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**PERCEIVED EFFECTIVENESS OF TOBACCO PACKAGING
AND CIGARETTE STICK WARNINGS AS ANTI-TOBACCO
INTERVENTIONS**

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This thesis is submitted for the degree of

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at

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Division of Tropical Health and Medicine

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I declare that this thesis is my own work and has not been submitted in any form for another degree or diploma at any university or institution of tertiary education. Information derived from the published or unpublished work of others has been acknowledged in the text, and a list of references is given.

I declare that the research included in this thesis was ethically conducted, with approval received for each component of the research from the James Cook University Human Research Ethics Committee. The following ethics approval codes relate to the research relevant to this thesis: H6929, H7116, H7194.

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Abstract

Introduction: Tobacco use remains the largest preventable cause of mortality in Australia, despite significant reductions in the prevalence of daily smoking over the past 25 years. Multiple public health interventions have contributed to these reductions, including health warnings and graphic images on cigarette packaging. Whilst initially effective in curbing tobacco use, recent research has identified that these packaging health warnings have become less effective as an anti-tobacco intervention. As tobacco is still the cause of death of an estimated 15 000 Australians per year, further improvements in anti-tobacco interventions are needed. A novel anti-tobacco medium being investigated is the cigarette stick itself. As the primary packaging of tobacco leaf used whilst smoking, it represents a logical and appropriate medium for communicating the consequences of smoking. This research first aimed to confirm recent findings suggesting that current cigarette packaging warnings have lost their effectiveness. It also evaluated the perceptions of a diverse participant cohort towards the use of cigarette sticks as a novel anti-tobacco intervention medium, and to inform on the development of warnings and messages effective both in preventing non-smokers from experimenting with cigarettes, and prompting current smokers to quit smoking.

Methods: A mixed methods approach was utilised, incorporating the use of online surveys, and semi-structured focus groups and interviews. Established health warnings on current cigarette packaging, and novel warnings and messages on individual cigarette sticks were presented to a range of participants, including adolescents and young adults, pharmacists, an international cohort of current smokers, and the wider Australian community. The Health Belief Model (HBM) was utilised in developing the interventional materials. These materials aimed to increase readers' perceived susceptibility and severity of the negative consequences of tobacco use, whilst also outlining the benefits of not smoking, and acting as an additional prompt for quit attempts. A sequential explanatory design was used, where initial survey and

focus group findings were triangulated and used to refine the health warnings and messages used in subsequent surveys, focus groups and interviews. Quantitative data on participants' perceived effectiveness of cigarette packaging and cigarette stick warnings were collected using 5-point Likert scales, and analysed using Chi squared and proportional odds logistic regression analyses. In-depth qualitative information was gathered to support and expand upon the quantitative data, achieved through free-text comments in the surveys, and from focus groups and interviews, which were analysed using content and thematic analyses respectively.

Results and Discussion: A total of 2 045 participants were involved in the research, of which 75% were Australian, 60% were female, 37% were smokers, and 80% were of Caucasian descent. These participants were split amongst five primary populations: the wider Australian community (637), pharmacists (79), school students (150), university students (501), and an international cohort of smokers (678). Perceptions of the effectiveness of current cigarette packaging warnings were generally consistent amongst all participant groups. These warnings were considered minimally effective in prompting current smokers to quit, though slightly more effective in preventing non-smokers from experimenting with cigarettes. Analyses of the qualitative data identified several reasons for these poor ratings, including a loss of shock value due to repetitive exposure over several years, simply ignoring the packaging warnings, and a feeling that the warnings were irrelevant, particularly amongst the younger participants.

In comparison, several of the novel warnings and messages on individual cigarette sticks were rated as significantly more effective than current packaging warnings in preventing non-smokers from smoking, and prompting current smokers to quit. These warnings were considered particularly effective in increasing participants' perceived susceptibility and severity to a wider range of consequences of smoking, and outlining the benefits of not smoking. The financial costs of smoking was a message considered novel, engaging, and widely applicable to the broader population compared to current packaging warnings,

particularly by current smokers (Odds Ratio [OR] = 3.42, 95% Confidence Interval [CI] 2.75-4.25, $p < .001$). This was supported by the open-text comments, with participants indicating that financial stability is valued over avoiding potential health issues. Other warnings perceived as effective throughout this research in comparison to current packaging warnings include the ‘minutes of life lost’ per cigarette (OR = 3.60, 95% CI 2.79-4.64, $p < .001$ amongst university students), and the negative effects of smoking on family members (OR = 2.85, 95% CI 2.29-3.55, $p < .001$ amongst current smokers). These warnings were considered novel, relatable, and engaging, making them capable of eliciting strong emotional responses likely to motivate changes in smoking behaviour amongst smokers, and prevent experimentation amongst non-smokers. Participants were also in favour of the inclusion of warnings and messages on cigarette sticks, with over half (54%) of smokers and over three-quarters (87%) of non-smokers either ‘agreeing’ or ‘strongly agreeing’. They believed that this anti-tobacco intervention would be more difficult to avoid, and would reduce the aesthetic appeal of smoking, particularly amongst adolescents.

