.85 (0.75–0.95)**	0.87 (0.77–0.98)*	0.87 (0.77–0.99)*	0.91 (0.80–1.04)
Concentration aid	1.05 (0.94–1.18)	1.09 (0.97–1.22)	1.01 (0.89–1.14)	1.02 (0.90–1.15)
Life enhancement	0.84 (0.76–0.94)**	0.99 (0.87–1.11)	0.97 (0.86–1.09)	1.07 (0.95–1.22)
Weight control	1.04 (0.94–1.15)	1.03 (0.93–1.15)	1.04 (0.94–1.15)	1.05 (0.94–1.17)
Social enhancement	1.02 (0.91–1.14)	0.97 (0.86–1.08)	0.97 (0.86–1.09)	0.92 (0.81–1.04)
Survey sampling effect				
Baseline sample	---	---	1.76 (1.26–2.47)***	1.68 (1.18–2.39)**
Wave 2 replenishment	---	---	1.00	1.00
Nagelkerke R square	0.041	0.120	0.052	0.113

Note:

* significant at $p < .05$;

** $p < .01$;

*** $p < .001$;

^a odds ratios shown are adjusted for age, sex, income, education, ethnicity, and country.

^b odds ratios shown are adjusted for both socio-demographic variables and a set of key predictor variables of quitting - intention to quit, self-efficacy of quitting, outcome expectancy, worries about health and quality of life, overall attitude about smoking, tried to quit within last year, longest time off smoking, heaviness of smoking index, and baseline smoking frequency.

^c for all predictors included in the model at each step.