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Exploring the effectiveness of cigarette warning labels: findings from the United States and United Kingdom arms of the International Tobacco Control (ITC) Four Country Survey

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- *This paper explores the effectiveness of cigarette warning labels across two countries, one (the UK) with new and stricter legislation where text based labels have been made more prominent and one (the USA) with less stringent regulation, where labels are less visible. Using longitudinal data from the two countries, the research seeks to investigate the impact of the different types of warning labels on the information processing by consumers. This paper assesses the effectiveness of warning labels in terms of: consumer attention, elaboration, contemplation on quitting and behavioural compliance. This study provides a comprehensive examination of these key factors in a fixed causal sequence. Structural equation modelling was used to test this model based on longitudinal panel survey data from the International Tobacco Control (ITC) Four Country Survey. Analysis of a sample of 901 US smokers and 1459 UK smokers yielded results in full support of all hypothesised relationships in the model proposed for both countries. Findings suggest that the new European Union policy of more prominent warning labels has a direct effect on influencing behavioural compliance by smokers.*

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Contextual background

Current figures suggest that annually around 440 000 deaths in the United States of America are attributable to smoking related illnesses

(Centers for Disease Control and Prevention, 2002) with 4.8 million smoking related deaths each year worldwide (Ezzati and Lopez, 2003). Against this background, governments worldwide have initiated a number of initiatives, regulatory interventions and social programs to address this problem with an emphasis on deterring uptake and supporting cessation. One such policy mandates the use of warning labels on cigarette packages.

Cigarette warning labels have been around since the 1960s (Federal Cigarette Labelling and Advertising Act, 1964). Recently several governments have strengthened regulations on warning labels, including the introduction of pictorial warning labels in Canada (Canada Gazette Part II, 2000), and the European Commission's directive to enlarge and rotate cigarette warning labels (Directive 2001/37/EC). The recently adopted Framework Convention on Tobacco Control (FCTC) sets minimal standards for warning labels (30% on the principal surfaces of the package, with rotating content, and with information about smoke constituents). Over 120 countries have ratified the FCTC already, and thus, the next few years will see a tremendous movement toward enhancing warning labels on cigarette packages.

On the 10th May 2004 the United States signed up to the FCTC but have yet to ratify it to date, and as a result, the US is still not committed to the convention rules with the US warning labels falling far short of the FCTC minimal standard. The labels are small and printed on the side of the pack, with no typographical or graphic elements to make the warnings distinguishable from the trade dress of the cigarette brand itself. The Surgeon General's report on reducing tobacco use (Centers for Disease Control and Prevention, 2000) stated that the US cigarette warning labels are weaker and less prominent than those in most other countries. So far, there are no plans in the US to strengthen their warning labels. Against the trend in the rest of the world, the question must be asked as to whether the US and other countries with weak labelling policies need to fall in step regarding revisions on the size, content and prominence of cigarette warning labels.

In order to answer this research question, key factors essential in the assessment of warning label effectiveness must be identified. Recent developments based on information processing frameworks have highlighted the pertinence of dimensions covering: attention; reading and comprehension; recall; elaboration, judgements and behavioural compliance (McGuire, 1999; Argo and Main, 2004). We draw on these dimensions to develop our model (see **Figure 1**) covering the essential stages required to assess warning label effectiveness. Specifically, our consumer information processing model is a fixed causal sequence linking attention, elaboration of the message, contemplation on quitting smoking and behavioural compliance. This paper extends the research to date by providing a comprehensive examination of these key stages over two time periods within a unified model. The second contribution of this paper is the assessment of the impact of the change in EU warning label policy on smokers with a view to informing policy development and decision-making in the US and other counties with weaker warning label policies. Our study adopts this cross-national approach, drawing on the contrast present in the UK sample where text based cigarette warning labels have

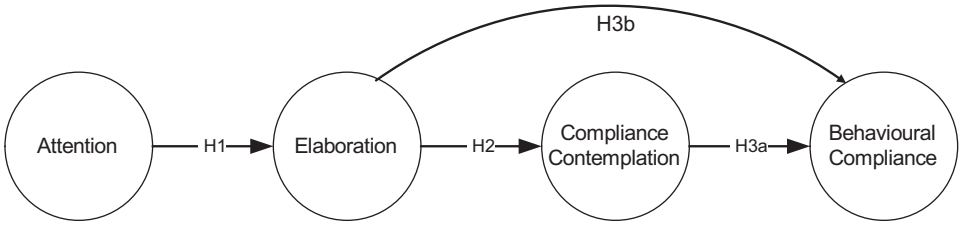

Figure 1. Conceptual model.

