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ORIGINAL ARTICLE

Australian Perceptions of Warnings on Cigarette Sticks

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Abstract
Novel warnings on individual cigarettes represent a potentially effective means for reducing tobacco use. This study evaluated perceptions of Australians towards health warnings on cigarettes. Participants rated and commented on their perceived effectiveness of current cigarette packaging warnings, and 12 text warnings (divided into four themes) on cigarette sticks in preventing non-smokers from smoking, and prompting current smokers to quit. Quantitative data were analysed using proportional odds logistic regression, and qualitative data using conceptual content analysis. From 637 participants, three themes were rated as more effective than current cigarette packaging warnings: mortality statistics, health condition consequences, and social and financial consequences of smoking. Packaging warnings were perceived as less effective due to desensitisation and smoker self-exemption. Stick warnings were considered more novel and engaging, especially the financial costs of smoking. Novel warnings on cigarettes that describe a broader range of consequences of smoking may be effective in combatting tobacco use.

Keywords Community health · Health education · Health promotion · Population health · Tobacco

Introduction

Health warnings on tobacco products have become more prominent, informative, and effective in reducing tobacco use, particularly in countries utilising the World Health Organization's (WHO) Framework Convention on Tobacco Control (FCTC) recommendations (Noar et al., 2016a, b; World Health Organization, 2017). Australian cigarette packaging currently utilises text warnings and graphic imagery (Australian Government Department of Health, 2016; Shanahan & Elliott, 2008), which reduce packaging appeal and misperceptions of cigarette safety (Drovandi et al., 2019c), increase quitting intentions in active smokers (Noar et al., 2016a, b), and are a major source of smoking-related health information (Hammond, 2011). The first simple text warning was introduced in 1973, with additional disease-specific and other text warnings added in 1987 and 1995, covering at

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least one-third of the face they were printed on (Chapman & Carter, 2003). Graphic images were added in 2006, which covered 30% of the front and 90% of the back of packaging (Commonwealth of Australia, 2004), increasing to 75% of the front in 2012 (Australian Government, 2011). The high viewing frequency of these cigarette packaging warnings may contribute to their effectiveness (Slade, 1997), though there are concerns of gradual disinterest with repetitive viewing (desensitisation) (White et al., 2015), with a large four-country study finding that cognitive processing of these warnings decreases rapidly after implementation (Borland et al., 2009).

Emerging methods for combatting packaging desensitisation include package inserts that reinforce the consequences of smoking (Thrasher et al., 2016), increasing the perceived harm of smoking through dissuasively coloured cigarettes (Drovandi et al., 2018b; Hoek et al., 2016), or adding health warnings to individual cigarette sticks (Drovandi et al., 2018b). Several studies have established proof of concept for this latter method, by printing the well-recognised 'Smoking Kills' warning on cigarettes and assessing the perceptions of a range of participant populations, with a focus on adolescents as a vulnerable population for the uptake of smoking (Moodie, 2015; Moodie et al., 2014, 2017, 2019). This was expanded upon by the development of a range of gain- and loss-framed messages, which were assessed by specific vulnerable populations of non-smokers and smokers (including school and university students) (Drovandi et al., 2018a, 2019a, 2020), as well as adult smokers in four countries (Drovandi et al., 2019b).

While these studies indicate the potential effectiveness of warnings in select populations, this may not reflect real-world effectiveness if implemented on a larger scale. Currently, few governments (including those of Scotland and Canada) have incorporated cigarette stick warnings into future tobacco control plans, requesting more data to support such a public health intervention (Health Canada, 2018; Scottish Government, 2018). These plans advocate for cigarette sticks as a logical medium for conveying smoking-related warnings and messages, as they are the primary packaging of tobacco, and the item consumed when smoking, making avoidance more difficult (Moodie, 2015).

Theoretical Framework

Health interventions are most effective when guided by theoretical frameworks (Glanz & Bishop, 2010). The Health Belief Model (HBM) is a commonly applied theoretical framework, and describes how health-related behaviours are influenced by a person's perceptions. These perceptions are grouped into six elements: a person's perceived (1) susceptibility to and (2) severity of poor health due to their behaviour, the (3) barriers, and (4) benefits of modifying their behaviour, and their (5) cues to commence behaviour changes and (6) self-efficacy in maintaining change (Janz & Becker, 1984).

Health warnings on cigarette sticks may influence all six of these elements, depending on the text used and messages portrayed. This includes increasing the perceived susceptibility and severity of smoking-related consequences, assisting in overcoming the barriers to quit, highlighting the benefits of quitting, acting as an additional cue to quit, and increasing self-efficacy to quit. Message content is therefore a key aspect for consideration, as indicated by packaging and marketing experts (Moodie, 2015), and is required to be evidence-based and carefully designed for the greatest impact on smoking behaviours in both smokers and non-smokers. Similar to the effects of pictorial warnings, modifying the appearance and therefore perceptions of cigarettes may contribute to reductions in non-smoker tobacco experimentation, and prompt quit attempts in current smokers (Noar et al.,

2016a, b). As active smokers and non-smokers are two distinct groups in relation to their smoking-related health behaviours, the perceptions of both groups are required.

Therefore, this study aimed to expand on previous tobacco warning research by evaluating community-level perceptions in Australia on the effectiveness of both existing tobacco packaging warnings, and a range of novel cigarette stick warnings in preventing non-smokers from smoking, and prompting current smokers to quit. It also aimed to assess community-level acceptance of this method of tobacco control.