Conclusions: This research has confirmed shortcomings in the effectiveness of current cigarette packaging warnings, emphasising the need for improvements in anti-tobacco interventions. The inclusion of novel and engaging warnings and messages on individual cigarette sticks was found to be a potentially effective next step in combating the global tobacco epidemic. It is essential that these warnings are able to elicit strong reactions by persons of any age and smoking status. The vast majority of non-smokers, and over half of smokers were in support of this novel anti-tobacco intervention. Future warning and message development for both cigarette packaging and cigarette sticks should therefore include short-term health, and non-health related consequences of tobacco use, since in this research they were found to be the most engaging, and likely to elicit positive public health changes in the community.

List of Publications

Published Thesis Chapters

Acknowledgement of changes: Some of these chapters have undergone minor changes in this thesis manuscript in accordance with the recommendations made by the external examiners that are not reflected in the published versions of this thesis. These changes do not affect the results and overall findings of these chapters.

1. Drovandi A, Teague PA, Glass B, Malau-Aduli B. A systematic review of the perceptions of adolescents on graphic health warnings and plain packaging of cigarettes. *Systematic Reviews*. 2019;8:25 <https://doi.org/10.1186/s13643-018-0933-0> (Chapter 2)
2. Drovandi A, Teague PA, Glass BG, Malau-Aduli B. A systematic review of smoker and non-smoker perceptions of visually unappealing cigarette sticks. *Tobacco Induced Diseases*. 2018;16(January):2. <https://doi.org/10.18332/tid/82191> (Chapter 3)
3. Drovandi A, Teague PA, Glass B, Malau-Aduli B. Australian perceptions of health messages and warnings on cigarette sticks. Submitted to *International Journal of Public Health*. (Chapter 4)
4. Drovandi A, Teague PA, Glass B, Malau-Aduli B. Australian community pharmacist experiences with smoking cessation and opinions of health warnings on individual cigarette sticks. *International Journal of Pharmacy Practice*. 2019;27(2):121-130. <https://doi.org/10.1111/ijpp.12470> (Chapter 5)
5. Drovandi A, Teague PA, Glass B, Malau-Aduli B. Effectiveness of health warnings on cigarette sticks: perceptions of school students in Queensland, Australia. *Frontiers in Public Health*. 2018;6:297. <https://doi.org/10.3389/fpubh.2018.00297> (Chapter 6)

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8. Drovandi A, Teague PA, Glass B, Malau-Aduli B. A four-country study on smoker perceptions of health warnings on cigarette sticks. Accepted in *Tobacco Induced Diseases*. [In Press]. (Chapter 9)

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1. Drovandi AD, Teague PA, Glass BD, Malau-Aduli BS. Health Warnings on Cigarette Sticks: The Next Step in Reducing Tobacco Use? Oral presentation at the James Cook University Research Festival, September, 2017, Townsville, QLD, Australia
2. Drovandi AD, Teague PA, Glass BD, Malau-Aduli BS. Perceptions of Visual Cigarette Stick Attributes: A Systematic Review. Oral presentation at the Townsville Health Research Showcase, September, 2017, Townsville, QLD, Australia

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List of Abbreviations

AD:	Aaron Drovandi (author)
ANOVA:	Analysis of Variance
BG:	Beverley Glass (co-author)
BMA:	Bunmi Malau-Aduli (co-author)
CASP:	Critical Appraisal Skills Programme
CI:	Confidence Interval
CPD:	Cigarettes per Day
FCTC:	Framework Convention on Tobacco Control
FDA:	Food and Drug Administration
FGD:	Focus Group Discussion
GHW:	Graphic Health Warning
HBM:	Health Belief Model
HCC:	Health Condition Consequences (of smoking)
HHS:	US Department of Health & Human Services
ID#:	Identification Number
ISC:	Immediate and Short-Term Consequences (of smoking)
JI:	Joanna Briggs Institute
JCU:	James Cook University
LMC:	Long-Term and Mortality Consequences (of smoking)