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substantially changed in size and content between the two time periods studied whereas no changes were made in the US.

Finally, limited research has been conducted examining consumer reactions to warning labels over time. Longitudinal studies in particular, allow the best examination of the effects of overexposure and wear-out. Given that cigarette warning labels have remained substantially unchanged in the US over the last two decades, longitudinal research is overdue in this context. The full effects of wear-out are likely to have been reached already in the US, however a longitudinal study will demonstrate the extent of any residual reductions in the effects of warning labels in this environment. The research background to our conceptual model is now discussed.

Research background and model development

Research (Argo and Main, 2004) has examined warning label effectiveness in a number of contexts (e.g., alcohol, chemicals, cigarettes) with overall mixed results found in their assessments (Adams and Edworthy, 1995; MacKinnon *et al*., 2002). Argo and Main (2004) define attention as comprising variables noticeability, awareness, attention and recognition. Both exposure to and awareness of warning labels are prerequisites to information processing. If warning labels fail to attract consumer attention, they cannot realistically yield any intended effect. Laughery *et al*., (1993) show that warnings should be designed to address pre-attentive processing through strong salient features such as colour, borders and pictures. Cognitive elaboration is considered central to memory and attitude change (Anderson, 1990) and Borland (1997), in his empirical study based on longitudinal data, finds that increased frequency of relevant thoughts regarding cigarette warning label messages results in greater behavioural compliance in terms of quit attempts. These conclusions are consistent with the elaboration likelihood model (Petty and Cacioppo, 1981) and its contention that awareness of messages without extensive elaboration is unlikely to lead to permanent attitude and behavioural change. Judgement on the merits of the warnings represents reasoned beliefs about the consequences of a behaviour in light of the information processed. Research findings (Mazis *et al*., 1991; Kaskutas, 1993; Argo and Main, 2004) are inconclusive about the effects of warning labels on consumer's perceptions of risk. Nevertheless, once a judgement is made on the merits of the warning label messages, contemplations on behaviour change and actual behavioural change are likely to occur. Therefore, greater elaboration on the harm of smoking is expected to lead to a greater degree of contemplation to quit. Behavioural compliance is a desired outcome of warnings. With few exceptions, research has shown that warning labels have a significant impact on behavioural compliance, although most of these studies have been conducted in domains such as chemicals. In those studies, the amount of explained variance reported in the literature is only moderate (around 10 to 15%; Argo and Main, 2004). A growing number of studies (Hammond *et al*., 2003, 2006; Kees *et al*., 2006; Hammond *et al*., 2007) have examined the behavioural impact of warning labels in the domain of tobacco use. In one Canadian study, Hammond *et al*. (2003) find that salience of warning labels and measures of their perceived impact are positively related to an index of behavioural progression toward quitting. Given the lack of research on the behavioural impact of cigarette warning labels, it is pertinent to examine the intermediary stages from exposure to compliance so that the nature and extent of these effects can be fully understood and assessed.

Since warning labels are not always effective in promoting behavioural change (Laughery *et al*., 1993; MacKinnon *et al*., 2002) it is important to consider why consumers might resist warnings. One reason for this phenomenon is overexposure and subsequent wear-out (Bornstein, 1989). Given that smokers are exposed to warning labels on average 20 times a day, overexposure and wear-out is likely to take place. Researchers also draw on other

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theories to understand the lack of compliance. For example the theory of perceptual defence (McGinnies, 1949; Schuster and Powell, 1987) posits that consumers disregard messages that conflict with their own beliefs. Research on fear appeals based on the protection motivation model (Tanner *et al*., 1991) suggests that maladaptive behaviours, such as increased smoking, can result from exposure to threat communications. Cigarette warning messages such as 'Smoking Kills' can be viewed as threats for those smokers who perceive their inadequate ability to remove the threat by quitting. According to social judgement theory (Sherif and Hovland, 1961) consumer reaction to warning labels depends on their latitude of acceptance. For some smokers, strong or provocative warning labels could lead to a contrast effect causing the message to fall outside their latitude of acceptance and inhibit processing. Overall these theories suggest that some consumers may not cognitively engage with warning labels, resulting in failures to comply with the message. It is therefore important to investigate not only the effects of warning labels on behavioural compliance but through each stage of the information process model such as that depicted in Figure 1.

Hypotheses

Consistent with McGuire's (1999) information processing model, we propose a causal sequence of effects from attention to the warning labels, through cognitive elaboration of the contents of the message, leading towards contemplations to quit and culminating in behaviour in compliance with the warning messages.