Methods

Study Design

This cross-sectional study involved the delivery of two online surveys, targeted at Australian adults of any smoking status aged 18 years and over. The initial survey was launched through SurveyMonkey in June 2017 and the URL link distributed through the social media accounts of the authors and their university (Facebook and Twitter) to prospective participants. Snowballing was used to increase respondent numbers. The second survey was launched through Google Surveys in June 2018 using the 'targeted audience' function, to address the initial survey's low smoker participation rate. The sampling criteria used to define the targeted audience in Google Surveys were set as follows: 'representative' sampling method, adults ($\geq$18 years old) of any gender, and living within Australia. Participants were first presented with an information and consent sheet with details of the recruitment and data confidentiality procedures, and on completion of the survey were invited to enter their email address to win one of 70 $20AUD Woolworths (Australian supermarket chain) e-gift vouchers. This research was approved by the human research ethics committee of the authors' university.

Surveys and Data Collection

Both surveys collected information on participant age, gender, ethnic background, and smoking status. Due to restrictions on the number of questions in Google Survey, only the SurveyMonkey survey collected information on state of residence, level of education, and occupation. Baseline perceptions on the health risks of tobacco were then gathered, through ratings on a 5-point ordinal scale ('Not at all harmful' [1] to 'Very harmful' [5]). Pictures representative of the fourteen cigarette-packaging warnings in circulation in Australia were then displayed (see Fig. 1): one of a lung with emphysema, and one prompting smokers to quit. Participants rated these on a 5-point ordinal scale ('Not at all effective' to 'Very effective') and gave their opinions on the effectiveness of the cigarette packaging warnings in preventing non-smokers from smoking, and on another scale in prompting current smokers to quit.

Ratings and comments of current packaging warnings acted as a comparison against the perceived effectiveness of cigarette stick warnings (described below), to better understand how these interventions could work together to reduce tobacco use. Photographs of twelve cigarette sticks with health warnings were then displayed, each with three lines of text (see Fig. 1). Cigarettes were grouped into four themes: mortality statistics (MS), health condition consequences (HCC), social and financial consequences (SFC), and supportive messages (SM) to quit smoking. The HBM influenced warning development and evaluation to

Fig. 1 The intervention materials displayed to participants; the front and back of two cigarette packaging in circulation in Australia, and the twelve cigarette warnings divided in to four themes

ensure all six elements of the framework were addressed. The warnings within the HCC and SM themes were also chosen to align with the cigarette packaging warnings presented. The MS warnings were an extension of previous research into cigarette stick warnings and current media campaigns (Greenhalgh, 2015; Hassan & Shiu, 2015; Moodie et al., 2019), and SFC warnings were related to the Australian tobacco climate, with increased stigma

towards smokers, and soaring tobacco taxation (Hirono & Smith, 2018). Consent to participate in the surveys was assumed by submission of a completed survey. See Appendix for the full survey.

The first survey presented themes in a standardised manner, which after analysis led to concerns of an order effect on responses. Therefore, the second survey randomised participants to one of four survey versions, each with themes presented in a different order. Participants rated on a 5-point ordinal scale how effective they perceived each theme would be in preventing non-smokers from smoking, and on another scale in prompting current smokers to quit. Each cigarette per theme was labelled 'A', 'B', and 'C' so participants could comment on specific warnings. Lastly, to assess level of acceptance, participants were asked to rate on a 5-point scale their opinion ('Strongly Disagree' to 'Strongly Agree') on the inclusion of health warnings on individual cigarettes. Comment boxes were included throughout the survey to elicit qualitative data that described participants' reasoning behind their ratings. The open-text responses also assisted in mapping themes identified to the six HBM elements to assess which elements were being sufficiently addressed through the warnings and messages developed.

Data Analysis

The characteristics of the study population were examined using descriptive analysis of the demographic data. Non-parametric tests (Kruskal–Wallis and Mann–Whitney *U*) in SPSS v25 (IBM Corp. Armonk, NY, USA) were used to investigate relationships between demographics and participant perceptions of health warnings, with *p*-values less than 0.05 considered significant. The Friedman test was used to measure differences in perceptions across the 5 categories (current warnings and the 4 interventional themes). Post hoc tests and Bonferroni adjustments were used to determine significant differences between the categories. Proportional odds logistic regression was utilised to account for the use of ordered categorical responses in the survey, and was performed using R v33.2.4 (R Core Team, Vienna, Austria) ordinal statistical package. This allowed evaluation between- and within-theme effectiveness (compared to packaging warnings).

Responses from open-text comments were analysed independently by two authors using conceptual content analysis to confirm emerging themes, using the HBM as the framework for the analysis. This involved the identification, coding, and quantification of key concepts raised by participants relative to individual rating questions, followed by mapping of the emerging themes to the six elements of the HBM to predict effects on smoking behaviours. Quantitative and qualitative data were triangulated to establish points of convergence and divergence within the two datasets and were integrated together in the results to address the study aims. To establish trustworthiness of the qualitative data, authors compared their independent findings, and conflicting interpretations were resolved through dialogue. Illustrative quotes are reported verbatim to support the discussion.

Results

Of the 637 participants, 200 completed the 2017 survey and 437 the 2018 survey, with their demographic characteristics shown in Table 1. There was an even distribution of males and females, though most participants were of Caucasian descent. Gender ($p < 0.001$) and age ($p = 0.015$) were significantly different between the surveys, with the

