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Do post-quitting experiences predict smoking relapse among former smokers in Australia and the United Kingdom? Findings from the International Tobacco Control Surveys

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Abstract

Introduction: Many smokers attempt to stop smoking every year, but the vast majority of quit attempts fail. This study examined prospectively the association between post-quitting experiences and smoking relapse among ex-smokers in Australia (AU) and the United Kingdom (UK).

Methods: Data came from 584 adult ex-smokers from AU and the UK who participated in Wave 9 of the ITC 4 Country Survey and successfully followed up a year later (Wave 10). Binary logistic

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Ethics approval

The survey protocols and all materials, including the survey questionnaires, were approved by the Office of Research Ethics at the University of Waterloo, Ontario, Canada (ORE#17469); Internal Review Board, Roswell Park Comprehensive Cancer Center (IRB NT −0–20), Research Ethics Office, King's College London, United Kingdom (IRB PNM/13/14–151); Human Research Ethics, the Cancer Council Victoria, Australia (HREC 0211); and Deakin University, Australia (DUHREC2018–346).

regression was used to examine whether baseline post-quitting experiences predicted relapse back to smoking at follow-up.

Results: Ex-smokers who perceived their stress coping ability had gotten worse since quitting were more likely to relapse back to smoking compared to their counterparts who reported no change (OR=5.77, 95% CI=1.64, 20.31, P <0.01). Ex-smokers who reported their homes had become fresher and cleaner post quitting were less likely to relapse compared to those who did not notice any change (OR=0.34, 95% CI=0.13, 0.93, P <0.05). Perceived changes in life enjoyment, negative affect control, social confidence, work performance, leisure time and financial situation did not independently predict relapse. No country differences were found.

Conclusion: The study showed that ex-smokers' relapse risk was elevated if they perceived any negative impact of quitting on their stress coping whereas relapse risk was reduced if they perceived any positive impact of quitting on the home (e.g. fresher and cleaner). Helping ex-smokers to develop alternative stress coping strategies and highlighting the positive impacts of quitting smoking on the homes may help protect against smoking relapse.

Keywords

post-quitting experiences; ex-smokers; relapse risk; Australia; United Kingdom

INTRODUCTION

Despite any perceived benefits from smoking, many smokers attempt to quit at some point in their life. However, it is estimated that 85% of those who successfully quit smoking for at least one month will relapse back to smoking again within a year [1]. Given the adverse health outcomes associated with continued smoking and the propensity for ex-smokers to relapse, it is important to understand factors that mitigate or promote maintenance of long-term smoking abstinence.

Recent research suggests that determinants of smoking cessation initiation are different from that of long-term smoking cessation maintenance [1–4]. These findings are consistent with the model of health behaviour change proposed by Rothman [5], who argues that determinants for the initiation of a behaviour change (such as quitting smoking) differ from the determinants of maintaining that behaviour change (continued smoking cessation). Specifically, Rothman [5] argues that behaviour initiation is based on future outcome expectations, whereas behaviour maintenance is based on the satisfaction gained from these outcomes. In other words, the maintenance of a new behaviour is dependent upon perceived positive outcomes associated with the new behaviour being realised, and if these anticipated benefits do not materialise, the risk of relapse can increase [5]. Thus, in relation to smoking cessation, if the actual experiences of quitting are not positive and/or the anticipated benefits of quitting are not realised, the likelihood of relapse back to smoking will increase.

To date, research on post-quitting experiences of ex-smokers is limited and the findings suggest that while most smokers experience an improvement in life enjoyment, stress coping and mental health following quitting, these positive experiences do not appear to protect them against relapse. However, any decline in stress coping and mental health post quitting

appears to increase relapse back to smoking [6–8]. How quitting impacts on other aspects of life beyond mental health, life enjoyment, stress and negative affect coping remain uncertain. For example, one might expect quitting to improve air quality of home, finances and spare time of smokers but how these changes might affect relapse risk have not been studied.

Using data from the International Tobacco Control Four Country (ITC 4C) Survey, this study sought to: (i) replicate the findings of Yong *et al.* [6] on the predictive effect of perceived impact of smoking cessation on ability to enjoy life, cope with stress and negative affect post quitting on smoking relapse risk; and (ii) also extend to include post-quitting changes in leisure time, financial situation, home environment, social confidence and work performance. It was hypothesised that any perceived negative impacts of quitting would elevate, but any positive impacts would reduce, relapse risk. The present study also explored for potential moderators such as country of residence and baseline quit duration.

METHOD

The ITC 4C Survey is a longitudinal cohort study of a broadly representative sample of over 2000 adult smokers in Australia, Canada, the US and the UK with approximately annual follow up since 2002. Participants who had quit smoking during any follow-up survey were retained in the study. Participants were recruited via random digit dialling telephone interviews and web-based advertisements to complete the 45-min survey. Participants lost to attrition were replenished using the same sampling procedures. Detailed description of the study methodology has been reported in Thompson *et al* [9].