Opportunity to engage in cognitive elaboration is missing if the receiver does not attend to the message. Furthermore, greater involvement with the warning label by paying close attention to the message is expected to lead towards greater elaboration. Borland (1997) finds that increased awareness of cigarette warnings leads to greater elaboration about the negative effects of smoking. We therefore hypothesise that:

H1: *For both the US and the UK, smokers who notice and attend to labels more will elaborate more on the content of the warning label messages.*

According to the elaboration likelihood model, smokers are likely to be persuaded by the warnings if they think carefully about the contents of the warning messages. Elaboration in terms of examining the validity and merits of the messages would lead to judgements beyond what is explicitly expressed in the warnings once the smoker becomes convinced of the dangers of smoking. As a result, greater elaboration on the harm of smoking would lead to more contemplation to quit smoking. Thus, we hypothesise that:

H2: *For both the US and the UK, smokers who elaborate more on the warning label messages will contemplate quitting smoking more frequently.*

Attitudinal and motivation theories (Ajzen, 1991) point to behavioural consequences once positive attitudes are formed and motivation to act is strong. Smokers who value health outcomes and are persuaded by warnings of the dangers and harm arising from smoking are likely to be motivated to change their behaviour in order to reduce cognitive dissonance. Given sufficient conviction and motivation, smokers would likely change their behaviour in order to bring it into alignment with the intended message within the warnings. Frequent contemplation on complying with the warnings without subsequent behavioural compliance would not in itself reduce cognitive dissonance. Hence we would expect a direct effect of contemplation to quit on behavioural compliance. However, some reactions to warning labels, such as putting the cigarette out before it is finished or deciding not to smoke after reading the label, can be argued as consequences of recall of prior cognitive reasoning. Elaboration of the warnings alone would likely refresh memory of judgements on the dangers of smoking and the desirability of quitting in contrary to

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habitual behaviour. Hence elaboration can also be expected to directly impact behavioural compliance. Indeed Borland (1997) reports a strong association between elaboration and behavioural compliance. In our study, we define behavioural compliance as putting a cigarette out before it is finished or deciding not to smoke after reading the warning label. We therefore hypothesise that:

H3a: *For both the US and the UK, smokers who contemplate quitting smoking more frequently will be more likely to adopt behaviours in compliance with the warnings.*

H3b: *For both the US and the UK, smokers who elaborate more on the warning label messages will be more likely to adopt behaviours in compliance with the warnings.*

Hypotheses 1 to 3 together, if supported, would validate our model and the causal sequence proposed (see Figure 1) across both the US and UK samples.

Apart from examining causal relationships within the model, a comparison between the US and the UK would help to clarify and make relevant the model in terms of the different cigarette warning label policy implementations across the two countries.

Given that US cigarette warning labels have not changed over a long period, wear-out is likely to have occurred. Longitudinal studies (Godfrey and Laughery, 1984; Pollack-Nelson, 1995; Henderson, 2000) have found that warning label effectiveness decreases with time; as consumers become too familiar with the label they do not notice its presence and fail to continue to process or adhere to the warning. Alternatively, one might argue that US smokers only react to the presence of a label rather than the warning message. Furthermore, one might also argue that US smokers have resolved their cognitive dissonance regarding the warnings and hence would discount such messages. Based on these two alternative arguments, one would conclude that no significant changes in US smokers' engagements with the warnings would take place over the two time points. On balance, we lean towards the literature supporting the case for a wear-out effect and hypothesise that:

H4a: *US smokers will not notice and attend to warning labels more at time 2 than at time 1.*

H4b: *US smokers will not elaborate on warning labels more at time 2 than at time 1.*

H4c: *US smokers will not contemplate quitting more frequently at time 2 than at time 1.*

H4d: *US smokers will not adopt compliance behaviour more often at time 2 than at time 1.*

Throughout the period of this study (from August 2002 to October 2003) US cigarette warning labels consisted of four rotating warnings, placed on the sides of the pack, covering approximately 5% of the total pack size. In contrast, changes to UK cigarette labels came into law (2001/37/EC) on the 1st January 2003. This directive imposes that all European Union Member States sell cigarette packs with two large warning labels. The front of the pack must contain one of two labels covering 30% of the front surface, while the second label on the back must contain one of 14 warnings covering 40% of the back surface. Previous regulations had instructed that a general message be placed on the front surface covering at least 4% with an alternating specific warning on the back of the pack covering around 5%.