Table 1 Demographic characteristics of the 2017 and 2018 survey participants

Variable	SurveyMonkey ($n=200$)		Google Surveys ($n=437$)		Overall ($n=637$)		p-value
	n	%	n	%	n	%	-
Gender							
Male	64	32.0	230	52.6	294	46.2	**< .001*****
Female	136	68.0	207	47.4	343	53.8	
Age group (years)							
18–25	70	35.0	129	29.5	199	31.2	**.015***
26–45	78	39.0	143	32.7	221	34.7	
46 and older	52	26.0	165	37.8	217	34.1	
Ethnicity							
Caucasian	164	82.0	297	68.0	461	72.4	.096
ATSI[a]	7	3.5	20	4.6	27	4.2	
Asian	17	8.5	37	8.5	54	8.5	
African	4	2.0	16	3.7	20	3.1	
Middle Eastern	1	0.5	5	1.1	6	0.9	
Not stated	7	3.5	62	14.2	69	10.8	
Level of education[b]							
Secondary School	65	32.5	-	-	-	-	-
Diploma	31	15.5					
Bachelor's degree	74	V					
Postgraduate degree	30	15.0					
Occupation[b]							
Student	50	25.0	-	-	-	-	-
Retired or unemployed	15	7.5					
Unskilled worker	38	19.0					
Skilled worker	80	40.0					
Did not answer	17	8.5					
Smoking status							
Non-smoker	148	74.0	344	78.7	492	77.2	.212
Current smoker	28	14.0	59	13.5	87	13.7	
Ex-smoker	24	12.0	34	7.8	58	9.1	
Baseline perceptions of smoking							
Not at all harmful	1	0.5	22	5.0	23	3.6	.054
Minimally harmful	2	1.0	9	2.1	11	1.7	
Some harm expected	8	4.0	25	5.7	33	5.2	
Quite harmful	39	19.5	50	11.4	89	14.0	
Very harmful	150	75.0	331	75.7	481	75.5	

[a]Aboriginal and/or Torres Strait Islander

[b]Data not gathered in 2018 survey due to restrictions on number of questions allowed

*$p < .05$

**$p < .01$

***$p < .001$

2018 survey having a higher percentage of males and older participants compared to the 2017 survey. Of the smoking participants, 28.6% were occasional smokers, and 39.3% intended to quit within the next 12 months. Most (75.5%) participants were aware of the harms of smoking, rating it as 'Very harmful' to health.

Perceptions of Warning Effectiveness

Overall, cigarette packaging warnings were generally perceived to be ineffective, particularly in prompting current smokers to quit, with significantly ($p < 0.05$) poorer effectiveness ratings compared to the cigarette stick themes. Table 2 summarises the rating scores for perceived effectiveness of cigarette packaging and cigarette stick warnings, and Table 3 summarises the proportional odds logistic regression analysis. Perceptions of effectiveness were not influenced by age, gender, ethnicity, level of education, or occupation. The second survey confirmed that the order of theme presentation did not significantly ($p > 0.05$) influence participants' ratings and preferences. The three key themes identified in the open-ended text responses were as follows: (1) limitations of current cigarette packaging warnings, (2) importance of the novelty of health warnings, and (3) impact of smoking status and health literacy.

Table 2 Ratings of perceived effectiveness of cigarette packaging and cigarette stick warning themes

Themes	Ineffective[a] (%)	Somewhat effective (%)	Effective[a] (%)	Median score (IQR)	Mean score (SD)
Packaging warnings					
Non-smokers[b]	242 (38%)	204 (32%)	191 (30%)	3 (2–4)	2.90 (1.24)
Smokers[c]	312 (49%)	166 (26%)	159 (25%)	3 (2–3.5)	2.33 (0.92)
Mortality statistics					
Non-smokers	197 (31%)	185 (29%)	255 (40%)	3 (2–4)	3.12 (1.31)
Smokers	257 (40%)	197 (31%)	183 (29%)	3 (2–4)	2.83 (1.31)
Health condition consequences					
Non-smokers	200 (31%)	176 (28%)	261 (41%)	3 (2–4)	3.13 (1.29)
Smokers	274 (43%)	192 (30%)	171 (27%)	3 (2–4)	2.79 (1.31)
Social & financial consequences					
Non-smokers	176 (28%)	184 (29%)	277 (43%)	3 (2–4)	3.19 (1.26)
Smokers	223 (35%)	204 (32%)	210 (33%)	3 (2–4)	2.95 (1.31)
Supportive messages to quit					
Non-smokers	300 (47%)	166 (26%)	171 (27%)	3 (2–4)	2.45 (1.18)
Smokers	262 (41%)	185 (29%)	190 (30%)	3 (2–4)	2.85 (1.28)

[a]Ineffective is the pooled 'Not at all effective' (1) and 'not very effective' (2) ratings, and effective is the pooled 'Quite effective' (4) and 'Very effective' (5) ratings from the 5-point ordinal scales

[b]Effectiveness in preventing non-smokers from smoking

[c]Effectiveness in prompting smokers to quit

Table 3 Proportional odds logistic regression model, with odds of perceived effectiveness for cigarette stick warnings compared to packaging warnings and between smokers and non-smokers

Variable	Estimate	SE	Z value	Odds ratio	95% confidence intervals		*P* value
					Lower	Upper	
Demographic characteristics							
Gender (male = 0, female = 1)	−0.28	0.24	−1.17	0.76	0.47	1.21	.243[NS]
Age 26–45 years (18–25 = 0, 26–45 = 1)	−0.21	0.30	−0.70	0.81	0.45	1.46	.485[NS]
Age 46 and older (18–25 = 0, 46 + = 1)	−0.48	0.37	−1.23	0.62	0.30	1.28	.198[NS]
Overall theme effectiveness							
Social and financial consequences[a]	0.96	0.21	4.62	2.61	1.73	3.94	< .001***
Mortality statistics[a] (MS)	0.69	0.20	3.38	1.99	1.35	2.95	< .001***
Health condition consequences[a] (HCC)	0.62	0.21	3.03	1.86	1.23	2.81	.024*
Supportive messages to quit[a] (SM)	−0.98	0.21	−4.57	0.38	0.25	0.57	< .001***
Effect on target smoking status (S = 0, N = 1)[b]	1.43	0.22	−6.65	4.18	2.72	6.43	< .001***
Theme effectiveness on smokers versus non-smokers							
Supportive messages (SM) (N = 0, S = 1)[b]	2.11	0.31	6.87	8.25	4.49	15.14	< .001***
Social and financial consequences (SFC) (N = 0, S = 1)[b]	0.53	0.30	1.78	1.70	0.94	3.06	.076[NS]
Mortality statistics (MS) (N = 0, S = 1)[b]	0.23	0.30	0.78	1.26	0.70	2.27	.436[NS]
Health condition consequences (HCC) (N = 0, S = 1)[b]	0.11	0.30	0.36	1.12	0.62	2.01	.721[NS]
Order of theme presentation[c]							
Order 2 (2341)	−.146	0.158	−0.929	0.86	0.63	1.18	.353
Order 3 (3412)	−.023	0.158	−0.162	0.97	0.71	1.33	.872
Order 4 (4123)	−.053	0.157	−0.340	0.94	0.70	1.29	.734