Sample

The current study was limited to Australia and the UK (follow-up data not available in the US and Canada) and consisted of 584 adult (18 and over) ex-smokers who participated in both Wave 9 (2013) and Wave 10 (2014) of the ITC 4C Survey. Table S1 (Supporting Information) presents the sample characteristics.

Measures

Outcome variable at Wave 10—Smoking relapse was determined by asking participants if they had remained quit or were back smoking. Those back smoking between Waves 9 and 10 surveys, including those who had quit again by Wave 10, were deemed to have relapsed.

Predictor variables at Wave 9—Survey questions and response options for assessing the eight post-quitting experiences are presented in supplementary Table S2 (Supporting Information). An index of number of reported improvements across the eight post-quitting experiences was also derived (score range from 0 to 8) and used as a dose-response predictor. Table 1 presents the descriptive statistics for these predictor variables.

Control variables at Wave 9—These included socio-demographic and smoking-related variables shown in Table 2.

Statistical analysis

All data analyses were conducted using SPSS. Binary logistic regression analysis was used to examine the relationship between smoking relapse at Wave 10 and the eight post-quitting predictor variables at Wave 9. Separate models were conducted to examine the relationship between smoking relapse and index of overall improvement measure because of collinearity issue with individual post-quit measures. Model building for smoking relapse prediction was conducted in a stepwise fashion starting with an examination of relationships between the key predictor variables and smoking relapse, followed by the addition to the model of control variables. Moderators were examined by adding into the model appropriate interaction terms. Odds ratios (OR) and 95% confidence intervals (CI) were estimated with $P<0.05$ indicating statistical significance.

RESULTS

Post-quitting experiences and association with subsequent relapse

The results (see Table 2) indicated that after controlling for potential confounders, participants who reported their ability to calm down under stress became considerably worse since quitting were significantly more likely to relapse than those reporting no change since quitting (OR 5.77, 95% CI 1.64, 20.31, $P=0.006$). However, those who reported having a fresher and cleaner home were significantly less likely to relapse (OR 0.34, 95% CI 0.13, 0.93, $P=0.036$). Other reported post-quitting experiences were not significantly related to smoking relapse. However, the overall index of post-quitting improvement predicted lower risk of relapse (OR 0.78, 95% CI 0.65, 0.94, $P=0.008$).

Differences by country and quit duration

No significant interaction with country or quit duration was found for any of the 8 post-quitting measures (omnibus tests: $P=0.388$ and 0.550, respectively) and the index of overall improvement ($P=0.787$and 0.674, respectively).

DISCUSSION

The results revealed only a partial replication of the findings of Yong *et al* [6]. The absence of an effect of life enjoyment was confirmed but the predictive effect of negative affect coping post quitting was not replicated. This study found ex-smokers who perceived a decline in their ability to remain calm under stress since quitting were significantly more likely to relapse than those that reported no change in stress coping ability. However, those who perceived an improvement in stress coping post quitting were no more or less likely to relapse. Of the new measures examined, only the perceived impact of quitting on the home environment was predictive of relapse with perceived improvement in home cleanliness and air quality associated with lower relapse risk compared to those who did not notice any changes in this domain. There was no evidence of any differences by country or quit duration in any of the predictive effects found.

The findings here and, in particular, the dose-response association with relapse risk of overall perceived positive impacts of quitting on diverse life domains post quitting are

consistent with Rothman's model of behaviour change [5], which posits that as the perceived benefits of changing a behaviour (ceasing smoking) are realised, people are more likely to maintain the new behaviour. Otherwise, they tend to not persist with the new behaviour.

The increased relapse risk of those who reported a deterioration in stress management post quitting is consistent with the commonly perceived benefit of smoking whereby many smokers believe that smoking assists them to calm down when experiencing stress [10]. Following smoking cessation, ex-smokers who have not found a suitable substitute to help them manage stress post quitting may be tempted to resort to smoking again to cope with stresses they face. Emotional turmoil associated with nicotine withdrawal is often high in the 2–3 weeks following a quit attempt, exacerbating feelings of stress [6]. However, as smoking cessation progresses and ex-smokers realise the benefits of remaining quit, their ability to cope with other life stresses without resorting to smoking will be important for maintaining smoking abstinence long term. Unless effective stress management skills are learnt without the use of cigarettes, they will remain vulnerable to relapse particularly once they have stopped the use of stop-smoking medication.

The finding that any positive impact on the home environment of smoking cessation being protective against relapse is novel. The increased likelihood of positive changes in the physical home environment as a result of giving up smoking, such as improved cleanliness without cigarette ashes, cigarette butts and ashtrays around the house and no lingering tobacco smells following smoking cessation [11] is likely to also impact other household members of the study participants. Thus, maintaining a fresher and cleaner home has positive implications for all household members which may serve as a further motivation for ex-smokers to remain abstinent.