MS:	Mortality Statistics (of smoking)
NDSHS:	National Drug Strategy Household Survey
NNAL-4:	4-(methylnitrosamino)-1-(3-pyridyl)-1-butanonol
OR:	Odds Ratio
PAT:	Peta-Ann Teague (co-author)
PP:	Plain Packaging
PRISMA:	Preferred reporting Items for Systematic Reviews and Meta-Analyses
QR:	Quick Response
RQ:	Research Question
SFC:	Social and Financial Consequences (of smoking)
SM:	Supportive Messages (to quit smoking)
SMQ:	Supportive Messages (to quit smoking)
TDF:	Theoretical Domains Framework
TPB:	Theory of Planned Behaviour
TTM:	Transtheoretical Model
UK:	United Kingdom
USA:	United States of America
WHO:	World Health Organization

Chapter ONE: General Introduction

1.1 THE TOBACCO EPIDEMIC

The global tobacco epidemic is now attributed to causing more than 7 million deaths annually, equivalent to 1 in 10 of total deaths, and is recognised as being the leading cause of preventable mortality worldwide.^{1,2} The most significant diseases linked to tobacco use include chronic cardiovascular and respiratory diseases, multiple forms of cancer (such as lung, mouth, and throat), and diabetes.² Conventional cigarettes remain the primary source of tobacco in most countries, and are largely responsible for the estimated 15 000 annual tobacco-attributable deaths in Australia.³ However, tobacco use in Australia has nearly halved over the past 25 years, with the prevalence of smoking dropping from 29.1% in 1993, to 14.9% in 2016. Accordingly, the proportion of Australians who have never smoked has increased from 49.1% to 62.3%.⁴ Regular decreases in daily tobacco use (as assessed by the National Drug Strategy Household Survey [NDSHS]) often align with the implementation of anti-tobacco public health interventions, such as mass media campaigns, and significant tax increases on tobacco products. However, the latest NDSHS (2016) showed a reduction in daily tobacco use of only 0.6% over the previous 3 years, the lowest reduction achieved since 1993.⁴

1.2 ANTI-TOBACCO PACKAGING INTERVENTIONS

Educating the public on the dangers of tobacco use is therefore essential, and is an integral component of the World Health Organisation's (WHO) Framework Convention on Tobacco Control (FCTC) guidelines for addressing the global tobacco crisis.⁵ Many countries have adopted the FCTC recommendations, one of which is the implementation of mandatory health warnings and graphic images on the packaging of all tobacco products.⁶ These measures aim to influence both non-smokers' and smokers' perceptions on the dangers of tobacco use, and have stimulated an increase in smokers' quit attempts, leading to health benefits for smokers and their communities.⁶⁻⁷

Within Australia, cigarette packaging includes two rotating sets of seven colour graphic health warnings (GHWs) with relevant descriptive text. These GHWs cover 75% of the front and 90% of the rear of the packs, and portray health consequences of tobacco use, supportive messages to quit smoking, and where to receive information and guidance on quitting.⁸ The most recent change in tobacco packaging and labelling is the standardised (plain) packaging of tobacco products.⁹ This requires packaging to be a dissuasive dark green/brown colour (see **Figure 1.1** below), and have no promotional features apart from the brand name and cigarette variant descriptor in a simple font.¹⁰ These changes were intended to reduce the visual appeal of tobacco products, and increase the prominence of existing text and graphic health warnings, in order to promote continued reductions in tobacco use.¹¹ Since its inception in Australia, several other countries, including France, the UK, Hungary, Norway, New Zealand, and Ireland, have made plans to, or have already implemented plain packaging for tobacco products.



Figure 1.1 Four examples of the front and rear of current cigarette packaging in Australia, including text-warnings, graphic images, and standardised (plain) packaging.

1.2.1 Shortcomings of Packaging Interventions

Anti-tobacco packaging interventions now reach more than half the world's population, and have contributed to significant reductions in tobacco use worldwide.¹ However, tobacco use persists, even in high-income countries with stringent tobacco policies such as Australia, where approximately 1 in 8 individuals are daily smokers.¹¹ This may be partially due to shortcomings of current cigarette packaging interventions. Whilst new and larger GHWs were initially quite effective in inducing cognitive reactions and behavioural responses, there has been evidence of a 'wearing-out' of the effectiveness of these warnings.¹²⁻¹⁴ This loss of effectiveness was found in a longitudinal four-country study of adults, where cognitive processing of the warnings 5-years after implementation had decreased to pre-implementation levels.^{13,14} A similar effect was evident in a study of Australian adolescents.¹⁵ These findings suggest that further research is needed to confirm and explore the reasons for this issue, whilst also identifying possible solutions and alternative interventions.

