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Mediational Pathways of the Impact of Cigarette Warning Labels on Quit Attempts

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Objective: To test and develop, using structural equation modeling, a robust model of the mediational pathways through which health warning labels exert their influence on smokers' subsequent quitting behavior. ***Method:*** Data come from the International Tobacco Control Four-Country Survey, a longitudinal cohort study conducted in Australia, Canada, the United Kingdom, and the United States. Waves 5–6 data (n = 4,988) were used to calibrate the hypothesized model of warning label impact on subsequent quit attempts via a set of policy-specific and general psychosocial mediators. The finalized model was validated using Waves 6–7 data (n = 5065). ***Results:*** As hypothesized, warning label salience was positively associated with thoughts about risks of smoking stimulated by the warnings ($\beta = .58$, $p < .001$), which in turn were positively related to increased worry about negative outcomes of smoking ($\beta = .52$, $p < .001$); increased worry in turn predicted stronger intention to quit ($\beta = .39$, $p < .001$), which was a strong predictor of subsequent quit attempts ($\beta = .39$, $p < .001$). This calibrated model was successfully replicated using Waves 6–7 data. ***Conclusion:*** Health warning labels seem to influence future quitting attempts primarily through their ability to stimulate thoughts about the risks of smoking, which in turn help to raise smoking-related health concerns, which lead to stronger intentions to quit, a known key predictor of future quit attempts for smokers. By making warning labels more salient and engaging, they should have a greater chance to change behavior.

Keywords: health warnings, quit attempts, mediational pathways, structural equation modeling

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This article uses structural equation modeling (SEM) to test and develop a mediational model of how health warning labels affect quitting smoking; in particular, we contrasted a positive influence model with a reactance model whereby the impacts are counterproductive. SEM provides several advantages over past studies of the impact of health warnings, which tended to employ regression-based models for such purpose. The first advantage of SEM is that it allows for the complex relationships between several independent and dependent variables, depicting the mediational pathways through which warning labels have their influence on subsequent behavior, to be examined in a single analysis, something that could not be done simultaneously using a regression-based approach. The latter has limited past studies to focusing on the relationship with quitting activity directly, without reference to general mediators (e.g., Borland, Yong, Wilson, et al., 2009; Hammond, Fong, McDonald, Cameron, & Brown, 2003). Second, SEM typically models key constructs using latent variables where measurement errors of key variables can be accounted for, thus providing for a more rigorous analysis than regression analysis, which can only accommodate observed variables. Third, SEM is largely a confirmatory technique and, as an explanatory tool, it is more efficient and better suited for understanding the complex processes involved in how and why warning labels work in changing behavior than regression-based models, which focus more on prediction. To date, use of mainly regression-based models in warning label impact research has limited our understanding of how and why warning labels work.

This study extends previous regression-based work by Borland, Yong, Wilson, et al. (2009) to explicitly test a mediational model of how warning labels might impact smoking behavior. As illustrated in Figure 1, this model theorized that health warning labels are expected to influence individuals by first influencing factors that are most proximal to the policy itself, such as noticing and reading the warning labels, and, as a result, they act to influence the extent to which people think about the harms of smoking, which in turn raise their smoking-related health concerns, leading them to form intentions to quit and, eventually, to stop smoking altogether. This mediational model has been theorized in broad terms based on the International Tobacco Control (ITC) conceptual model of the effect of tobacco control policies on smoking behaviors (Fong et al., 2006; International Agency for Research on Cancer, 2008), but is expanded here to take into account possible impacts of cognitive and behavioral avoidance. The overall framework of the ITC model is that policies have immediate proximal impacts, which subsequently affect more general mediators of quitting activity and, through them, affect quitting-related behavior (Fong et al., 2006).

The extant literature has suggested that there are two plausible competing models for the impact of warning labels on quitting. The positive influence model, developed from findings based on both population survey research (e.g., Borland, Yong, Wilson, et al., 2009; Hammond et al., 2003) and experimental studies (e.g., Emery, Romer, Sheerin, Jamieson, & Peters, 2013), predicts that reactions to the warnings will produce positive effects on quitting

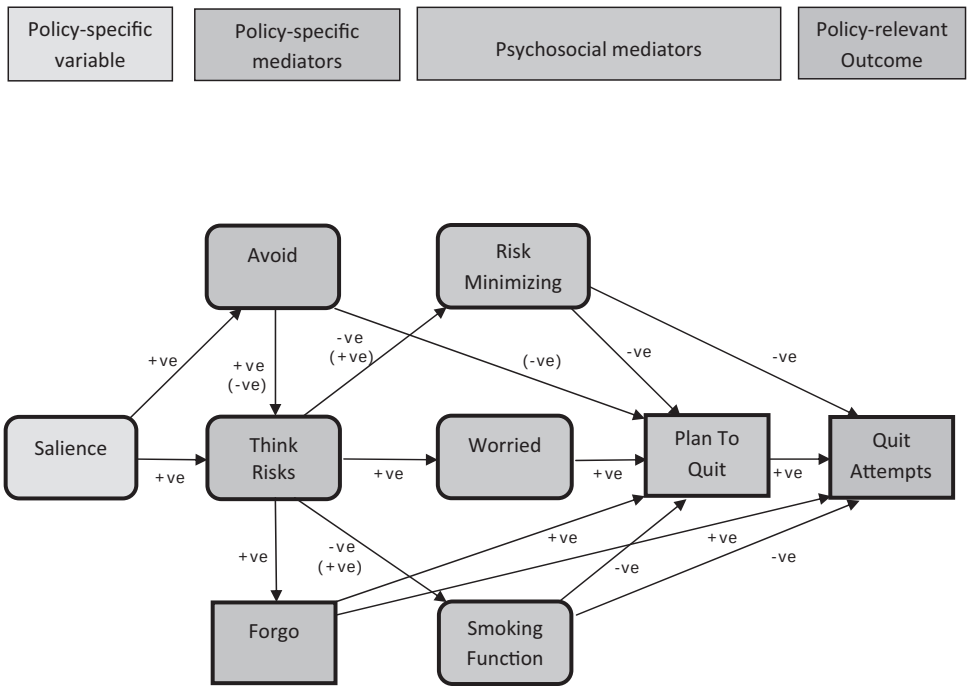

Figure 1. Hypothesized model of the pathways explaining the impact of warning labels. Note that this model is a simplified version—the indicator variables for each latent construct, the associations among the mediators (forgo, avoid, worried, smoking function, and risk minimizing) along with the pathways of the control variables (country, age group, sex, education, and daily cigarette consumption) are not shown. Salience, think risks, avoid, risk minimizing, worried, and smoking function are latent variables while forgo, plan to quit, and quit attempts are observed variables. The predicted effect of the positive influence model is in bold face whereas that of the reactance model is in parentheses, with the other effects being similar for the two models.

interest and activity, and that there will be no overall negative effects even from occasional avoidance of the warnings. By contrast, the reactance model, based on arguments drawn mainly from the fear appeals literature (e.g., de Bruin & Peters, 2013; Peters, Ruiter, & Kok, 2013; Ruiter, Abraham, & Kok, 2001; Ruiter & Kok, 2005), predicts that avoidance will be associated with reduced desirable responses to the warnings and that any strong reactions to the warnings will lead to counterproductive effects that will at least reduce their desirable effects.