[a]Reference level was the effectiveness of current packaging warnings

[b]*N* non-smoker, *S* smoker, *EXS* ex-smoker; *** < .001, ** < .01, * < .05; *NS* not significant

[c]Reference level was order 1 (theme 1234 presentation order; MS, HCC, SFC, SM)

Cigarette Packaging Warnings and Their Limitations

Packaging warnings generally had poor effectiveness ratings, especially on current smokers with nearly half (49%) of participants rating them as 'ineffective', due to smokers becoming desensitised to warnings and self-exempting themselves from the consequences of smoking. Nearly half of the participants commented that the public are desensitised to current cigarette packaging warnings, which have lost their shock value since their initial implementation. These opinions were more common amongst females, those aged under 45 years, and were evenly distributed between those with high school education and those

with bachelor's degrees. Approximately one-third of these opinions were held by current or ex-smokers.

> '*After originally viewing the packet when the legislation was first introduced, I now tend to not notice the packaging at all'* (Male, 18–25, Smoker), *'Everyone knows about them now so the initial shock has worn off*' (Male, 46+, Smoker), '*People have become desensitised over time. Yeah it's shocking the first 10 times you've seen the images, but after that you ignore them or no longer bothers you*' (Female, 18–25, Non-Smoker).

Some participants (21%) also felt that the current cigarette packaging warnings only created fear but did not proffer solutions on quitting smoking.

> '*Most smokers know smoking is bad, but the addiction makes it so hard [to quit], and no amount of disgusting imagery can solve this issue'* (Male, 26–45, Smoker), *'They just create fear, but doesn't actually help people to stop smoking'* (Female, 26–45, Smoker).

Health Warning Novelty

Several cigarette stick warnings were considered novel and engaging, with the potential to reduce tobacco experimentation, and increase quitting intentions. The SFC theme was rated as the most effective (odds ratio [OR] = 2.61, 95% confident interval [CI] 1.73–3.94, $p < 0.001$) compared to packaging warnings. Both age and smoking status affected these ratings. Most (84.4%) 18–25 year olds rated these warnings as effective in prompting smokers to quit, compared to 57.5% of those aged 46 and over ($p = 0.007$). Non-smokers also rated these warnings as more effective in preventing non-smokers from smoking ($p = 0.005$). Describing the non-health-related consequences of smoking was considered novel and engaging, with the financial costs of smoking standing out as an important message.

> '*These messages put the impact smoking has on your life in perspective'* (Male, 18–25, Smoker), '*I think the public has grown so used to being told what diseases smoking causes but may not be aware of just how much their habit costs'* (Female, 18–25, Non-Smoker), *'Makes them realise how much money they are wasting'* (Female, 46+, Ex-Smoker).

The MS theme was also perceived as significantly more effective than cigarette packaging warnings (OR = 1.99, 95% CI 1.35–2.95, $p < 0.001$). The 18–25-year olds, and non-smokers gave higher ratings on effectiveness compared to older participants, and current and ex-smokers ($p = 0.015$ and $p = 0.025$ respectively). Over half of the 18–25-year olds (51.4%) rated these warnings as effective, compared to one-third (33.3%) of the older age groups. These warnings were considered effective by 43.9% of non-smokers, compared to 28.6% of current smokers, and 20.8% of ex-smokers. The 'minutes of life lost' cigarette was cited as particularly effective, with participants stating that it reduces the attractiveness of smoking, causes hesitation amongst smokers, and may prompt them to quit or cut-back.

> '*Seeing how much of their life they are losing could be extremely effective at cutting down smoking*' (Male, 46+, Ex-Smoker), *'Time is a big concern of every person, that puts it in perspective'* (Male, 18–25, Smoker).

Conversely, the other warnings in this theme relating to death statistics received mixed responses, with self-exemption a key factor that may limit the impact of these messages.

'The fact that illness doesn't occur immediately makes the warnings easy to dismiss. "I'm not sick it hasn't affected me". (Male, 46+, Ex-Smoker), '*I think the generalised statistics is the least effective, people always ignore these messages because of the "it won't happen to me mentality"'* (Female, 26–45, Non-Smoker).

Similarly, the HCC theme was rated as more effective than packaging warnings (OR = 1.86, 95% CI 1.23–2.81, $p = 0.024$). However, these warnings were similar to packaging warnings, and rather the novelty of health warnings on cigarette sticks may have led to this effect. Nearly half of non-smokers (48.6%) rated these warnings as effective, compared to one-quarter of current smokers (25.0%) and less than one-fifth (16.7%) of ex-smokers ($p < 0.001$). Nearly one-quarter of participants stated that they are too basic, and already common knowledge.

'*People already know this, they lack shock value'* (Female, 26–45, Non-Smoker), '*Already on cigarette packets so it is a duplication'* (Female, 26–45, Smoker), '*I think that this message has been given repeatedly already'* (Female, 46+, Ex-Smoker).

There was also some concern that both novel and used warnings, as well as the novelty of warnings on cigarette sticks, might eventually become less effective over time.