The lack of a predictive effect of other post-quitting measures, along with no evidence of any interaction with country and quit duration, might be due to low power to detect an effect given the small sample size and the inherent noise in self-report data. Thus, our findings warrant further replication to confirm. Future study is also needed to shed light on how post-quitting experiences and the associated relapse risk might be affected by the use of nicotine vaping products.

Implications

The current study suggests that targeting ex-smokers who struggle to develop an alternate form of coping with stress without reliance on smoking will likely protect them against relapse following smoking cessation. Additionally, intervention that highlights to smokers the positive impacts of quitting on air quality of the home environment and the health of household members will likely also serve to reduce their relapse risk following cessation.

CONCLUSIONS

This study revealed that ex-smokers were more likely to relapse back to smoking if they perceived a decline in their ability to cope with stress following quitting whereas the risk was reduced if they perceived a positive impact of quitting on their home environment such as improved cleanliness and better air quality. Implementing alternative non-smoking

strategies that enhance stress coping ability and highlighting the positive impacts of quitting on their home may further serve to protect them from smoking relapse.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Conflicts of Interest

KMC has received payment as a consultant to Pfizer, Inc., for service on an external advisory panel to assess ways to improve smoking cessation delivery in health care settings. KMC also has served as a paid expert witness in litigation filed against cigarette manufacturers. GTF and JFT have served as expert witnesses or consultants for governments defending their country's policies or regulations in litigation. GTF also served as a paid expert consultant to the Ministry of Health of Singapore in reviewing the evidence on plain/standardized packaging. AM is a UK National Institute for Health Research Senior Investigator. The views expressed in this article are those of the authors and not necessarily those of the National Institute for Health Research, or the UK Department of Health and Social Care. All other authors have no conflicts of interest to declare.

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Table 1.

Sample distribution of post-quitting experiences.

Variables	Total N = 584	Australia N = 334	UK N = 250	*P*-value for Country difference
Since quit, capacity to enjoy life (%)				
Improved	52.9	50.9	55.6	0.273
Gotten worse	4.0	3.9	4.0	
Stayed the same	40.9	43.7	37.2	
Don't know	2.2	1.5	3.2	
Since quit, ability to cope with stress (%)				
Improved	25.7	26.0	25.2	0.093
Gotten worse	13.0	15.9	9.2	
Stayed the same	57.2	54.5	60.8	
Don't know	4.1	3.6	4.8	
Since quit, ability to control negative feelings (%)				
Improved	21.6	21.9	21.2	
Gotten worse	13.2	15.9	9.6	0.116
Stayed the same	60.5	58.3	63.6	
Don't know	4.6	3.9	5.6	
Since quit, social confidence (%)				
Improved	18.5	15.9	22.1	0.258
Gotten worse	3.4	3.9	2.8	
Stayed the same	75.3	77.2	72.7	
Don't know	2.7	3.0	2.4	
Since quit, work performance (%)				
Improved	13.5	15.0	11.6	0.137
Gotten worse	1.0	1.5	0.4	
Stayed the same	45.2	46.7	43.2	
Not employed outside home	40.2	36.8	44.8	
Since quit, home air quality and cleanliness (%)				
Improved	63.1	53.5	75.9	<0.001
Noticed no difference	34.0	42.9	22.1	
Don't know	2.9	3.6	2.0	
Since quit, have more/less spare time (%)				
Have more	29.5	31.4	26.8	0.257
Have less	0.7	0.6	0.8	
Stayed the same	67.8	66.8	69.2	
Don't know	2.1	1.2	3.2	
Since quit, have more/less money to spend (%)				
Have more	65.9	63.5	69.2	0.196
Have less	0.7	1.2	0.0	

Variables	**Total N = 584**	**Australia N = 334**	**UK N = 250**	***P*-value for Country difference**
Stayed the same	29.8	31.7	27.2	
Don’t know	3.6	3.6	3.6	
Index of overall improvement				
Mean (SD)	2.90(2.03)	2.78(1.99)	3.07(2.07)	0.081

Table 2.