A number of studies (Borland, 1997; Willemsen, 2005; Hammond *et al.*, 2007) have shown that new labels increase the visibility of warnings and result in increased awareness, elaboration and to some extent compliance behaviour. We therefore hypothesise that:

H5a: *UK smokers will notice and attend to warning labels more at time 2 than at time 1.*

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H5b: *UK smokers will elaborate on warning labels more at time 2 than at time 1.*

H5c: *UK smokers will contemplate quitting more frequently at time 2 than at time 1.*

H5d: *UK smokers will adopt compliance behaviour more often at time 2 than at time 1.*

Methodology

Data from the International Tobacco Control (ITC) Four Country Survey (http://www.itcproject.org) were used for this research. This nationally representative, longitudinal panel survey of adult smokers was designed to evaluate the impact and mechanisms of impact for a number of key government policy initiatives to reduce tobacco consumption. The survey began in 2002 and the data used for this analysis come from two waves collected in October–December 2002 (before the change in UK legislation) and May–August 2003. Telephone interviews were conducted with a continuing cohort of respondents. Initial contact with respondents was made using probability sampling methods (random-digit-dialling methods from list-assisted telephone numbers) with numbers selected at random from the population of each country within strata defined by geographic region and community size.

Inclusion criteria for this research defined smokers as those who reported having smoked at least 100 cigarettes in their lifetime and who smoked at least once a day. Only data for the US and the UK are analysed and reported on in this paper. After excluding participants with missing values at either wave (231 US and 355 UK respondents), the survey resulted in a sample of 901 US smokers with a mean age of 44 years (SD = 14.14) and 59% were female. The average number of cigarettes smoked per day for these smokers was 19 (SD = 10.27). The UK sample consisted of 1459 smokers, with a mean age of 46 years (SD = 14.14), 56% were female, and the average number of cigarettes smoked per day for the sample was 18 (SD = 8.64). Therefore, the samples are similar in terms of demographic profile and smoking pattern.

Measures

Attention was assessed with two items that addressed awareness (i.e. 'How often, if at all, have you noticed the warning labels on cigarette packages during the last month') and depth of processing (i.e. 'How often, if at all, have you read or looked closely at the warning labels on cigarette packages during the last month'). Both items have a five-point response format ranging from 'never' to 'very often'. *Elaboration* was assessed with two items covering the main content of warning label messages. Both items are framed 'How often, if at all, did you' firstly 'think about the danger or other bad things about smoking' and secondly 'think about the harm your smoking might be doing to you'. Both questions use the month before the survey as the time frame of reference and have a five-point response option from 'never' to 'very often'. *Compliance contemplation* (contemplation on quitting) was assessed via one item. This item measures the extent to which 'warning labels on cigarette packages have led you to think about quitting in the past six months'. Responses are based on three options: 'not at all', 'somewhat' and 'very much'. This item is distinct from the elaboration items which cover thinking about the dangers and harm of smoking, in that this item relates to thinking about behaviour in compliance with the warning. Finally *behavioural compliance* was assessed by two items, firstly 'In the last month, have you butted out a cigarette before you finished it because you thought about the harm of smoking' and secondly 'In the last month, have the warning labels stopped you from having a cigarette when you were about to smoke one'. Four response options 'never', 'once', 'a few times' and 'lots of times' are provided for each of these two items.

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Table 1. Mean, standard deviation and correlations

	Mean		SD		1	2	3	4	5	6	7
	US	UK	US	UK							
1. Awareness	−0.17	1.22	1.50	1.58	—	0.59**	0.14**	0.07*	0.13**	0.07*	0.20**
2. Depth of processing	−0.10	1.17	1.31	1.71	0.46**	—	0.12**	0.10**	0.16**	0.07**	0.22**
3. Elaboration on danger	−0.21	−0.13	1.23	1.38	0.04	0.07*	—	0.50**	0.05	0.18**	0.11**
4. Elaboration on harm	−0.16	−0.17	1.16	1.36	0.09**	0.12**	0.48**	—	0.08*	0.18**	0.14**
5. Inclination to quit	−0.03	0.23	0.61	0.79	0.10**	0.17**	0.12**	0.15**	—	0.06	0.10**
6. Compliance on butting out	−0.07	−0.01	1.15	1.02	0.06*	0.07**	0.15**	0.12**	0.11**	—	0.14**
7. Compliance on stopping	0.01	0.15	0.75	0.76	0.02	0.09**	0.09**	0.10**	0.19**	0.19**	—

Note: Correlations: upper triangle US, lower triangle UK.
*$p < 0.05$; **$p < 0.01$.