'I suspect these types of messages will be alarming when people first see them on cigarettes, but they will no doubt become accustomed to them' (Female, 26–45, Ex-Smoker)**,** *'Disinterest over time, I think the messages should be ever-changing'* (Female, 46+, Non-Smoker).

Finally, the SM theme was overall considered less effective than current packaging warnings (OR = 0.38, 95% CI 0.25–0.57, $p < 0.001$). However, they were considered more effective (OR = 8.25, 95% CI 4.49–15.14, $p < 0.001$) than packaging warnings in prompting current smokers to quit. Many considered this theme as potentially more effective than negative messages for some smokers.

'*It is not scaremongering, threatening or demeaning, but offers a possible solution*' (Female, 46+, Ex-smoker), *'May convince those already considering to quit to actually do something about it'* (Male, 18–25, Smoker), *'Educate and provide options rather than offensive images that can easily lose their impact'* (Female, 18–25, Non-Smoker).

In addition, even though these messages may lack relevance for non-smokers, some believed that it would highlight to non-smokers the issues that smokers face once they are addicted.

'Hopefully they realise it's easier to not start than try to quit' (Female, 46+, Non-Smoker), *'Being seen as an addict can be considered as a weakness, and needing help may have an effect to avoid being associated with it'* (Female, 18–25, Ex-Smoker).

However, some believed that like the warnings in the HCC theme, there was a lack of novelty of the messages in this theme which are 'already out there' and could be viewed as boring or repetitive, and not affect smokers, especially if they are not interested in quitting.

'Smokers should by now have seen, heard, and understood these messages. They are not new and do not address the issues that stop them giving up'. (Male, 46+, Non-Smoker), *'I think everyone knows how to access quit programs and who to contact'* (Female, 26–45, Smoker).

Impact of Smoking Status and Health Literacy

Health warnings were not seen as equally effective across all demographics, with both cigarette packaging and cigarette stick warnings perceived as significantly more effective in preventing non-smokers from smoking, than in prompting current smokers to quit (OR = 4.18; 95% CI 2.72–6.43, $p < 0.001$). There were many reasons described for this effect, such as the issue of desensitisation to warnings, and self-exception of the dangers of smoking as previously described. There were also views that smokers do not care about their health, which may in part be affected by poor health literacy and not fully understanding the consequences of smoking and the severity of the illnesses it is linked to.

'Smokers don't care, they are only concerned with the present day and indulging impulses' (Female, 26–45, Smoker), '*It's no good if smokers do not understand what the conditions are and how they impact on their health'* (Female, 18–25, Non-Smoker), *'Smokers from low socio-economic groups have low health literacy and may not understand the information being provided'* (Female, 26–45, Non-Smoker).

There were also shortcomings identified throughout all of the themes related to effectiveness on non-smokers, such as the reduced likelihood of exposure to these warnings compared to those visible on cigarette packaging, as well as the warnings being 'too little too late'.

'A non-smoker wouldn't have the cigarette in their hand so they might see that there is a message but would have to get quite close to read it' (Female, 26–45, Non-Smoker), *'If a non-smoker was trying cigarettes and they had already made the decision to smoke it, I don't think some writing will change their mind'* (Male, 26–45, Non-Smoker).

There were also concerns relating to the supportive messages theme, in that younger people might underestimate the addictive potential of tobacco experimentation, and create perceptions that if addiction was to occur, it can be easily remedied with available support systems.

'Maybe these [messages] will make smoking feel safe, like if I become addicted I can stop easily because these sources will help me' (Male, 18–25, Non-Smoker), *'I am concerned that a non-smoker may see this as an opportunity to smoke because there is a remedy to stop later on'* (Female, 46+, Non-Smoker).

Acceptance of Health Warnings on Tobacco Products

A majority (81.5%) of participants agreed that individual tobacco products should include health warnings and messages, while 11.0% were neutral/unsure, and the remaining 7.5% disagreed. There was a significant smoking status effect, with non-smokers and ex-smokers being more likely to agree with the inclusion of health warnings on tobacco products compared to current smokers ($p < 0.001$). Nearly all (91.2%) non-smokers and three-quarters (75.0%) of ex-smokers agreed, compared to one-third (35.7%) of current smokers.

Participant comments were generally positive, stating that more health warnings, and ensuring that the wider community is continuously reminded of the dangers of smoking, can only be beneficial.

> '*All [tobacco products] have negative health implications and should be labelled accordingly*' (Female, 26–45, Non-Smoker). '*The cost to our health system in treating smokers is very high, the fewer smokers the better*' (Male, 46+, Ex-Smoker).

Discussion

This study explored the perceptions of Australians on the effectiveness of cigarette packaging and cigarette stick warnings, and their acceptance of the inclusion of health warnings and messages on individual cigarette sticks. The key findings were the low perceived effectiveness of current packaging warnings (likely due to smoker desensitisation to the warnings and self-exemption from consequences of smoking), the importance of the novelty of health warnings, the novelty of these warnings on cigarette sticks, and the impact of individual factors such as smoking status and health literacy.

As described by Chapman and Liberman (2005), and supported by the Word Health Organization (World Health Organization, 2011), '*consumers of tobacco products have a fundamental right to accurate information about the risks of smoking and other forms of tobacco use*'. Health warnings on cigarette sticks support this fundamental right, particularly for those not exposed to warnings on cigarette packaging, such as smokers who use alternative packaging, or adolescents who share individual cigarettes (Ali & Dwyer, 2009; Forster et al., 2003). Cigarette stick warnings may also have synergistic effects with packaging warnings, as similarly demonstrated in research investigating the combined effects of text plus pictorial warnings, and pictorial warnings plus standardised packaging (Hammond et al., 2014; Hoek et al., 2011). As this study (in accordance with previous research) found that packaging warnings might have lost their shock value since implementation (Borland et al., 2009; White et al., 2015), the addition of warnings to the cigarette-stick may address this issue. This study also found that the novelty of the warnings and messages used are likely to be essential in their effectiveness and should not simply replicate those used on packaging.