Despite the historical insistence by the tobacco industry that smokers are well aware of the risks of smoking, and are able to make an informed choice on whether or not they should smoke, a significant volume of research has shown that this is not the case.¹⁶⁻²¹ Smokers in particular continue to have unrealistic opinions about the difficulties associated with quitting smoking, and the overall harmfulness of tobacco products.^{16,22} This is particularly rampant amongst adolescents,²³⁻²⁵ who also often share cigarettes, and are not necessarily exposed to GHWs on a regular basis, and therefore may not incite abstinence or cessation within this vulnerable population.^{26,27} Packaging interventions require being viewed to elicit an effect, meaning their effectiveness is impacted by such avoidance techniques. Other techniques employed by both adolescent and adult smokers include concealing packaging,^{28,29} the use of alternative storage containers for cigarettes,²⁸ and actively viewing the non-warning sections of packaging.^{30,31}

1.2.2 Cigarette Sticks as an Anti-Tobacco Medium

Promoting further reductions in tobacco use is essential to improve the health of current and future generations.^{3,4} This requires a combination of refreshing existing anti-tobacco interventions, and designing and implementing new interventions.¹⁰ Several novel interventions are being trialled,³² including the use of health warnings on individual cigarette sticks. As the cigarette stick is the primary packaging of tobacco leaf, and the item consumed whilst smoking, it may be effective as a communication medium for text-based health warnings and messages.³³ As health warnings on cigarette packaging have had a significant effect in reducing tobacco use, cigarette-stick warnings have the potential to elicit cumulative or synergistic effects.^{13,34,35} Effective warnings must deliver a coherent message with enough information for personal application, and a realisation of the influence of smoking on both short and long-term quality of life.³⁶ Due to the small surface area of cigarette sticks, short text-only messages would therefore need to be informative and memorable, as they are limited to using few words. Previous research into health warnings found that direct and brief warnings are also more easily recalled in comparison to longer and more generalised messages.³⁷ Finally, in addition to the effectiveness of the warnings implemented, the novelty of health warnings on cigarette sticks, and the increased viewing frequency of these warnings are theorised to contribute to their potential effectiveness.

1.3 THESIS AIMS AND HYPOTHESES

1.3.1 Aims

Due to the emergence of recent evidence on the gradually diminishing effectiveness of current anti-tobacco packaging interventions, this thesis aims to:

1. Assess the perceptions of non-smokers and smokers towards current cigarette packaging health warnings, to identify the strengths and shortcomings of this tobacco control intervention;
2. Assess the perceptions of the non-smoking population (with a focus on adolescents and young adults), on the potential effectiveness of health warnings on individual cigarette sticks in preventing the uptake of smoking;
3. Assess the perceptions of smokers on the potential effectiveness of health warnings on individual cigarette sticks in prompting quit attempts; and
4. Assess public support for the implementation of this novel anti-tobacco intervention.

1.3.2 Hypotheses

In addressing these aims within this thesis, it is hypothesised that:

1. Based on the current literature, cigarette packaging warnings will receive poor ratings in their perceived effectiveness as a tobacco control intervention;
2. For both non-smokers and smokers, specific warnings and messages on cigarette sticks will elicit cognitive and emotional reactions, leading to perceived effectiveness ratings higher than those achieved by current packaging warnings; and
3. Participants in the research will be amenable to the inclusion of health warnings and messages on individual cigarettes as an additional tobacco control intervention.

To test these hypotheses, this thesis is divided into eleven chapters, including this introductory chapter, and eight paper-based chapters, followed by discussion and conclusion chapters.

1.3.3 Research Questions

Three primary research questions (RQs) were created to address the aims and hypotheses in this thesis in relation to the participant groups. These are based on the premise that preventing smoking in young non-smokers is more beneficial than stimulating quitting in adulthood, whilst also identifying ways in which active smokers can be prompted to quit.

RQ1: How are current health warnings on tobacco products perceived?

RQ2: How can young people be dissuaded from smoking through using health warnings on tobacco products?

RQ3: How can smoking cessation attempts be stimulated through using health warnings on tobacco products?

1.4 THEORETICAL FRAMEWORK

Addressing these aims and testing the hypotheses require the utilisation of an appropriate behavioural theory, as health promotion interventions which are grounded in theory are more effective than those that are not.³⁸ Theoretical models that are regularly utilised for planning and evaluating health-based interventions include the Transtheoretical Model (TTM), the Theory of Planned Behaviour (TPB), the Theoretical Domains Framework (TDF), the Action Planning Model, The Health Belief Model (HBM), and Social Cognitive Theory.³⁹ Each of these theories posit that behaviour is influenced by a set of factors, such as knowledge, finances, stress, culture, and peer pressure, which can be modified to positively affect health outcomes in a single person or an entire population.³⁸