Analytical approach

In order to assess change at an individual level, differences were calculated for each individual by subtracting time 2 items from corresponding time 1 items. This method affords self-referencing utilising individual respondent observations at time 1 as a baseline for comparison. Therefore the model is operationalised through change measures (by subtracting time 2 items from time 1) and lends explanation on causal impacts of changes from one stage of the model to the next, irrespective of baseline levels of individuals within and across countries. Amos version 6.0, structural equation modelling software was used to conduct all modelling analyses. To compare individual items across groups paired *t*-tests were conducted using SPSS, version 14.0.

Results

Table 1 shows the mean and standard deviation of these seven change measures as well as the correlations between them for both the US and the UK samples.

Scale reliability and validity

In order to assess the reliability and validity of the constructs (attention, elaboration, compliance contemplation and behavioural compliance), a measurement model was assessed through confirmatory factor analysis (CFA) based on the US sample variance–covariance matrix and maximum likelihood estimation. This measurement model yields an excellent fit[1] ($\chi^2(9) = 22.87$, $p < 0.01$, GFI = 0.993, AGFI = 0.978, CFI = 0.982, TLI = 0.959, RMSEA = 0.041 and AIC = 60.875) according to the usual conventions (Hair *et al.*, 1998; Hu and Bentler, 1999). All regression paths are significant at $p < 0.01$. Estimates of construct reliability for attention, elaboration and behavioural compliance are 0.59, 0.58 and 0.28, respectively, and thus are adequate with the exception of the construct of behavioural compliance (Bagozzi and Yujae, 1988). The correlations observed between the constructs from the CFA range from 0.11 to 0.54. Given these moderate correlation values, discriminant validity is supported.

The CFA results for the UK model are comparable with excellent fit measures ($\chi^2(9) = 19.80$, $p < 0.05$, GFI = 0.996, AGFI = 0.988, CFI = 0.989, TLI = 0.974, RMSEA = 0.029 and AIC = 57.802) and all paths significant at $p < 0.01$. Estimates of construct reliability for attention, elaboration and behavioural compliance are less satisfactory at 0.44, 0.49 and 0.37, respectively. The correlations

[1]GFI, goodness of fit index; AGFI, adjusted goodness of fit index; CFI, comparative fit index; TLI, Tucker Lewis index; RMSEA, root mean square error of approximation; AIC, Akaike information criterion.

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Table 2. Results from conceptual model

Hypothesised path	β	CR	Result
H1 (US) Attention → Elaboration	0.24	4.22***	Supported
H2 (US) Elaboration → Compliance contemplation	0.11	2.55*	Supported
H3a (US) Compliance contemplation → Behavioural compliance	0.15	2.12*	Supported
H3b (US) Elaboration → Behavioural compliance	0.60	4.91***	Supported
H1 (UK) Attention → Elaboration	0.20	3.34***	Supported
H2 (UK) Elaboration → Compliance contemplation	0.21	6.26***	Supported
H3a (UK) Compliance contemplation → Behavioural compliance	0.28	5.58***	Supported
H3b (UK) Elaboration → Behavioural compliance	0.31	4.95***	Supported

CR, critical ratio.
*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

observed between the constructs ranged from 0.15 to 0.40, also supporting discriminant validity.

Hypothesis tests on conceptual model

The Hypotheses 1, 2, 3a and 3b for the US sample were tested simultaneously in a structural equation model. The model yields good fit with $\chi^2(11) = 65.56$, $p < 0.01$, GFI = 0.980, AGFI = 0.948, CFI = 0.931, TLI = 0.868, RMSEA = 0.074 and AIC = 99.56. Results of the hypothesised paths are given in **Table 2** which shows that all four hypotheses are fully supported. Furthermore, all paths within the model are significant at $p < 0.05$. The UK sample also yielded good fit with $\chi^2(11) = 58.58$, $p < 0.01$, GFI = 0.989, AGFI = 0.971, CFI = 0.950, TLI = 0.905, RMSEA = 0.054 and AIC = 97.579 and all regression paths significant at $p < 0.001$. Table 2 shows that the corresponding four hypotheses for the UK sample are also fully supported. Hence the conceptual model as depicted in Figure 1 is validated across both countries with an adequate predictive power for behavioural compliance ($R^2 = 0.40$) for the US sample but less satisfactory ($R^2 = 0.22$) for the UK sample.

Hypothesis tests on measurement items

Paired *t*-tests were conducted to examine Hypotheses 4 through 5 for the US and UK samples. The results provided in **Table 3** show some support (all except for three in the UK sample) for the hypotheses.

These results indicate that for the UK, warning label changes have had a significant impact on increasing awareness of and depth of processing regarding label contents, but surprisingly levels of elaboration have decreased between the two data waves. On the other hand, for the US where warning labels have been left unchanged over a long period, results show that awareness, depth of processing and elaboration of the message contents generally decreased over time.