In aligning the results to the HBM (Janz & Becker, 1984), the perceived susceptibility to and severity of smoking-attributable diseases was found to be lacking in response to packaging warnings, and the HCC theme in this study. This may be remedied through expanding the range of novel warnings including both health and non-health consequences of smoking, with many effective examples utilised overseas not yet used in Australia (Hammond, 2011), and utilising rotating sets of warnings to prevent 'wear-out'. Similarly, the benefits of quitting were considered not well addressed by packaging warnings, though the SFC theme of cigarette stick warnings was considered effective in that they highlighted the financial benefits of quitting. However, overcoming perceived barriers to quit were not sufficiently addressed in any of the warnings, and there was also criticism on the lack of messages on packaging which direct smokers on how to quit and enforce self-efficacy in quitting. Research on the benefits of positively framed (what can be gained) messages compared to those traditionally used on cigarette packaging which are negatively framed (what can be lost) indicates that both may be equally effective in engaging viewers (O'Keefe & Jensen, 2008).

Smoking status was, as expected, a key factor in individuals' perceptions of cigarette packaging and cigarette stick warnings. As most Australians are non-smokers, attaining the perceptions of this majority and ensuring their continued dissuasion from smoking are essential in protecting public health. This is vital due to the strong links between adolescent and young-adult smoking, and smoking in adulthood (US Department of Health & Human Services, 2014), and between parental smoking behaviours and adolescent smoking initiation (Leonardi-Bee et al., 2011). The perception that smokers self-exempt from the consequences of smoking was also identified, which may be facilitated by contextual factors such as social norms on tobacco use, pre-existing health beliefs, and a lack of personal or familial experiences of tobacco-related consequences (Hammond, 2011). Relatability and novelty of the warnings and messages available must therefore extend to both smokers and non-smokers, and be understandable to people with poorer health literacy.

The findings of this study may guide governmental bodies considering implementation of cigarette stick warnings, or expanding warnings and messages used elsewhere in their tobacco control policies (Health Canada, 2018; Scottish Government, 2018). Cigarette stick warnings may positively affect smoking-related behaviours, if aimed at increasing smoker and non-smoker awareness of the likelihood of suffering a smoking-related disease, as well as the social, financial, and any other relevant consequence of smoking. Further research with a more diverse participant sample is needed to determine the potential real-world effectiveness of cigarette stick warnings. In addition to this, capturing perceptions from the same cohort across multiple time points is likely to indicate the extent of desensitisation and message wear-out over time for cigarette stick warnings. Identifying specific participant reactions, similar to previous cigarette packaging research (Alaouie et al., 2015; Hammond et al., 2012), such as the ability to attract attention, comprehension, credibility, emotional appeal, and personal applicability, would also provide more detail as to why certain warnings are perceived as more effective than others (Hammond, 2011).

As with any research, there are inherent limitations to consider when interpreting and applying the results of this study. The brief exposure to each warning and lack of co-presenting cigarette-packaging warnings alongside cigarette stick warnings did not replicate real-world situations of multiple exposures. Also, the use of online surveys and internet-based recruitment prevents tactile interaction with the intervention materials, and did not necessarily draw a representative sample of the population. While a larger number of smoking participants were desired, the proportions of both current and ex-smoking participants were representative of the Australian population at the time of this study (Australian Institute of Health & Welfare, 2017). Also, there is a difficulty in extrapolating perceptions to actual effectiveness. Finally, the applicability of these results from an Australian cohort may be different to other developed and low to middle-income countries, depending on the presence (or lack) of stigma towards smoking, and pre-existing public health interventions relating to smoking.

Conclusions

Ensuring continued reductions in tobacco use requires the renewal and additions of tobacco control policies and related interventions. Cigarette packaging warnings appear to need more frequent updating, and take into account population factors such as health literacy limitations, and use a greater range of informative materials including supportive messages. Warnings that depict the mortality and financial consequences of tobacco use

were perceived as the most effective and represent an area for further research. The use of both established and these novel warnings and messages on individual cigarette sticks may thus also serve as an effective measure in reducing tobacco use, as they would provide additional health and non-health information complementing that provided by cigarette packaging.

Appendix Survey questions

Items with a (*) asterisk were only used in the 2017 SurveyMonkey survey and not in the 2018 Google Survey, due to the limited number of questions allowed. These specific questions were selected to be removed due to their lack of impact on responses in the 2017 survey.

1. What is your gender?

    a) Male
    b) Female
    c) Other

2. What is your age in years?

    a) 18–25
    b) 26–35
    c) 46–55
    d) 56–65
    e) 66 or older

3. Which Australian state do you primarily reside in?*

    a) Queensland
    b) New South Wales
    c) Australian Capital Territory
    d) Victoria
    e) Tasmania
    f) Northern Territory
    g) South Australia
    h) Western Australia

4. What is your ethnic background? (choose any that are applicable)

    a) Caucasian
    b) Aboriginal
    c) Torres Strait Islander
    d) Asian
    e) African
    f) Middle Eastern
    g) Prefer not to say

5. What is your highest level of education currently attained?*

a) Grade 10 high school or below
b) Grade 12 high school
c) Diploma
d) Bachelor degree
e) Postgraduate degree or higher

6. What is your main occupation or role? (open-ended answer)*
7. What is your smoking status?

a) Non-smoker
b) Occasional smoker (at least weekly)
c) Daily smoker
d) Ex-smoker

8. How harmful do you think smoking is to a person's health (5-point scale)? (open-comment box at the end of this question)

a) Not at all harmful
b) Minimally harmful
c) Some harm expected
d) Quite harmful
e) Very harmful