To date, research evidence has suggested that larger and graphic health warnings on cigarette packs are noticed more often, stimulate more harm- and quitting-related cognitive and behavioral responses, and increase knowledge of health effects of smoking better than relatively small text-only warnings (Cameron, Pepper, & Brewer, 2013; Hammond, 2011; Yong et al., 2013). Research evidence to date has also demonstrated that cognitive reactions to warning labels on cigarette packs, such as thoughts about the harms of smoking, stimulated by the warnings and behavioral reactions, such as forgoing a planned cigarette, are both strongly and positively associated with quit intentions (Fathelrahman et al., 2009), and both cognitive reactions and forgoing cigarettes independently and prospectively predict making quit attempts among adult smokers (Borland, 1997; Borland, Yong, Wilson, et al., 2009). Larger and graphic warnings have also been shown to result in greater avoidance behavior (Borland, Wilson, et al., 2009; Hammond, Fong, McDonald, Cameron, & Brown, 2004), and these reactions are positively correlated with cognitive reactions and subsequent quit attempts, although, when controlling for cognitive reactions, they are no longer positively predictive of attempts. Studies to date have generally failed to find any adverse effects of avoidance behavior on quitting interest and behavior (Borland, Yong, Wilson, et al., 2009; Hammond et al., 2004; Kees, Burton, Andrews, & Kozup, 2010; Peters et al., 2007). Thus, the evidence is directly contrary to the contention by some that avoidance behavior will lead to a reduction in desirable behavior change (Peters et al., 2013; Ruiter et al., 2001; Ruiter & Kok, 2005), which is based on experimental studies typically of single exposures. It is plausible that on the occasions when a person avoids the health warnings, they may be less likely to take any action toward quitting. However, population-based survey data have shown that, over a period of time, these smokers will also be more likely to think about the warnings and, thus, take quit-related action (Borland, Yong, Wilson, et al., 2009).

Turning to possible mediators of the effects of warning labels, both the positive influence and the reactance models postulate there are three types of mediators that are relevant. First are worries or concerns about health (Costello, Logel, Fong, Zanna, & McDonald, 2012; Emery et al., 2013; International Agency for Research on Cancer, 2008), which are theorized to increase people's interest in quitting smoking. Second are functional beliefs about the utility of smoking (Yong & Borland, 2008), which should be negatively related to quitting activity. A positive effect of reactions to warnings would be to undermine functional beliefs, while a reactance effect would be to lead to an overvaluing of benefits as part justification for continuing to smoke. Third are risk-minimizing beliefs (Borland, Yong, Balmford, et al., 2009), which are a form of cognitive avoidance that smokers may engage in when confronted with strong health warnings. A positive influence model would predict that these beliefs would be reduced by strong health warnings, while a reactance model would predict that they would increase in reaction to the warnings. These psychological mediators have been shown in past studies to have a strong predictive effect on subsequent quitting intentions (Hammond et al., 2003; Kees et al., 2010; Romer, Peters, Strasser, & Langleben, 2013) and behavior (Borland, Yong, Balmford, et al., 2009; Borland, Yong, Wilson, et al., 2009; Costello et al., 2012; Hammond et al., 2007; Hammond et al., 2003; Hyland et al., 2006; Shanahan & Elliot, 2009; Yong & Borland, 2008).

To ensure the effectiveness of warning labels, it is critically important to understand how and why warning labels work. Thus the key aims of this study were, first, to test and develop a robust model of the impacts of health warnings on smoking behavior and, second, to test the competing positive influence versus reactance models of effect using data from the International Tobacco Control Four-Country (ITC-4) Survey conducted in four high-income English-speaking countries (Australia, Canada, the United Kingdom, and the United States). Specifically, our study aims were (a) to test the hypothesized pathways explaining the impact of warning labels on quitting behavior of adult smokers; (b) to examine whether avoidance behavior inhibits (reactance model) or facilitates (positive influence model) cognitive response to warning labels and motivation to quit smoking; (c) to examine whether harm-related thoughts stimulated by warning labels challenge and reduce risk-minimizing beliefs and smoking function beliefs (positive influence model) or increase them (reactance model); and (d) to validate the model derived from the calibration sample using a new sample. Based on the positive influence model, we hypothesized that health warning labels would stimulate quit attempts primarily by first stimulating smokers to think about the harms of smoking and, in turn, increasing their personal concerns about the future negative impact of smoking on health and quality of life, while decreasing their psychological defenses and perceived value of smoking (both are known to undermine quitting), all of which would lead to increased intention to quit smoking, a key predictor of future quit attempts. Both models would predict that warning labels would positively influence the behavior of forgoing a cigarette, primarily through thoughts about harms of smoking, and that forgoing behavior, in turn, would lead to stronger quit intentions. Forgoing might also have a direct positive effect on subsequent quit attempts (Borland, Yong, Wilson, et al., 2009). Both models would also predict that warning labels would stimulate increased avoidance behavior, but a reactance model would predict that it would inhibit thoughts about smoking harms and motivation to quit smoking rather than having facilitating effects as predicted by a positive influence model.

At the time of the current study, warning labels across the four countries differed in size, content, and nature (graphic vs. text). Warnings ranged from the large Canadian graphic warning labels to the small U.S. text-only warnings on the side of packs. Despite these differences, country differences in the mediational pathways were not expected because no by-country interaction was found in past research (Borland, Yong, Wilson, et al., 2009), suggesting that stronger warnings have their effect by eliciting stronger reactions rather than different kinds of effects. The analysis was also limited to quit attempts as the main outcome because factors associated with making quit attempts are quite different from those for quit maintenance (Borland et al., 2010; Vangeli, Stapleton, Smit, Borland, & West, 2011). This is confirmed by the fact that predictive

effect of warning label effectiveness measures was found for quit attempts, but not for quit success among those who tried (Borland, Yong, Wilson, et al., 2009), except when these measures were assessed after quitting (Partos, Borland, Yong, Thrasher, & Hammond, 2013).

Method

Sample and Design

The study made use of two samples drawn from the ITC-4 Survey, a cohort study of adult smokers followed up annually with replenishment, conducted in Australia, Canada, the United Kingdom, and the United States. The main aim of the ITC-4 project is to evaluate the psychosocial and behavioral effects of national-level tobacco control policies. Respondents were recruited in each country using stratified random-digit dialing and computer-assisted telephone technique whereby households were contacted and screened for adult smokers with the next birthday who would agree to participate in the study. Those who agreed to participate were rescheduled for a telephone survey a week later, and were sent a check or voucher to compensate for their time. The study protocol received ethics approval from the relevant institutional review boards in the four countries studied. Further details of the methodology of the ITC-4 Survey have been reported elsewhere (Thompson et al., 2006).