Discussion

Public policy makers are charged to make decisions to protect consumers and society from harmful products. At the same time, they are required to take a balanced view in terms of public safety and legitimate commercial activities. Tobacco consumption poses an obvious danger in terms of individual and public health. Whilst the individual might make informed choices on the consumption of tobacco, society nevertheless bears the cost of health and other economic costs. Furthermore, the case of public health regarding the unacceptable risk of environmental tobacco smoke is compelling (Centers for Disease Control, 2006). As a result, most governments mandate warnings on tobacco products. However, policymakers are still left with a difficult task in deciding on the balance

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Table 3. Results of paired *t*-tests

Hypothesis	Direction	Time 1	Time 2	*T*	Supported
	(Time 1 to Time 2)	Mean (SD)	Mean (SD)		Yes/no
H4a (US) Awareness	= or ↓	2.91 (1.28)	2.73 (1.25)	3.49***	Yes
H4a (US) Depth of processing	= or ↓	2.31 (1.17)	2.21 (1.14)	2.32**	Yes
H4b (US) Elaboration on danger	= or ↓	3.38 (1.22)	3.16 (1.27)	5.19***	Yes
H4b (US) Elaboration on harm	= or ↓	3.53 (1.24)	3.37 (1.23)	4.07***	Yes
H4c (US) Compliance contemplation	= or ↓	1.38 (0.62)	1.35 (0.59)	1.37 ns	Yes
H4d (US) Compliance on butting out	= or ↓	0.78 (1.16)	0.72 (1.11)	1.74*	Yes
H4d (US) Compliance on stopping	= or ↓	1.26 (0.69)	1.27 (0.72)	−0.49 ns	Yes
H5a (UK) Awareness	↑	3.14 (1.42)	4.36 (1.01)	−29.31***	Yes
H5a (UK) Depth of processing	↑	2.31 (1.32)	3.48 (1.40)	−26.30***	Yes
H5b (UK) Elaboration on danger	↑	3.23 (1.38)	3.10 (1.36)	3.48***	No
H5b (UK) Elaboration on harm	↑	3.32 (1.36)	3.16 (1.37)	4.70***	No
H5c (UK) Compliance contemplation	↑	1.32 (0.60)	1.55 (0.73)	−11.05***	Yes
H5d (UK) Compliance on butting out	↑	0.50 (0.95)	0.50 (0.94)	0.21 ns	No
H5d (UK) Compliance on stopping	↑	1.13 (0.50)	1.28 (0.72)	−7.45***	Yes

Notes: Standard deviations are indicated in parentheses.
ns, not significant.
*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

between effective warnings and legitimate product and marketing information to be displayed. To this end, much research is needed to gain a better understanding of the information processing of different warnings (e.g. EU warning labels *vs*. US warning labels) by consumers. Argo and Main (2004, p. 205) call for future research 'to compare consumers' reaction to warning labels that remain the same on the product with those that change over time'. They further signalled the need for longitudinal research on the effectiveness of such warnings. We have accordingly taken up their suggested direction for future research in our study.

The central purpose of our study is to propose and test an integrative model that would allow a simultaneous examination of key output variables. Our model provides greater understanding of how consumers process warning label messages and makes explicit the causal linkages from attention through elaboration, contemplation on quitting and behavioural compliance. The results for the first three sets of hypotheses show that smokers in both countries process warning label information in the same way.

The results of the paired *t*-tests for the US sample offer some support for the view that overexposure and extended wear-out have led to continued small reductions in the level of elaborations of the warning labels over time. However, it must be noted that the use of statistical tests based on large samples are known to yield significant results arising from small differences. Therefore caution must be taken when drawing conclusions from any weak relationships found. To demonstrate the effects, if any, of wear-out on elaboration, longitudinal data over a much longer time frame are required. As such, no conclusive judgement can be made on the merits or demerits of the two alternative arguments presented prior to setting out our set of hypotheses for H4.

The results for the UK sample appear initially perplexing as large increases in awareness and depth of processing of the warning labels have taken place with the introduction of new labels, suggesting that the new and much more prominent warning labels in the UK have yielded on average large increases in awareness and depth of processing by smokers. However, the paired *t*-tests also show

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significant, though small, reductions in smokers' elaboration of both the dangers and the harm of smoking. However, paired *t*-tests cannot assess causal relationships. The item level positive correlations and the significant positive regression path in our structural model lend support to the beneficial effects of raising awareness and depth of processing of warning labels on elaborations about the danger and harm of smoking, despite the general decreasing trend observed in both countries. The decreasing trend may be attributable to the wide spread increased levels of product information presented to consumers.