1.4.1 The Health Belief Model

Health-related behaviours are the product of multiple influencing factors, which evolve throughout the lifetime of an individual, with tobacco use theorised to be affected by both classical conditioning (cues and cravings) and operant conditioning, and being driven by

expectations and consequences (reward versus punishment).⁴⁰ The Health Belief Model (HBM) is one of the most widely used conceptual frameworks for understanding and modifying health-related behaviours.⁴² It was initially developed in response to a failed public health intervention in the United States by social psychologists, who wanted to understand why a free tuberculosis screening program was underutilised by the public.³⁹ It was found that a lack of understanding of tuberculosis within the community was the cause, thus, the HBM was developed, with the current (1988) version describing health-related behaviours as being influenced by six major elements, as well as individual-specific modifying variables (such as age, gender, race, and economics).⁴¹ These elements encompass an individual's perceptions of a behaviour and its relationship to good or poor health, modifying factors, and triggers for taking action which modifies their health-related behaviours.⁴¹

Several studies have utilised the HBM in order to understand how an improved level of knowledge/awareness of tobacco and its consequences influences decision making, how educational materials can be effectively delivered to the wider community, and how the delivery of this information impacts upon health-beneficial decision making.⁴²⁻⁴⁶ **Table 1.1** outlines each of the elements of the HBM relative to tobacco use. After consideration of the available theories, and given the precedence of the use of the HBM in tobacco-related research, the HBM was therefore utilised in this research, particularly as it allows specific mapping of anti-tobacco interventional materials to the six major elements and utilisation of modifying variables. In relation to this thesis, tobacco packaging interventions such as graphic health warnings, text warnings, and plain packaging increase the perceived susceptibility (e1) and severity (e2) of consequences of tobacco use, whilst also decreasing the perceived benefits of tobacco use (e3), and acting as a cue to quit smoking (e5). With changes to the warnings utilised, they also have the potential to address the other elements of the HBM and its modifying variables to effectively improve understanding of the dangers of tobacco use.

Table 1.1 The six elements of the HBM as applicable to tobacco use.

Element	Description & Example
e1: Perceived Susceptibility	An individual's perceived susceptibility in contracting or suffering from a tobacco-related disease.
e2: Perceived Severity	An individuals' perceived severity of portrayed tobacco-related diseases, such as lung cancer or heart disease.
e3: Perceived Benefits	An individual's perceived benefits in either smoking, not smoking, or trying to quit smoking.
e4: Perceived Barriers	An individuals' perceived barriers in either avoiding smoking or starting smoking, or trying to quit smoking.
e5: Cues to Action	An individuals' exposure to external sources of information which prompt a maintenance or modification of their smoking behaviours.
e6: Self-Efficacy	An individuals' perceived ability to undertake positive health-related activities related to their smoking behaviours.

1.5 METHODOLOGY

1.5.1 Research Design

This thesis utilises an explanatory sequential mixed-methods design to address the research aims, and test the hypotheses postulated (see **Figure 1.2**). This research approach involves the initial conduct of quantitative data collection and analysis, which then both informs and is strengthened by the collection and analysis of qualitative data.⁴⁷ Public health interventions require a sound understanding of factors leading to poor health within a population, which is best achieved through a mixed-methods approach. Quantitative studies such as online surveys allow the identification of statistically significant results that can guide the most effective interventions, though they lack the capability to clarify and provide in-depth understanding of the research findings; furthermore, they are unable to assess respondent honesty and interpretation of the questions asked.⁴⁸ Qualitative studies such as interviews and focus groups are able to overcome these limitations of quantitative research, particularly in delving into the

reasons behind why a public health intervention is considered effective or ineffective. These studies however are limited by their sample size and thus the applicability of their data to a large population.⁴⁸

Weaknesses due to bias in qualitative or quantitative approach can be overcome by triangulating between the two research methods to uncover the best possible explanations for the observed phenomenon.⁴⁹ Therefore, due to the novelty of cigarette-stick warnings, and the lack of research describing their effectiveness amongst different populations, a mixed methods approach was chosen for this research in order to understand not only what interventions are perceived as the most effective in improving public health through controlling tobacco use, but also why they were perceived this way. This ensures that the sequential nature of this research (and future research) can be designed to reflect a more robust set of findings.