Logistic regression analyses for prospective association between Wave 9 post-quit experiences and smoking relapse at Wave 10 follow-up for Australia and the UK

	% Relapse	Model 1			Model 2		
Predictors		**AOR**	**95% CI**	***P***	**AOR**	**95% CI**	***P***
Since quit, capacity to enjoy life				0.324			0.632
Improved	8.4	0.58	0.28–1.22	0.151	0.65	0.26–1.65	0.365
Gotten worse	17.4	0.59	0.11–3.05	0.525	1.17	0.12–11.49	0.894
Stayed the same	16.8	*ref*			*ref*		
Since quit, ability to cope with stress				0.012			0.023
Improved	6.7	0.77	0.23–2.56	0.667	1.21	0.28–5.34	0.799
Gotten worse	23.7	**4.17**	**1.55–11.18**	**0.005**	**5.77**	**1.64–20.31**	**0.006**
Stayed the same	11.7	*ref*			*ref*		
Since quit, ability to control negative feelings				0.291			0.175
Improved	8.7	1.16	0.38–3.60	0.794	0.95	0.22–4.09	0.949
Gotten worse	15.6	0.41	0.13–1.31	0.133	0.26	0.06–1.08	0.064
Stayed the same	12.5	*ref*			*ref*		
Since quit, work performance				0.918			0.600
Improved	7.6	0.69	0.18–2.71	0.596	1.99	0.33–12.05	0.456
Gotten worse	--	--	--	--	--	--	--
Not employed	13.6	1.12	0.58–2.19	0.730	1.90	0.70–5.13	0.205
Stayed the same	12.8	*ref*			*ref*		
Since quit, home air quality and cleanliness							
Improved	7.9	**0.37**	**0.19–0.72**	**0.003**	**0.34**	**0.13–.93**	**0.036**
Noticed no difference	18.7	*ref*			*ref*		
Since quit, have more/less spare time				0.951			0.545
Have more	9.9	1.13	0.52–2.45	0.751	0.56	0.19–1.58	0.271
Have less	–	–	–	–	–	–	–
Stayed the same	13.1	*ref*			*ref*		
Since quit, have more/less money to spend				0.773			0.926
Have more	11.7	1.29	0.65–2.56	0.473	1.20	0.48–3.02	0.695
Have less	–	–	–	–	–	–	–
Stayed the same	13.8	*ref*			*ref*		
Since quit, social confidence				0.153			0.155
Improved	2.8	0.26	0.06–1.19	0.082	0.20	0.03–1.60	0.130
Gotten worse	15.0	0.36	0.04–3.30	0.368	0.15	0.01–2.59	0.193
Stayed the same	31.3	*ref*			*ref*		
Gender							
Female	11.9		NA		0.98	0.42–2.29	0.961
Male	12.8		NA		*ref*		
Country							
Australia	12.0		NA		0.59	0.24–1.47	0.259

	% Relapse	Model 1			Model 2		
Predictors		**AOR**	**95% CI**	***P***	**AOR**	**95% CI**	***P***
UK	12.6		NA		*ref*		
Age at recruitment, years							0.318
18–24	12.5		NA		*ref*		
25–39	14.7		NA		0.33	0.05–2.27	0.262
40–54	13.5		NA		0.48	0.07–3.21	0.447
55+	8.3		NA		0.17	0.02–1.50	0.111
Ethnicity							
White	12.3		NA		*ref*		
Non-white	11.2		NA		2.15	0.41–11.36	0.366
Income							0.318
High	12.8		NA		0.49	0.14 – 1.70	0.262
Moderate	11.6		NA		0.47	0.14 – 1.61	0.229
Low	11.6		NA		*ref*		
Education							0.327
High	9.7		NA		1.20	0.73–6.58	0.159
Moderate	14.9		NA		1.04	0.37–2.96	0.935
Low	15.6		NA		*ref*		
Wave of recruitment[#]	NA		NA		1.00	0.85–1.18	0.993
Survey mode							
Internet	13.3		NA		1.59	0.56–4.49	0.380
Telephone	9.6		NA		*ref*		
Quit duration							<0.001
<1 month	42.9		NA		*ref*		
1–6 months	36.1		NA		0.95	0.27–3.35	0.934
7–12 months	37.0		NA		1.00	0.24–4.25	1.00
> 12 months	3.2		NA		**0.03**	**0.01–0.13**	**0.000**
Urges to smoke[#]	NA		NA		1.33	0.82–2.15	0.247
Use of stop-smoking medication							
Yes	29.8		NA		1.23	0.51–2.93	0.647
No	7.8		NA		Ref		
Home smoking bans							
None	13.6		NA		Ref		
Partial/total ban	12.4		NA		1.08	0.24–4.76	0.923

Note.

[#]Wave of recruitment and urges to smoke were treated as quasi-continuous variables for modelling purposes. Model 1 shows odds ratio for each key predictor adjusting for the other seven key predictor variables in the table. Model 2 shows odds ratio also adjusted for control variables assessed at baseline such as age group, gender, ethnicity, income, education, wave recruited into the study, survey mode, quit length, urges to smoke, use of any stop-smoking medications and home smoking bans. AOR, adjusted odds ratio; CI, confidence interval; NA, not applicable; – estimates could not be computed due to small sample size; Refused and Don't Know responses (not more than 4.6%) were excluded.