Calibration sample. This sample consisted of adult current smokers who participated in Wave 5 of the ITC-4 Survey and who were successfully followed at Wave 6, approximately a year later. This sample was called the calibration sample because it was used to test the hypothesized mediational model and to develop a good-fitting model, which was then validated in a second sample, that is, the validation sample (see next section). The total number of respondents at baseline was 8,243, but only 7,038 were current smokers. Of these, 4,988 (70.9%) were successfully followed ($M_{\text{length}} = 335$ days, $SE = .56$) and used for analysis.

Validation sample. Like the calibration sample, the validation sample consisted of adult current smokers who participated in the survey at Wave 6 and were successfully followed at Wave 7. The total sample at baseline was 8,194, of which 6,886 were current smokers and, of these, 5,065 (76.3%) were successfully followed ($M_{\text{length}} = 394$ days, $SE = .70$).

For our purposes, the policy-specific variable, policy-specific mediators, and psychosocial mediators used for calibration and validation were based on survey data from Wave 5 (collected from September 2006 to February 2007) and Wave 6 (collected from October 2007 to January 2008), respectively, while the policy-relevant outcome was based on Wave 6 and Wave 7 data (collected between October 2008 and March 2009), respectively.

Measures

The measures used in measurement and structural models for both calibration and validation are presented in Table 1. They were specifically chosen or developed for inclusion in the ITC Survey based on their reliability and validity as measures of the respective constructs of interest (International Agency for Research on Cancer, 2008). For some analytic purposes (*t* tests and correlations), questions assessing the same constructs were combined by averaging their responses, except for avoidance, to form composite measures with scale reliability, as shown in Table 1. As per previous research (Borland, Yong, Wilson, et al., 2009), an index of avoidance was created by summing the responses across the four kinds of avoidance behavior (i.e., covering up the warnings, keeping them out of sight, using a cigarette case, and not buying packs with certain labels). For modeling, the policy-specific variable was warning label salience, modeled as a latent variable with two indicator items. The policy-specific mediators consisted of one cognitive (i.e., think risks) and two behavioral variables (i.e., avoid and forgo). Think risks was modeled as a latent variable with three indicators. Behavioral avoidance was modeled as a latent variable with four indicators for calibration purposes, but as an observed variable for validation because it was only assessed using a single question in Wave 6 to reduce respondents' burden. There were four psychosocial mediators in the model, namely, risk-minimizing beliefs, worried about smoking harms, smoking functions (all three modeled as latent variables with multiple indicators), and intentions to quit (measured using a single question and modeled as an observed variable). The policy-relevant outcome was any quit attempts since the previous wave, assessed at follow-up using a single question. Control variables were country, gender, age group, education levels (using 3 categories to roughly equate the different education systems across the four countries), and number of cigarettes smoked per day (CPD), all modeled as observed variables.

Data Analysis

Calibration analysis. Analyses of sample attrition and sample characteristics, along with correlation among variables, were conducted using Stata, Version 12. For practical reasons, all variables were treated as continuous measures for the correlational analyses.

SEM of the proposed mediational pathways of warning impact (see Figure 1) was conducted using Mplus, Version 6. For modeling data from both continuous and categorical measures, parameter estimation was based on weighted least squares with means and variance-adjusted chi-square test statistics (Asparouhov, 2005). Models were estimated as follows. First, we estimated a measurement model that included all latent variables with multiple indicators in the hypothesized model (i.e., warning label salience, thoughts about smoking risks and about quitting as a result of warning labels, worry about future damage to health and quality of life, avoidance of warning labels [calibration model only], risk-minimizing beliefs, and functional beliefs about smoking). Next, we estimated the structural model, which included both latent and observed variables, and involved testing prospective effects of individual attention to health warning labels on making quit attempts through both policy-specific mediators and psychosocial mediators. Indicators of risk-minimizing beliefs and functional beliefs about smoking had approximately normal distributions and, thus, were treated as continuous variables; all other measures were treated as categorical variables and had non-normal distributions. In the structural models, we controlled for country, age, gender, education, and CPD by regressing all variables on them.

The adequacy of overall model fit was evaluated using the comparative fit index (CFI; Bentler, 1990), the Tucker−Lewis index (TLI), and the root mean square error of approximation

Table 1
Observed and Latent Variables Used in the Measurement and Structural Models for Calibration and Validation Samples

Measures	Indicator item wording	Factor loading
Latent variables		
Salience	In the last month, how often, if at all, have you noticed the warning labels on cigarette	.83 (.83)
Cronbach's α = .67 (.79)	packages? − Never, Rarely, Sometimes, Often, Very often	
	In the last month, how often, if at all, have you read or looked closely at the warning labels on cigarette packages? − Never, Rarely, Sometimes, Often, Very often	.72 (.73)
Think risks	To what extent, if at all, do the warning labels make you think about the health risks	.90 (.87)
Cronbach's α = .79 (.79)	of smoking? − Not at all, A little, Somewhat, A lot	
	To what extent, if at all, do the warning labels on cigarette packs make you more likely to quit smoking? − Not at all, A little, Somewhat, A lot	.84 (.86)
	In the past 6 months, have [warning labels on cigarette packages] led you to think about quitting? − Not at all, Somewhat, Very much	.76 (.80)
Worried	How worried are you, if at all, that smoking will damage your health in the future? −	.94 (.93)
Cronbach's α = .84 (.84)	Not at all worried, A little worried, Moderately worried, Very worried	
	How worried are you, if at all, that smoking will lower your quality of life in the future? − Not at all worried, A little worried, Moderately worried, Very worried	.86 (.86)
Avoid1[a]	In the last month, have you made any effort to avoid looking at or thinking about the warning labels . . .	
	By covering the warnings up? − Yes, No	.92 (NA)
	By keeping the pack out of sight? − Yes, No	.93 (NA)
	By using a cigarette case or some other pack? − Yes, No	.78 (NA)
	By not buying packs with particular labels? − Yes, No	.64 (NA)
Risk-minimizing beliefs	Please tell me whether you strongly agree, agree, neither agree nor disagree, disagree,	
Cronbach's α = .67 (.67)	or strongly disagree with each of the following statements:	
	The medical evidence that smoking is harmful is exaggerated.	.52 (.53)
	You've got to die of something, so why not enjoy yourself and smoke.	.76 (.75)
	Smoking is no more risky than lots of other things that people do.	.62 (.64)
Smoking function beliefs	Please tell me whether you strongly agree, agree, neither agree nor disagree, disagree,	
Cronbach's α = .53 (.42)	or strongly disagree with each of the following statements:	
	You enjoy smoking too much to give it up.[b]	.66 (.49)
	Smoking is an important part of your life.	.55 (.54)
Observed variables		
Forgo	In the last month, have the warning labels stopped you from having a cigarette when you were about to smoke one? − Never, Once, A few times, Many times	NA
Avoid2[a]	In the last month, have you made any effort to avoid looking at or thinking about the warning labels such as covering them up, keeping them out of sight, using a cigarette case, avoiding certain warnings, or any other means? − Yes, No	NA
Plan to quit	Are you planning to quit smoking − within the next month, within the next 6 months, sometime in the future beyond 6 months, or are you not planning to quit?	NA
Making quit attempts	Have you made any attempts to stop smoking since we last talked with you in [last survey date]? − Yes, No	NA

Note. Values in parentheses are for validation model. NA = not applicable.
[a] Avoid1 is a multiple-item question that was used to assess avoidance behavior in Wave 5; Avoid2 is a single-item question that was used instead in Wave 6. [b] "You enjoy smoking too much to give it up" cross-loaded on the latent variable "worried" with standardized factor loading of −.25 and −.21 for calibration and validation models, respectively.