9. How do you feel about quitting smoking?* (open-comment box at the end of this question) (Logic Pathway – only those who selected 'occasional smoker' or 'daily smoker' in question 7 saw this question)

a) I have no interest or intentions to quit smoking
b) I know I should quit smoking though I don't currently plan to
c) I intend to quit smoking sometime in the next 12 months
d) I intend to quit smoking within the next 3 months

***Cigarette packaging warnings shown**

10. How effective do you think current health warnings are at preventing non-smokers from starting smoking (5-point scale)? (open-comment box at the end of this question)

a) Not at all effective
b) Minimally effective
c) Moderately effective
d) Quite effective
e) Very effective

11. How effective do you think current health warnings are at prompting current smokers to quit (5-point scale)? (open-comment box at the end of this question)

a) Not at all effective
b) Minimally effective
c) Moderately effective

d) Quite effective
e) Very effective

12. Do you think current tobacco warnings have any shortcomings? (open-ended answer)
13. Are there are other tobacco warnings you have seen (e.g. in media) that you remember being particularly informative or effective? If so, please detail your thoughts on them. (open-ended answer)

***Cigarette stick warnings shown—one theme at a time with two associated questions**

14. How effective do you think this theme would be at discouraging non-smokers from smoking (5-point scale)? (open-comment box at the end of this question for each theme presented)

a) Not at all effective
b) Minimally effective
c) Moderately effective
d) Quite effective
e) Very effective

15. How effective do you think this theme would be at encouraging current smokers to quit (5-point scale)? (open-comment box at the end of this question for each theme presented)

a) Not at all effective
b) Minimally effective
c) Moderately effective
d) Quite effective
e) Very effective

16. Would you agree or disagree to having health warnings included on individual cigarette sticks in Australia (5-point scale)? (open-comment box at the end of this question)

a) Strongly disagree
b) Disagree
c) Neutral
d) Agree
e) Strongly agree

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Author Contribution AD conceived the study, AD and BMA designed the intervention and analysed the data, and all authors wrote and revised the manuscript.

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Declarations

Ethics Approval Ethical approval was granted by the James Cook University Human Research Ethics Committee (H6929).

Consent to Participate All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000. Informed consent was obtained from all patients for being included in the study.

Data Data are available from the corresponding author on reasonable request.

Conflict of Interest The authors declare no competing interests.

References

Alaouie, H., Afifi, R. A., Haddad, P., Mahfoud, Z., & Nakkash, R. (2015). Effectiveness of pictorial health warnings on cigarette packs among Lebanese school and university students. *Tobacco Control, 24*(e1), e72-80.

Ali, M. M., & Dwyer, D. S. (2009). Estimating peer effects in adolescent smoking behavior: A longitudinal analysis. *Journal of Adolescent Health, 45*(4), 402–408.

Australian Government. (2011). *Competition and Consumer (Tobacco) Information Standard* (2011). Retrieved from http://www.comlaw.gov.au/Details/F2013C00598. Accessed 17 Feb 2021.

Australian Government Department of Health. (2016). *Post-implementation review of tobacco plain packaging*. Retrieved from https://ris.pmc.gov.au/2016/02/26/tobaccoplain-packaging. Accessed 15 Feb 2021.

Australian Institute of Health and Welfare. (2017). *National drug strategy household survey 2016: Detailed findings. Drug statistics series no. 301. Cat. No. PHE 214*. Canberra, Australia. Retrieved from: https://www.aihw.gov.au/reports/illicit-use-of-drugs/2016-ndshs-detailed/data. Accessed 17 Feb 2021.

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*(5), 358–364.

Chapman, S., & Carter, S. M. (2003). "Avoid health warnings on all tobacco products for just as long as we can": A history of Australian tobacco industry efforts to avoid, delay and dilute health warnings on cigarettes. *Tobacco Control, 12*(Suppl 3), iii13-22.

Chapman, S., & Liberman, J. (2005). Ensuring smokers are adequately informed: Reflections on consumer rights, manufacturer responsibilities, and policy implications. *Tobacco Control, 14*(Suppl 2), ii8-13.

Commonwealth of Australia. (2004). *Trade Practices (Consumer Product Information Standards) (Tobacco) Regulations, Commonwealth Consolidated Acts*. Retrieved from: https://www.legislation.gov.au/Details/F2007C00131. Accessed 31 Oct 2020.

Drovandi, A., Teague, P. A., Glass, B., & Malau-Aduli, B. (2018a). Australian school student perceptions of effective anti-tobacco health warnings. *Frontiers in Public Health, 6*, 297.

Drovandi, A., Teague, P. A., Glass, B., & Malau-Aduli, B. (2018b). A systematic review of smoker and non-smoker perceptions of visually unappealing cigarette sticks. *Tobacco Induc Dis, 16*, 02.

Drovandi, A., Teague, P. A., Glass, B., & Malau-Aduli, B. (2019a). Do health warnings on cigarette sticks dissuade smokers and non-smokers? A focus group and interview study of Australian university students. *Psychology Research and Behavior Management, 12*, 361–373.

Drovandi, A., Teague, P. A., Glass, B., & Malau-Aduli, B. (2019b). Smoker perceptions of health warnings on cigarette packaging and cigarette sticks: A four-country study. *Tobacco Induced Diseases, 17*, 23.

Drovandi, A., Teague, P. A., Glass, B., & Malau-Aduli, B. (2019c). A systematic review of the perceptions of adolescents on graphic health warnings and plain packaging of cigarettes. *Systematic Reviews, 8*(1), 25.