Therefore, for this thesis, quantitative data collection involves the use of quantitative-focused online surveys, which rely on 5-point Likert-scale rating systems and open-text comment boxes, to gather the perceptions of participants. Qualitative focus groups and interviews will also be conducted to build upon the findings from the online surveys. After collection and analysis of both phases of data, there will be a triangulation of the entire data set for overall interpretation.⁴⁷ Triangulation of the quantitative and qualitative findings offer a comparative analysis to reveal interpretations of convergent and divergent findings. The advantage of this mode of mixed-methods research is that the qualitative research can be carefully designed based on what is found from the quantitative data, to answer key questions and give insight to explain the reasoning behind the quantitative data. However, the use of two independent phases makes the process lengthy, and there is a risk of unexpected divergence between the quantitative and qualitative data.⁴⁷

Within each individual online survey, a concurrent triangulation design will allow each chapter to independently cross-validate their internal findings between the quantitative (Likert scales) and qualitative (comment boxes) components. This approach is widely used as it allows the concurrent collection and comparison of both types of data to determine if there is a convergence or divergence within the overall dataset.⁴⁷ This method allows each type of data collection to strengthen the other in a shorter timeframe compared to sequential designs. The main limitation of this method relates to the potential difficulties in comparing the two sources of data, particularly when there is unexpected disparity between the datasets.⁴⁷

1.5.2 Key Participant Groups

There are five participant groups in this research; the wider Australian community, Australian community pharmacists, Australian school students, Australian university students, and an international cohort of smokers (Australia, Canada, United Kingdom, and United States). From these populations there are three key participant groups addressed in this research; adolescents, young adults, and active smokers. This thesis is composed of eleven chapters, with the key participant groups involved throughout Chapters 2 to 9, encompassing the research component utilising the aforementioned explanatory sequential mixed-methods design (see **Figure 1.2**).

The wider Australian community are the first participant group, to allow the collection of a relatively generalizable dataset relating to public perceptions of current packaging warnings and cigarette stick warnings. The data will then be bolstered by the recruitment of community pharmacists and school students. Community pharmacists are health professionals that regularly interact with smokers to provide advice on how to quit smoking, and frequently receive information relating to why a person smokes, and their primary drive(s) for quitting. Their input will be valuable in refining the cigarette stick warnings into reflecting the most frequently-cited drivers behind quitting smoking. School students represent a key participant

group, amongst whom preventing smoking is essential, making gathering their perceptions crucial when designing public health interventions.

Data from these participant groups will allow a refining of the warnings and messages, which will then be presented to the second key participant group, young adults. Similar to adolescents, preventing smoking uptake amongst those aged under 30 years significantly reduces their likelihood of smoking into adulthood. Their data will then be used to refine the warnings again for evaluated amongst the final key participant group, active smokers. An international cohort of smokers will be used due to gauge the international applicability of cigarette-stick warnings.

1.5.3 Design of Interventional Materials

Two forms of intervention will be evaluated in this research; established cigarette packaging interventions (which include graphic pictorial images, text warnings, and plain packaging), and experimental cigarette-stick warnings and messages. Prior to the commencement of this thesis, there was a significant amount of research indicating the effectiveness of cigarette packaging warnings,⁵⁰ though few studies had investigated the perceptions of cigarette-stick warnings, and were limited to only a few warnings.^{32,51-53} This included ‘Smoking Kills’, the ‘Minutes of life lost’ per cigarette, and the names of toxic cigarette constituents.^{32,51-53}

Three primary sources were used when developing the initial set of cigarette-stick warnings, including data from a large meta-analysis investigating the effectiveness of graphic cigarette packaging warnings,⁵⁰ a systematic review investigating how adolescents specifically respond to cigarette packaging warnings (Chapter 2), and a systematic review investigating how the perceptions of smoking is altered in response to modifications to cigarette stick appearance (Chapter 3). When mapping the findings from these three sources to the HBM, it was found that elements 1 and 2 (perceived susceptibility and severity) were most commonly utilised in warnings on tobacco products, aiming to create feelings of shock, fear, and disgust to prevent

tobacco use amongst non-smokers, and prompt current smokers to quit. Elements 3 and 5 (perceived benefits and cues to action) were also addressed in these studies, though to a lesser extent, and focused on outlining the health benefits of not smoking, and suggesting resources which may assist smokers in quitting. From the research on cigarette-stick warnings, the ‘minutes of life lost’ warning was perceived as the most effective due to the novelty of the warning itself, the applicability of life and life expectancy to persons of any age, gender or smoking status, and the severity of losing life.^{51,52} In comparison, the ‘smoking kills’ message was seen as ‘common-sense’, and a lack of understanding negatively impacted on the effectiveness of the cigarette displaying the name of toxic cigarette constituents.^{32,51-53}

Twelve cigarette sticks, divided into four themes (see **Figure 1.3**), were initially developed and evaluated in Chapters 4-6. These were developed by the candidate, and involved the printing of red-texted warnings and messages on address labels, which were then cut to size and affixed to commercial cigarettes. Each cigarette had three lines of text, which either involved three separate messages, or one coherent message that could be read as the cigarette is rotated. Throughout this research, photographs of the developed cigarettes were used in online surveys, whereas the actual cigarettes were used in focus groups and interviews.