(RMSEA; Browne & Cudeck, 1993). Acceptable model fit is indicated by a value of greater than .95 on both CFI and TLI (Hu & Bentler, 1999), and a value less than .05 on RMSEA. Where appropriate, modification indices were employed to help suggest revision to the model to improve model fit. The Mplus DIFFTEST command was used to compare nested models to help decide whether a given model fit significantly better or worse than a competing model (Muthen & Muthen, 1998−2010).

All analyses used survey weights constructed to make the sample representative of the smoker population in geographic regions of each of the four countries, and calibrated by age and gender (Thompson et al., 2006).

Validation analysis. Validation analysis involved the same kind of analyses and model fit evaluation that was conducted for the calibration analysis, except that, instead of testing the hypothesized models, the finalized measurement and structural models from the calibration analyses were tested on the Waves 6–7 sample to determine the robustness of the results.

Additional sensitivity analyses were conducted to test the hypothesized model using Waves 5–6 subsamples derived from random split-half and separate country data. We also conducted mediational analysis to test the significance of the indirect paths of warning label salience via the hypothesized mediating variables to quit attempts.

Results

Calibration Model

The results of the analyses for the calibration model are presented below.

Sample characteristics and attrition. Sample characteristics by attrition status are presented in Table 2. Retained respondents were older ($p < .001$), more likely to come from Australia, to endorse functional beliefs about smoking ($p < .001$), but less likely to forgo a cigarette because of warning labels ($p < .01$) than those lost to the study. The two groups were similar on all other measures.

Correlations. Correlations between policy-specific variable, policy-specific mediators, psychosocial mediators, and policy-relevant outcome are presented in Table 3. Warning label salience was most strongly and positively related to thoughts about the risks of smoking followed by forgoing. Think risks was most strongly and positively associated with forgo followed by worried. However, think risks correlated negatively with risk minimizing and smoking function. Worried was most strongly and negatively associated with risk-minimizing beliefs, but positively associated with quit intentions. Risk minimizing and smoking function correlated negatively with both quit intentions and quit attempts. Quit attempts correlated most strongly and positively with quit intentions.

Structural equation models. The results for the measurement and structural models are presented below.

Measurement model. The results indicated that the model was a good fit to the data (CFI = 0.987; TLI = 0.982; RMSEA = 0.027), but the item "You enjoy smoking too much to give it up" had a negative residual variance. Based on the modification index, this could be resolved by allowing this item to cross-load on the latent variable "worried," which is substantively meaningful because enjoyment can be considered an indicator of worry but phrased positively. The fit of the revised model was significantly improved, $\chi^2(1)$ difference test = 46.4, $p < .001$; CFI = 0.989; TLI = 0.985; RMSEA = 0.025. Factor loadings of the indicators

Table 2
Characteristics of Calibration and Validation Samples by Attrition Status

Variables	Calibration (Waves 5–6)			Validation (Waves 6–7)		
	Retained (n = 4,988)	Lost (n = 2,050)	Group difference (p)	Retained (n =5,065)	Lost (n = 1,821)	Group difference (p)
Control variables (baseline wave)						
Country (%)			<.001			<.001
Canada	24.9	24.2		25.7	22.2	
United States	22.7	32.2		23.7	29.9	
United Kingdom	25.3	21.6		23.6	24.5	
Australia	27.1	22.0		26.9	23.3	
Gender: male (%)	42.5	42.8	.84	42.8	42.7	.94
Age group (%)			<.001			<.001
18–24	5.6	11.6		4.2	10.9	
25–39	24.2	32.9		22.7	31.8	
40–54	42.1	35.8		43.2	34.4	
55+	28.1	19.7		29.9	22.8	
Education levels (%)			.03			.46
Low	52.2	55.6		51.3	52.9	
Medium	31.1	29.3		31.4	30.6	
High	16.7	15.1		17.3	16.5	
Cigarettes per day, *M* (*SE*)	17.3 (.14)	17.2 (.24)	.77	17.3 (.14)	16.9 (.24)	.16
Policy-specific variables (baseline)						
Salience, *M* (*SE*)[a]	3.3 (.02)	3.4 (.03)	.21	2.8 (.02)	2.9 (.03)	.33
Policy-specific mediators (baseline)						
Thoughts about risks of smoking, *M* (*SE*)[b]	2.0 (.01)	2.0 (.02)	.51	1.7 (.01)	1.8 (.02)	<.01
Avoidance, *M* (*SE*)[c]/% Yes[d]	0.4 (.01)	0.4 (.02)	.95	13.3	14.7	.13
Forgo, *M* (*SE*)[b]	1.2 (.01)	1.3 (.02)	<.01	1.2 (.01)	1.3 (.02)	<.001
Psychosocial mediators (baseline)						
Worried about damage from smoking *M* (*SE*)[b]	2.6 (.01)	2.6 (.02)	.54	2.5 (.01)	2.5 (.02)	.14
Risk-minimizing beliefs *M* (*SE*)[a]	3.0 (.01)	3.0 (.02)	.14	2.9 (.01)	2.9 (.02)	.44
Smoking function beliefs *M* (*SE*)[a]	3.2 (.01)	3.1 (.02)	<.001	3.6 (.01)	3.6 (.02)	.05
Intention to quit (%)			.08			.74
Within next month	10.8	12.9		10.8	11.6	
Within next 6 months	23.9	24.1		22.1	22.5	
Sometime in the future, beyond 6 months	35.4	34.2		36.1	35.4	
Not planning to quit	29.9	28.7		31.0	30.4	
Policy-relevant outcome (follow-up)						
Making quit attempts (%)	37.3	NA	NA	38.5	NA	NA

Note. NA = not applicable.
[a] Scale ranges from 1−5. [b] Scale ranges from 1−4. [c] Scale for calibration ranges from 0−4. [d] Percentage based on a yes−no response for the single-item measure for validation.