Drovandi, A., Teague, P. A., Glass, B., & Malau-Aduli, B. (2020). Australian university student perceptions of health messages on cigarette sticks. *Health Communication, 35*(4), 456–464.
Forster, J., Chen, V., Blaine, T., Perry, C., & Toomey, T. (2003). Social exchange of cigarettes by youth. *Tobacco Control, 12*, 148–154.
Glanz, K., & Bishop, D. B. (2010). The role of behavioral science theory in development and implementation of public health interventions. *Annual Review of Public Health, 31*, 399–418.
Greenhalgh, E. M. (2015). Chapter 14. Social marketing and public education campaigns. In M. M. Scollo & M. H. Winstanley (Eds.), *Tobacco in Australia: Facts and Figures*. Cancer Council Victoria.
Hammond, D. (2011). Health warning messages on tobacco products: A review. *Tobacco Control, 20*(5), 327–337.
Hammond, D., Thrasher, J., Reid, J. L., Driezen, P., Boudreau, C., & Santillan, E. A. (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*(Suppl 1), 57–67.
Hammond, D., White, C., Anderson, W., Arnott, D., & Dockrell, M. (2014). The perceptions of UK youth of branded and standardized, 'plain' cigarette packaging. *European Journal of Public Health, 24*(4), 537–543.
Hassan, L. M., & Shiu, E. (2015). No place to hide: Two pilot studies assessing the effectiveness of adding a health warning to the cigarette stick. *Tobacco Control, 24*(e1), e3-5.
Health Canada. (2018). *New health-related labelling for tobacco products. Document for consultation.* Retrieved from https://www.canada.ca/en/health-canada/programs/consultation-tobacco-labelling/document.html. Accessed 20 Oct 2020.
Hirono, K. T., & Smith, K. E. (2018). Australia's $40 per pack cigarette tax plans: The need to consider equity. *Tobacco Control, 27*(2), 229–233.
Hoek, J., Gendall, P., Eckert, C., & Louviere, J. (2016). Dissuasive cigarette sticks: The next step in standardised ('plain') packaging? *Tobacco Control, 25*(6), 699–705.
Hoek, J., Wong, C., Gendall, P., Louviere, J., & Cong, K. (2011). Effects of dissuasive packaging on young adult smokers. *Tobacco Control, 20*(3), 183–188.
Janz, N. K., & Becker, M. H. (1984). The health belief model: A decade later. *Health Education Quarterly, 11*(1), 1–47.
Leonardi-Bee, J., Jere, M. L., & Britton, J. (2011). Exposure to parental and sibling smoking and the risk of smoking uptake in childhood and adolescence: A systematic review and meta-analysis. *Thorax, 66*(10), 847–855.
Moodie, C. (2015). Novel ways of using tobacco packaging to communicate health messages: Interviews with packaging and marketing experts. *Addiction Research & Theory, 24*(1), 54–61.
Moodie, C., Gendall, P., Hoek, J., MacKintosh, A. M., Best, C., & Murray, S. (2019). The response of young adult smokers and nonsmokers in the United Kingdom to dissuasive cigarettes: An online survey. *Nicotine & Tobacco Research, 21*(2), 227–233.
Moodie, C., MacKintosh, A. M., Gallopel-Morvan, K., Hastings, G., & Ford, A. (2017). Adolescents' perceptions of an on-cigarette health warning. *Nicotine & Tobacco Research, 19*(10), 1232–1237.
Moodie, C., Purves, R., McKell, J., & de Andrade, M. (2014). Novel means of using cigarette packaging and cigarettes to communicate health risk and cessation messages: A qualitative study. *International Journal of Mental Health and Addiction, 13*(3), 333–344.
Noar, S. M., Francis, D. B., Bridges, C., Sontag, J. M., Ribisl, K. M., & Brewer, N. T. (2016a). The impact of strengthening cigarette pack warnings: Systematic review of longitudinal observational studies. *Social Science & Medicine, 164*, 118–129.
Noar, S. M., Hall, M. G., Francis, D. B., Ribisl, K. M., Pepper, J. K., & Brewer, N. T. (2016b). Pictorial cigarette pack warnings: A meta-analysis of experimental studies. *Tobacco Control, 25*(3), 341–354.
O'Keefe, D. J., & Jensen, J. D. (2008). Do loss-framed persuasive messages engender greater message processing than do gain-framed messages? A Meta-Analytic Review. *Communication Studies, 59*(1), 51–67.
Scottish Government. (2018). *Raising Scotland's tobacco-free generation*. Retrieved from https://www.gov.scot/publications/raising-scotlands-tobacco-free-generation-tobacco-control-action-plan-2018/. Accessed 20 Oct 2020.
Shanahan, P., & Elliott, D. (2008). *Evaluation of the effectiveness of the graphic health warnings on tobacco product packaging 2008*.
Slade, J. (1997). The pack as advertisement. *Tobacco Control, 6*(3), 169–170.

Thrasher, J. F., Swayampakala, K., Cummings, K. M., Hammond, D., Anshari, D., Krugman, D. M., & Hardin, J. W. (2016). Cigarette package inserts can promote efficacy beliefs and sustained smoking cessation attempts: A longitudinal assessment of an innovative policy in Canada. *Preventive Medicine, 88*, 59–65.

US Department of Health and Human Services. (2014). *The health consequences of smoking - 50 years of progress*. Retrieved from https://www.surgeongeneral.gov/library/reports/50-years-of-progress/full-report.pdf. Accessed 17 Feb 2021.

White, V., Bariola, E., Faulkner, A., Coomber, K., & Wakefield, M. (2015). Graphic health warnings on cigarette packs: How long before the effects on adolescents wear out? *Nicotine & Tobacco Research, 17*(7), 776–783.

World Health Organization. (2011). *WHO report on the global tobacco epidemic, 2011: Warning about the dangers of tobacco*.

World Health Organization. (2017). *WHO report on the global tobacco epidemic, 2017*. Monitoring tobacco use and prevention policies.