The above discussion highlights potential limitations in this study. Longitudinal studies are powerful tools in examining social phenomena, however more conclusive answers to our research questions will require data collection over a longer time frame. It must be noted that such longer terms observation may see a reduction in the differences found between the UK and the US smokers, particularly if the UK warnings are left unchanged. Additionally, in studies such as ours, where there is no possible control over the environment during the natural/field experimentation, there is limited scope to draw firm conclusions on causal relationships. We also note that the construct reliability values were low for the multi-item constructs employed. Future research should seek to improve these measures.

The ITC Four Country Survey is an ongoing project with additional data collection phases planned, as well as parallel national-level cohort surveys being conducted in five additional countries. However, examination of single policy implementations is of limited value to decision makers in contexts where national governments often concurrently implement a variety of intervention strategies, such as media campaigns, work place smoking bans and other health promotions. Future research should therefore address potential multiplicative effects of warning label policy in the presence of other policy interventions.

Finally, regarding recommendations for warning label policies in the US, our model has demonstrated (through Hypotheses 1, 2, 3a and 3b) the potential direct effects of increasing smokers' awareness and depth of processing of warnings. Together with indications of potential wear-out in the US, our study suggests that a revision of US cigarette warning label policy is needed so that it is in line with policies of other governments such as in the EU, Canada and Australia. Indeed when policies mandate that the tobacco industry bear the costs of printing warning labels, this communication strategy is extremely cost-effective compared to other tobacco prevention efforts, such as paid mass media advertising. Such an approach should be considered in order to reduce the more than 440 000 tobacco-attributable deaths in the US each year (Centers for Disease Control and Prevention, 2002).

Biographical notes

Louise Hassan is a research fellow within the Institute for Social Marketing located at Stirling University, Scotland UK. Her research interests are broad and include means of persuasive communication in social contexts, evaluating the effectiveness of policy changes and governmental demarketing as well as understanding the motivations behind ethical consumption practices. To date, she has published in journals such as the *Journal of Advertising*, the *International Journal of Consumer Studies* and the *Journal of Strategic Marketing*.

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health behaviours and the efficacy of communication and policy efforts to promote these behaviours. He is currently working on the Mexican ITC project and has published in journals such as the *Journal of Health & Social Behavior* and the *American Journal of Preventive Medicine*.

Geoffrey Fong is currently leading a major international study designed to understand and evaluate national-level tobacco control policies being introduced in over 100 countries over the next few years. Fong is the Chief Principal Investigator of this project—the International Tobacco Control Policy Evaluation Project (also known as the ITC Project)—which involves over 40 researchers from 9 countries: Canada, United States, United Kingdom, Australia, Ireland, Thailand, Malaysia, South Korea, and China. Through surveys conducted on smoking populations internationally, the ITC Project is evaluating the effectiveness of stop-smoking strategies such as warning labels, advertising and promotion bans, higher taxes, and protections against second hand smoke. He has published in many journals such as the prestigious *Journal of Personality and Social Psychology*.

Gerard Hastings is the Director of the Institute for Social Marketing and the Centre for Tobacco Control Research at the University of Stirling and the Open University, UK. He has published widely in both marketing and health journals, including the *Journal of Macro Marketing*, *Psychology & Marketing*, the *British Medical Journal* and *Social Science and Medicine*.

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References

Adams AS, Edworthy J. 1995. Quantifying and predicting the effects of basic text display variables on the perceived urgency of warning labels: tradeoffs involving font size, border weight, and color. *Ergonomics* **38**: 2221–2237.

Ajzen I. 1991. The theory of planned behavior. *Organizational Behavior and Human Decision Processes* **50**: 179–211.

Anderson JR. 1990. *Cognitive Psychology and its Implications*. W.H. Freeman: New York.

Argo JJ, Main KJ. 2004. Meta-analyses of the effectiveness of warning labels. *Journal of Public Policy and Marketing* **23**: 193–208.

Bagozzi RP, Yujae Y. 1988. On the evaluation of structural equation models. *Journal of the Academy of Marketing Science* **16**: 74–94.

Borland R. 1997. Tobacco health warnings and smoking-related cognitions and behaviors. *Addiction* **92**: 1427–1435.

Bornstein RF. 1989. Exposure and affect: overview and meta-analysis of research. *Psychological Bulletin* **106**: 265–289.

Canada Gazette Part II. 2000. 134(15): 1738–1848.