Table 3
Pearson Correlation Matrix Between Policy-Specific Variable, Policy-Specific Mediators, Psychosocial Mediators, and Policy-Relevant Outcome for Calibration and Validation Samples

	1	2	3	4	5	6	7	8	9
Calibration									
1. Salience	1.00								
2. Think risks	0.41**	1.00							
3. Worried	0.16**	0.39**	1.00						
4. Avoid	0.12**	0.25**	0.11**	1.00					
5. Forgo	0.25**	0.44**	0.17**	0.20**	1.00				
6. Risk minimizing	−0.10**	−0.30**	−0.46**	−0.05*	−0.14**	1.00			
7. Smoking function	−0.09**	−0.18**	−0.15**	−0.01	−0.14**	0.31**	1.00		
8. Plan to quit	0.10**	0.32**	0.42**	0.08**	0.18**	−0.37**	−0.34**	1.00	
9. Quit attempts	0.08**	0.17**	0.19**	0.05*	0.14**	−0.17**	−0.19**	0.36**	1.00
Validation									
1. Salience	1.00								
2. Think risks	0.47**	1.00							
3. Worried	0.16**	0.40**	1.00						
4. Avoid	0.14**	0.25**	0.11**	1.00					
5. Forgo	0.26**	0.42**	0.15**	0.18**	1.00				
6. Risk minimizing	−0.11**	−0.29**	−0.49**	−0.05**	−0.09**	1.00			
7. Smoking function	−0.10**	−0.17**	−0.09**	−0.01	−0.13**	0.20**	1.00		
8. Plan to quit	0.10**	0.29**	0.42**	0.07**	0.14**	−0.35**	−0.23**	1.00	
9. Quit attempts	0.05*	0.16**	0.22**	0.06**	0.12**	−0.18**	−0.14**	0.37**	1.00

* $p < .01$. ** $p < .001$.

for each latent variable in the final model were all significant ($ps <$ .001), with standardized values ranging between .52 and .94 (see Table 1). The cross-loading item has a factor loading of −.25 ($p <$ .001).

Structural model. The hypothesized model, as depicted in Figure 1, was a good fit to the data (CFI = 0.978; TLI = 0.966; RMSEA = 0.027), but could be further improved by adding a direct path from salience to forgo, $\chi^2(1)$ difference test = 15.4, $p < .001$. The revised model still exhibited good overall fit to the data (CFI = 0.978; TLI = 0.966; RMSEA = 0.027) and explained 23% of the variance in quit attempts (see Figure 2 and supplemental Table 1 for details). As hypothesized, warning label salience was positively associated with thoughts about risks of smoking and about quitting (β = .58, $p < .001$). Label salience was also positively associated with the two behavioral reactions to the warnings, namely, avoidance behavior (β = .20, $p < .001$) and forgoing a cigarette (β = .15, $p < .001$). Avoidance, however, had a positive association with thoughts about risks and about quitting (β = .28, $p < .001$), contrary to the prediction of the reactance model. As expected from both models, thoughts about risks and

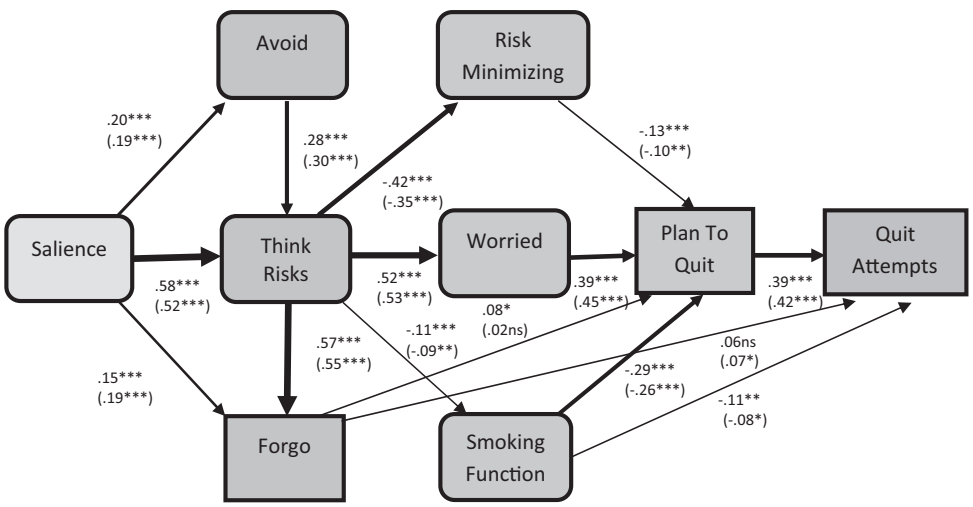

Figure 2. Structural equation model for Waves 5–6 calibration sample and Waves 6–7 validation sample with standardized regression coefficients (validation in parentheses) assessing the pathways of warning label impact on making quit attempts. To simplify presentation, control variables, factor loadings, residual values, regression coefficients of nonsignificant paths, and associations between variables were omitted from the figure. The thickness of the arrow depicts the effect size. ns = not statistically significant. * $p < .05$; ** $p < .01$; *** $p < .001$.

quitting predicted increased worry about smoking doing damage to health and lowering quality of life ($\beta = .52$, $p < .001$), and worry, in turn, predicted stronger intention to quit smoking ($\beta = .39$, $p < .001$). Thoughts about risks and about quitting stimulated by warning labels were also strongly predictive of frequency of forgoing a cigarette ($\beta = .57$, $p < .001$). Forgoing, however, was only a weak predictor of both quit intention ($\beta = .08$, $p < .05$) and quit attempts ($\beta = .06$, $p = .068$). Contrary to the prediction of the reactance model but consistent with the positive influence model, thoughts about risks and about quitting were negatively associated with risk-minimizing beliefs ($\beta = -.42$, $p < .001$) and smoking function beliefs ($\beta = -.11$, $p < .001$); however, as expected, both kinds of beliefs were negatively associated with quit intention ($\beta = -.13$ and $-.29$, ps $< .001$). As predicted, smoking function also had a direct negative effect on quit attempts ($\beta = -.11$, $p < .01$). Again, as expected, quit intention was a strong predictor of subsequently making quit attempts ($\beta = .39$, $p < .001$).

Validation Model

The results from the validation analysis were very similar to those of the calibration analysis (see Figure 2 and supplemental Table 1 for details). Both the measurement and the structural models were good fits to the Waves 6–7 data (CFI = .993 and .985; TLI = .989 and .973; RMSEA = .026 and .027, respectively). All pathways were successfully replicated with very similar effect sizes, except for the direct path from forgo to plan to quit, which was not significant ($\beta = .02$, $p = .468$). Results from random split-half and separate country analyses were also very similar to those of the calibration analysis, with only minor exceptions that effects for some pathways were either marginally significant or not significant but still trending in the same direction (see supplemental Table 1).

Tests of Indirect Paths

Results indicated that the tested indirect effects of warning label salience on quit attempts were all statistically significant for both the calibration and the validation models, with one exception (see Table 4). The indirect path via forgo, however, was not significant in the validation model ($\beta = .002$, $p = .469$).

Discussion

The results of this study demonstrate that the hypothesized mediational model of health warning label impact provided a good fit to the data both individually and pooled across the four countries studied, thus supporting the broad ITC conceptual model, which hypothesized that policies influence attempts to stop smoking through policy-specific variables and psychosocial mediators. These analyses are a demonstration, similar to Nagelhout et al.'s (2012), of the usefulness of the longitudinal cohort design of the ITC project surveys, coupled with the inclusion of multiple indicators of policy impact—allowing analytic models of considerable richness to be employed to answer questions about how policies may ultimately impact important behaviors, such as cigarette reduction, quit attempts, and quit success.