Theme 1 (Mortality Statistics) warnings were developed as a result of the effectiveness of the ‘minutes of life lost’ warning in previous research, each of which were intended to be novel, have high impact/shock value, and be perceived as applicable to all smokers. Theme 2 (Health Condition Consequences) warnings were developed to mimic and act as a comparison to the types of conditions portrayed on current cigarette packaging (see **Figure 1.3**). Both of these themes are strongly linked to elements 1 and 2 of the HBM (perceived susceptibility and severity), with the conditions listed in Theme 2 considered to be well advertised health consequences of smoking and understood by the majority of participants, including adolescents.

Mixed Methods: Sequential Explanatory Design

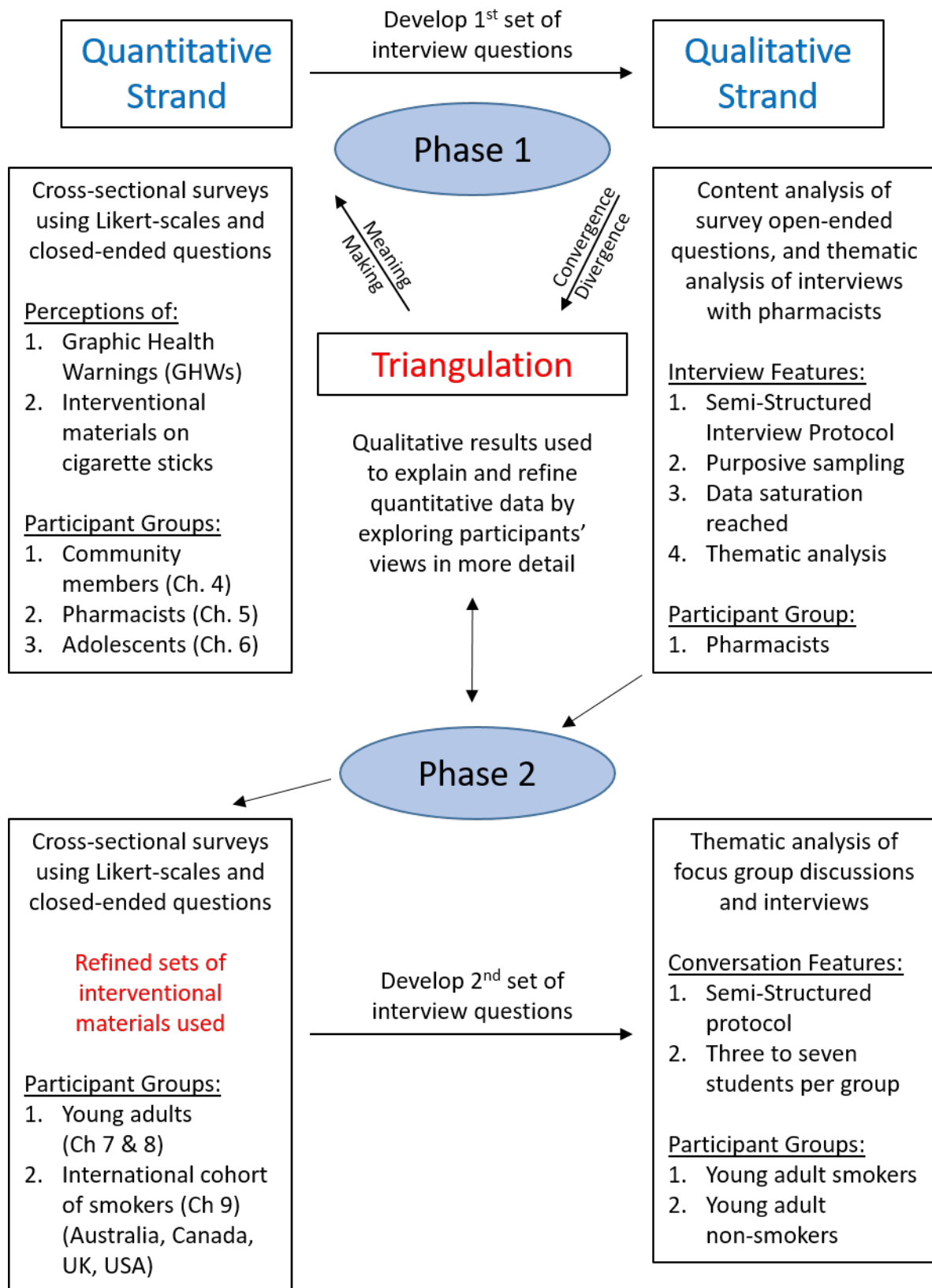
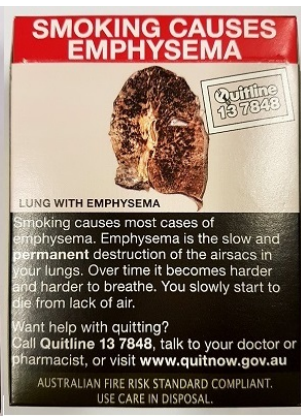
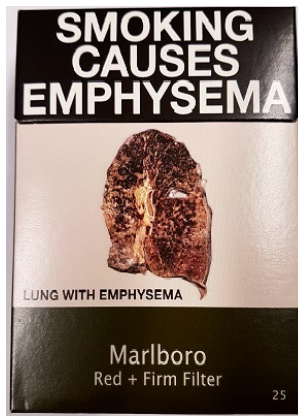