Centers for Disease Control and Prevention. 2000. *Reducing Tobacco Use: A Report of the Surgeon General*. Department of Health and Human Services: Atlanta.

Centers for Disease Control and Prevention. 2002. Annual smoking-attributable mortality, years of potential life lost, and the economic costs—United States, 1995–1999. *Morbidity and Mortality Weekly Report* **51**(14): 300–303.

Centers for Disease Control and Prevention. 2006. *The Health Consequences of Involuntary Exposure to Tobacco Smoke: A Report of the Surgeon General*. Department of Health and Human Services: Atlanta.

DOI: 10.1002/nvsm

Directive 2001/37/EC of the European Parliament and of the Council of 5 June 2001 on the approximation of the laws, regulations and administrative provisions of the Member States concerning the manufacture, presentation and sale of tobacco products. Official Journal of the European Communities L194/26.

Ezzati M, Lopez AD. 2003. Estimates of global mortality attributable to smoking in 2000. *Lancet* **362**: 847–852.

Federal Cigarette Labeling and Advertising Act. 1964. 15 U.S.C. 1331.

Godfrey SS, Laughery KR. 1984. The biasing effects of familiarity on consumers' awareness of hazard. In *Proceedings of the Human Factors Society 28th Annual Meeting*, Alluisi MJ, de Groot S, Alluisi EA (eds). Human Factors Society: Santa Monica, CA; 81–85.

Hair JF, Anderson RE, Tatham RL, Black WC. 1998. *Multivariate Data Analysis* (5th edn). Prentice Hall: Englewood Cliffs, NJ.

Hammond D, Fong GT, McDonald PW, Cameron R, Brown KS. 2003. The impact of the graphic Canadian warning labels on adult smoking behaviour. *Tobacco Control* **13**: 391–395.

Hammond D, Fong GT, McNeill A, Borland R, Cummings KM. 2006. Effectiveness of cigarette warning labels in informing smokers about the risks of smoking: Findings from the International Tobacco Control (ITC) Four Country Survey. *Tobacco Control* **15**: iii19–iii25.

Hammond D, Fong GT, Borland R, Cummings KM, McNeill 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.

Henderson B. 2000. Wear out: an empirical investigation of advertising wear-in and wear-out. *Journal of Advertising Research* **6**: 95–100.

Hu L, Bentler PM. 1999. Cut off criteria for fit indices in covariance structural analysis: conventional criteria versus new alternatives. *Structural Equation Modeling* **6**: 1–56.

Kaskutas LA. 1993. Changes in public attitudes toward alcohol control policies since the warning label mandate of 1988. *Journal of Public Policy and Marketing* **12**: 30–42.

Kees J, Burton S, Andrews JC, Kozup J. 2006. Tests of graphic visuals and cigarette package warning combinations: implications for the framework convention on tobacco control. *Journal of Public Policy and Marketing* **25**: 212–223.

Laughery KR, Vaubel KP, Young SL, Brelsford JW, Jr, Rowe AL. 1993. Explicitness of consequence information in warnings. *Safety Science* **16**: 597–613.

MacKinnon DP, Nohre L, Cheong J, Stacy AW, Pentz MA. 2002. Longitudinal relationship between the alcohol warning and alcohol consumption. *Journal of Studies on Alcohol* **62**: 221–226.

Mazis MB, Morris LA, Swasy JL. 1991. An evaluation of the alcohol warning label: Initial survey results. *Journal of Public Policy & Marketing* **10**: 229–241.

McGinnies E. 1949. Emotionality and perceptual defense. *Psychological Review* **56**: 244–251.

McGuire WJ. 1999. *Constructing Social Psychology: Creative and Critical Processes*. Cambridge University Press: New York.

Petty RE, Cacioppo JT. 1981. *Attitudes and Persuasion: Classic and Contemporary Approaches*. Brown: Dubuque, IA.

Pollack-Nelson C. 1995. Analysis of methylene chloride product labeling. *Ergonomics* **38**: 2176–2187.

Schuster CP, Powell CP. 1987. Comparison of cigarette and alcohol controversies. *Journal of Advertising* **16**: 26–33.

Sherif M, Hovland CI. 1961. *Social Judgment*. Yale University Press: New Haven, CT.

Tanner JF, Jr, Hunt JB, Eppright DR. 1991. The protection motivation model: a normative model of fear appeals. *Journal of Marketing* **55**: 36–45.

Willemsen MC. 2005. The new EU cigarette health warnings benefit smokers who want to quit the habit: results from the Dutch continuous survey of smoking habits. *European Journal of Public Health* **15**: 389–392.

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