The findings from the present study confirmed our hypothesis that warning labels are effective in changing smokers' behavior primarily by stimulating them to think about the risks of smoking, which in turn evoke emotional reactions of worrying about negative outcomes, such as future health consequences and lowered quality of life from smoking. The increase in health concerns from the negative impact of smoking appears to increase intentions to quit smoking, which stimulates quitting behavior. The consistency of the findings across the four countries suggests that, despite the diverse warning labels across these countries with stronger warnings producing greater levels of reactions as found previously (Borland, Wilson, et al., 2009; Hammond et al., 2007), once people are engaged by the warning labels, regardless of their nature or type, the same processes are involved in carrying through their impacts on quitting behavior. The small text-only warnings in the United States are less noticeable and, hence, very few people pay any attention to these warnings, and those who do (for whatever reasons) are influenced in similar ways, resulting in a similar behavioral change. So larger and graphic warnings are more effective in the sense of drawing more people to pay attention to and engage with these warnings (Borland, Wilson, et al., 2009; Hammond, 2011).

The finding of the important role of thoughts about the risks of smoking in the hypothesized mediational pathway is consistent with the independent predictive effect of this same cognitive factor found by Borland et al. (2009), who used logistic regression models. The data reveal that this cognitive response to warning labels brings about the desired quitting behavior primarily by enhancing the downstream affective, motivational, and behavioral facilitators of such behavior and by reducing the psychological barriers to quitting. Inherent in the positive influence model is the expectation that the extent of thinking about smoking harms is predicated on being informed about the health risks of smoking, initially through new warning label

Table 4
Indirect Effects of Warning Label Salience on Making Quit Attempts

Indirect effects	Waves 5–6 calibration β	Waves 5–6 calibration *SE*	Waves 6–7 validation β	Waves 6–7 validation *SE*
Salience → quit attempts				
Via think risks, worried, and plan to quit	.049***	.006	.040***	.006
Via think risks, forgo, and plan to quit	.010*	.005	.002	.003
Via think risks, smoking function, and plan to quit	.008***	.002	.004**	.002
Via think risks, risk minimizing, and plan to quit	.013**	.004	.006*	.003

* $p < .05$. ** $p < .01$. *** $p < .001$.

content improving smokers' knowledge of a wide range of health effects of smoking and subsequently through constantly reminding them of the health effects triggered by each exposure of the warning labels. Relatively larger and more graphic warning labels that are more salient have been shown to do a better job at this (Hammond, 2011; Hammond et al., 2012; Thrasher, Arillo-Santillán, et al., 2012; Thrasher, Carpenter, et al., 2012; Thrasher, Pérez-Hernández, Arillo-Santillán, & Barrientos-Gutierrez, 2012).

As expected from both models, warning labels that are salient stimulate avoidance behavior, but, contrary to the prediction of the reactance model (de Bruin & Peters, 2013; Peters et al., 2013; Ruiter & Kok, 2005), such behavior inhibits neither thoughts about the harms of smoking nor motivation to quit smoking, lending further support to previous finding of no adverse effects of avoidance behavior from several experimental (Kees et al., 2010; Peters et al., 2007) and population-based studies (Borland, Yong, Wilson, et al., 2009; Hammond et al., 2004). The data we have presented in this article show that behavioral avoidance is associated with increased rather than decreased frequency of thoughts about smoking harms, suggesting another pathway through which warnings can exert their influence on subsequent quitting behavior. This is not surprising because any attempts to avoid the warnings, so as to not think of the harms of smoking, prove futile. The more one tries to not think of something, the more one tends to focus on it (Rassin, Merckelbach, & Muris, 2000; Wegner, 1994). These findings suggest that, at least at the population level where smokers are repeatedly exposed to warning messages over a period of time, avoidance of warnings does not appear to have any adverse effects as predicted by some. The lack of adverse outcomes, even in countries like Canada and Australia that have strong warnings, might be because these warnings are accompanied by telephone quitline numbers and/or other supportive messages designed to increase self-efficacy for quitting. Some health communication theories have predicted that messages that combine threatening information with information that increase self-efficacy for behavior change are more likely to result in positive behavior change (Witte & Allen, 2000).

Again, as predicted by both models, salient warnings can also lead smokers to momentarily resist and forgo a planned cigarette. Such immediate cessation-related behavior is stimulated mainly by thoughts about the harms of smoking, although there is some evidence that it can also be directly triggered by warnings that are salient. Consistent with Borland et al.'s (2009) finding, forgoing behavior leads smokers to subsequently make a quit attempt either directly or via quit intentions, although neither pathway seems robust. Future research is warranted to clarify whether the immediate nonsmoking actions stimulated by warning labels influence downstream quitting behavior directly or indirectly via quitting motivation.

The analyses also indicate that another route, whereby thoughts stimulated by warning label can stimulate subsequent quitting activity, is challenging and reducing beliefs that serve as psychological rationalizations and justifications for smoking. Consistent with past research (Borland, Yong, Balmford, et al., 2009; Yong & Borland, 2008), both of these beliefs have an inhibiting effect on motivation to quit smoking, with functional beliefs about smoking also having a direct inhibiting effect on quit attempts. However, the data in our study suggest that warning label-stimulated thoughts about the harms of smoking do not increase these beliefs, as predicted by the reactance model, but, rather, consistent with the positive influence model, they lead to a reduction in both of these beliefs, which reduces their overall negative impact on quit intentions and behavior.

Strengths and Limitations

This study has several strengths. First, to our knowledge, this is the first study to examine a full, theoretically based mediational model explaining the effect of cigarette pack warning labels on quitting behavior. Second, the large sample size, the longitudinal design, the validation of the model on different samples, and the consistency of the findings across countries provide confidence in the robustness of the final model. However, several study limitations warrant mention. First, it might be argued that the findings presented here are based on four high-income countries and may not fully generalize to other countries with different cultural and socioeconomic environments. However, it should be noted that the hypothesized model was tested on data pooled across four countries with warning labels that differ in nature, size, and position; and any country-specific effect was controlled for, and the fact that it was successfully replicated provides confidence that the effect of warning label impact will be mediated through similar pathways in many other countries as well. Second, the mediators were all collected at the same time point, although the fact that our model was successfully replicated in different samples does lend support to the credibility of the causal assumptions made in our model. Third, it is possible that there might be other alternative models that had not been tested that would fit the data equally well, or even better.

Findings Implications

Our findings have important implications for health warning policy implementation and development. It is now clear that larger and more graphic warnings are better at getting more people to pay attention to them (Borland, Wilson, et al., 2009; Hammond, 2011; Hammond et al., 2007; Hammond et al., 2003; Thrasher, Pérez-Hernández, et al., 2012), and once people are engaged, warnings will have a chance to change behavior via various pathways of influence. Therefore, efforts should be made by policymakers to increase the salience of warning labels through the use of elements such as pictorial images, changing graphic design elements, increasing the size of warnings particularly on front of packs, and putting warnings against a standardized background like the plain packaging introduced in Australia recently. Other interventions, such as use of mass media campaigns that carry similar health warnings and display of similar warnings at point of sale, may complement the pack warnings because these strategies can help to reinforce the same messages found on cigarette pack warning labels (Brennan, Durkin, Cotter, Harper, & Wakefield, 2011; Coady et al., 2013; Li et al., 2012; Thrasher et al., 2013). From an implementation perspective, to ensure that warning labels remain highly salient, they should be placed prominently on the front of tobacco products, and refreshed periodically to overcome habituation. Challenging smokers' beliefs about the functional utility of smoking and helping them to find healthy alternatives may also help reduce the psychological barrier to quitting.

Conclusion

Our study findings support a simplified conceptual model of the impact of warning labels as follows. Cigarette warning labels seem to encourage smokers to quit smoking through the main pathway of getting them to pay attention to these warnings, then by stimulating them to think about the harms of smoking, which helps to raise their concerns for the future negative outcomes of smoking. This, in turn, leads to stronger intentions to quit smoking, which then drives them to try to change their behavior. A second pathway is through generating harm-related thoughts that counteract and reduce psychological defenses; a third is by weakening beliefs about the value of smoking. There may be a fourth, thoughts leading to forgoing cigarettes which may have a small independent effect, but whether through intentions or directly through attempts is unclear. Avoidance behavior shows no undesirable effect and only has any effect it may have through increasing (not decreasing) the frequency of thoughts about smoking harms.

References

Asparouhov, T. (2005). Sampling weights in latent variable modeling. *Structural Equation Modeling, 12,* 411–434. doi:10.1207/s15328007sem1203_4

Bentler, P. M. (1990). Comparative fit indexes in structural models. *Psychological Bulletin, 107,* 238–246. doi:10.1037/0033-2909.107.2.238

Borland, R. (1997). Tobacco health warnings and smoking-related cognitions and behaviours. *Addiction, 92,* 1427–1435. doi:10.1111/j.1360-0443.1997.tb02864.x

Borland, R., Wilson, N., Fong, G. T., Hammond, D., Cummings, K. M., Yong, H. H., . . . McNeill, A. (2009). Impact of graphic and text warnings on cigarette packs: Findings from four countries over five years. *Tobacco Control, 18,* 358–364. doi:10.1136/tc.2008.028043

Borland, R., Yong, H., Balmford, J., Cooper, J., Cummings, K. M., O'Connor, R. J., . . . Fong, G. T. (2010). Motivational factors predict quit attempts but not maintenance of smoking cessation: Findings from the International Tobacco Control Four Country Project. *Nicotine and Tobacco Research, 12*(Supp), S4–S11. doi:10.1093/ntr/ntq050

Borland, R., Yong, H., Balmford, J., Fong, G., Zanna, M., & Hastings, G. (2009). Do risk-minimizing beliefs about smoking inhibit quitting? Findings from the International Tobacco Control (ITC) Policy Evaluation Survey. *Preventive Medicine, 49,* 219–223. doi:10.1016/j.ypmed.2009.06.015

Borland, R., Yong, H. H., Wilson, N., Fong, G. T., Hammond, D., Cummings, K. M., . . . McNeill, A. (2009). How reactions to cigarette pack health warnings influence quitting: Findings from the ITC Four-Country survey. *Addiction, 104,* 669–675. doi:10.1111/j.1360-0443.2009.02508.x

Brennan, E., Durkin, S., Cotter, T., Harper, T., & Wakefield, M. (2011). Mass media campaigns designed to support new pictorial health warnings on cigarette packets: Evidence of a complementary relationship. *Tobacco Control, 20,* 412–418. doi:10.1136/tc.2010.039321

Browne, M., & Cudeck, R. (1993). Alternative ways of assessing model fit. In K. Bollen & J. Long (Eds.), *Testing structural equation models* (pp. 136–162). Newbury Park, CA: Sage.

Cameron, L. D., Pepper, J. K., & Brewer, N. T. (2013). Responses of young adults to graphic warning labels for cigarette packages. *Tobacco Control*. Advance online publication. doi:10.1136/tobaccocontrol-2012-050645

Coady, M. H., Chan, C. A., Auer, K., Farley, S. M., Kilgore, E. A., & Kansagra, S. M. (2013). Awareness and impact of New York City's graphic point-of-sale tobacco health warning signs. *Tobacco Control, 22,* e51–e56. doi:10.1136/tobaccocontrol-2011-050261

Costello, M. J., Logel, C., Fong, G. T., Zanna, M. P., & McDonald, P. W. (2012). Perceived risk and quitting behaviors: Results from the ITC 4-Country survey. *American Journal of Health Behavior, 36,* 681–692. doi:10.5993/AJHB.36.5.10

de Bruin, M., & Peters, G. (2013). Let's not further obscure the debate about fear appeal messages for smokers. *American Journal of Preventive Medicine, 44,* e51. doi:10.1016/j.amepre.2013.02.006

Emery, L. F., Romer, D., Sheerin, K. M., Jamieson, K. H., & Peters, E. (2013). Affective and cognitive mediators of the impact of cigarette warning labels. *Nicotine & Tobacco Research*. Advance online publication. doi:10.1093/ntr/ntt124

Fathelrahman, A. I., Omar, M., Awang, R., Borland, R., Fong, G. T., Hammond, D., & Zain, Z. (2009). Smokers' responses towards cigarette pack warning labels in predicting quit intention, stage of change, and self-efficacy. *Nicotine & Tobacco Research, 11,* 248–253. doi:10.1093/ntr/ntn029

Fong, G. T., Cummings, K. M., Borland, R., Hastings, G., Hyland, A., Giovino, G. A., . . . Thompson, M. E. (2006). The conceptual framework of the International Tobacco Control (ITC) Policy Evaluation Project. *Tobacco Control, 15*(Supp. 3), iii3–iii11.

Hammond, D. (2011). Health warning messages on tobacco products: A review. *Tobacco Control, 20,* 327–337. doi:10.1136/tc.2010.037630

Hammond, D., Fong, G. T., Borland, R., Cummings, K. M., McNeil, A., & Driezen, P. (2007). Text and graphic warnings on cigarette packages: Findings from the International Tobacco Control Four Country Study. *American Journal of Preventive Medicine, 32,* 202–209. doi:10.1016/j.amepre.2006.11.011

Hammond, D., Fong, G. T., McDonald, P. W., Cameron, R., & Brown, K. S. (2003). The impact of the graphic Canadian warning labels on adult smoking. *Tobacco Control, 12,* 391–395. doi:10.1136/tc.12.4.391

Hammond, D., Fong, G. T., McDonald, P. W., Cameron, R., & Brown, K. S. (2004). Graphic Canadian warning labels and adverse outcomes: Evidence from Canadian smokers. *American Journal of Public Health, 94,* 1442–1445. doi:10.2105/AJPH.94.8.1442

Hammond, D., Thrasher, J., Reid, J. L., Driezen, P., Boudreau, C., & Arillo-Santillán, E. (2012). Perceived effectiveness of pictorial health warnings among Mexican youth and adults: A population-level intervention with potential to reduce tobacco-related inequities. *Cancer Causes & Control, 23*(Supp. 1), 57–67. doi:10.1007/s10552-012-9902-4

Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling, 6,* 1–55. doi:10.1080/10705519909540118

Hyland, A., Borland, R., Li, Q., Yong, H. H., McNeil, A., Fong, G. T., . . . Cummings, K. M. (2006). Individual-level predictors of cessation behaviors among participants in the International Tobacco Control (ITC) Four Country Survey. *Tobacco Control, 15*(Supp. 3), iii83–iii94. doi:10.1136/tc.2005.013516

International Agency for Research on Cancer. (2008). *IARC handbooks of cancer prevention, tobacco control, Vol. 12: Methods for evaluating tobacco control policies*. Lyon, France: Author.

Kees, J., Burton, S., Andrews, J., & Kozup, J. (2010). Understanding how graphic pictorial warnings work on cigarette packaging. *Journal of Public Policy & Marketing, 29*(2), 265–276.

Li, L., Borland, R., Yong, H. H., Hitchman, S. C., Wakefield, M. A., Kasza, K. A., & Fong, G. T. (2012). The association between exposure to point-of-sale anti-smoking warnings and smokers' interest in quitting and quit attempts: Findings from the International Tobacco Control Four Country Survey. *Addiction, 107,* 425–433. doi:10.1111/j.1360-0443.2011.03668.x

Muthen, L., & Muthen, B. (1998–2010). *Mplus user's guide* (6th ed.). Los Angeles, CA: Author.

Nagelhout, G. E., de Vries, H., Fong, G. T., Candel, M. J., Thrasher, J. F., van den Putte, B., . . . Willemsen, M. C. (2012). Pathways of change explaining the effect of smoke-free legislation on smoking cessation in

the Netherlands: An application of the International Tobacco Control conceptual model. *Nicotine & Tobacco Research, 14,* 1474–1482. doi:10.1093/ntr/nts081

Partos, T. R., Borland, R., Yong, H. H., Thrasher, J., & Hammond, D. (2013). Cigarette packet warning labels can help prevent relapse: Findings from the International Tobacco Control 4-Country policy evaluation cohort study. *Tobacco Control, 22,* e43–e50. doi:10.1136/tobaccocontrol-2011-050254

Peters, E., Romer, D., Slovic, P., Jamieson, K. H., Wharfield, L., Mertz, C. K., & Carpenter, S. M. (2007). The impact and acceptability of Canadian-style cigarette warning labels among US smokers and nonsmokers. *Nicotine & Tobacco Research, 9,* 473–481. doi:10.1080/14622200701239639

Peters, G. J., Ruiter, R. A., & Kok, G. (2013). Threatening communication: A critical re-analysis and revised meta-analytic test of fear appeal theory. *Health Psychology Review, 7*(Supp. 1), S8–S31. doi:10.1080/17437199.2012.703527

Rassin, E., Merckelbach, H., & Muris, P. (2000). Paradoxical and less paradoxical effects of thought suppression: A critical review. *Clinical Psychology Review, 20,* 973–995. doi:10.1016/S0272-7358(99)00019-7

Romer, D., Peters, E., Strasser, A., & Langleben, D. (2013). Desire versus efficacy in smokers' paradoxical reactions to pictorial health warnings for cigarettes. *PLoS ONE, 8,* e54937. doi:10.1371/journal.pone.0054937

Ruiter, R. A. C., Abraham, C., & Kok, G. (2001). Scary warnings and rational precautions: A review of the psychology of fear appeals. *Psychology & Health, 16,* 613–630. doi:10.1080/08870440108405863

Ruiter, R. A. C., & Kok, G. (2005). Saying is not (always) doing: Cigarette warning labels are useless [letter]. *European Journal of Public Health, 15,* 329. doi:10.1093/eurpub/cki095

Shanahan, P., & Elliot, D. (2009). *Evaluation of the effectiveness of the graphic health warnings on tobacco product packaging 2008*. Canberra, Australia: Australian government Department of Health & Ageing.

Thompson, M. E., Fong, G. T., Hammond, D., Boudreau, C., Driezen, P., Hyland, A., . . . Laux, F. L. (2006). Methods of the International Tobacco Control (ITC) Four Country Survey. *Tobacco Control, 15*(Supp. 3), iii12–iii18. doi:10.1136/tc.2005.013870

Thrasher, J. F., Arillo-Santillán, E., Villalobos, V., Pérez-Hernández, R., Hammond, D., Carter, J., . . . Regalados-Piñeda, J. (2012). Can pictorial warning labels on cigarette packages address smoking-related health disparities? Field experiments in Mexico to assess pictorial warning label content. *Cancer Causes & Control, 23,* 69–80. doi:10.1007/s10552-012-9899-8

Thrasher, J. F., Carpenter, M. J., Andrews, J. O., Gray, K. M., Alberg, A. J., Navarro, A., . . . Cummings, K. M. (2012). Cigarette warning label policy alternatives and smoking-related health disparities. *American Journal of Preventive Medicine, 43,* 590–600. doi:10.1016/j.amepre.2012.08.025

Thrasher, J. F., Murukutla, N., Pérez-Hernández, R., Alday, J., Arillo-Santillán, E., Cedillo, C., & Gutierrez, J. P. (2013). Linking mass media campaigns to pictorial warning labels on cigarette packages: A cross-sectional study to evaluate impacts among Mexican smokers. *Tobacco Control, 22,* e57–e65. doi:10.1136/tobaccocontrol-2011-050282

Thrasher, J. F., Pérez-Hernández, R., Arillo-Santillán, E., & Barrientos-Gutiérrez, I. (2012). [Towards informed tobacco consumption in Mexico: Effects of pictorial warning labels among smokers]. *Revista de Salud Pública de México, 54,* 242–253.

Vangeli, E., Stapleton, J., Smit, E., Borland, R., & West, R. (2011). Predictors of attempts to stop smoking and their success in adult general population samples: A systematic review. *Addiction, 106,* 2110–2121. doi:10.1111/j.1360-0443.2011.03565.x

Wegner, D. M. (1994). Ironic processes of mental control. *Psychological Review, 101,* 34–52. doi:10.1037/0033-295X.101.1.34

Witte, K., & Allen, M. (2000). A meta-analysis of fear appeals: Implications for effective public health campaigns. *Health Education & Behavior, 27,* 591–615. doi:10.1177/109019810002700506

Yong, H. H., & Borland, R. (2008). Functional beliefs about smoking and quitting activity among adult smokers in four countries: Findings from the ITC Four-Country Survey. *Health Psychology, 27*(3 Supp.), S216–S223. doi:10.1037/0278-6133.27.3(Suppl.).S216

Yong, H. H., Fong, G. T., Driezen, P., Borland, R., Quah, A. C., Sirirassamee, B., . . . Omar, M. (2013). Adult smokers' reactions to pictorial health warnings labels on cigarette packs in Thailand and moderating effects of type of cigarette smoked: Findings from the International Tobacco Control Southeast Asia (ITC-SEA) Survey. *Nicotine and Tobacco Research, 15,* 1339–1347. doi:10.1093/ntr/nts241

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