Figure 1.2 Illustration of the mixed-methods sequential explanatory design utilised in this thesis.

Theme 3 (social and financial consequences) warnings were developed with the intention to utilise both the under-addressed element 3 (outlining the benefits of not smoking/quitting) and the modifying variables of the HBM, particularly economy and social standing which have been identified as key factors affecting tobacco use.^{54,55} Lastly, theme 4 (supportive messages) was developed to align with elements 5 and 6 (cues to action and self-efficacy) of the HBM, and partially align with current Australian tobacco packaging, which include the quit-line phone number and one package which includes a pictorial image promoting quitting.

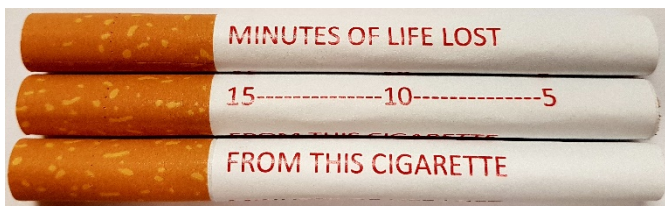
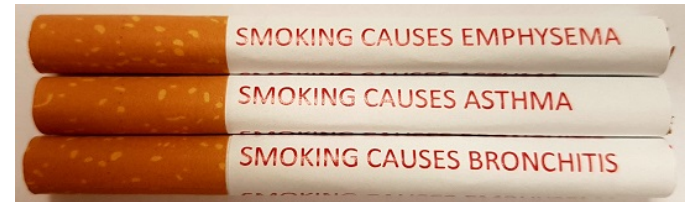
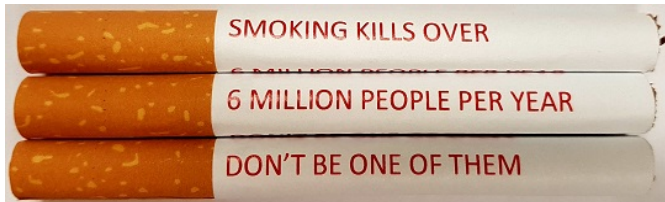
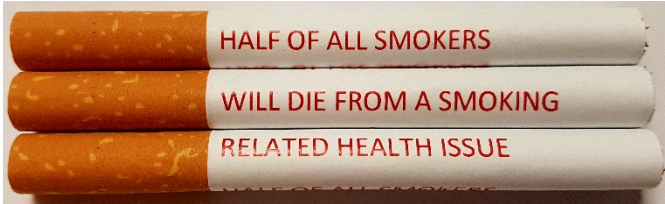
Congruence in the results within the first set of questionnaires across different population groups (Chapters 4 to 6) prompted a refining of the warnings and themes evaluated in subsequent chapters of this thesis (Chapters 7 and 8) (see **Figure 1.4**). Themes 1 and 2 had their titles and individual cigarette-stick warnings modified to reflect several shortcomings raised. This included long-term warnings as being un-relatable (especially to younger participants), self-exclusion from warnings citing statistics, and previous and repetitive exposure to several of the health-condition warnings.

The new themes 1 and 2 (immediate and short-term consequences, and long-term and mortality consequences respectively) reflected these changes in the cigarette-stick warnings, whereas the titles of themes 3 and 4 were found to be well-received and remained unchanged, though individual cigarette-stick warnings and messages were modified. The social implications of smoking were more strongly focused on in theme 3, whilst theme 4 had messages added which focused on the addiction itself as well as difficulties in quitting. These additions addressed the shortcomings identified in Chapters 4 to 6. The final original research chapter (Chapter 9) had only eight cigarette-stick interventions utilised without themes, to focus on specific warnings which were perceived as having the greatest impact on smokers. The two highest rated warnings and messages from each of the themes in the previous chapters were presented in this final study (see **Figure 1.5**).



Theme 1 – Mortality Statistics (MS)

Theme 2 – Health Condition Consequences (HCC)



Theme 3 – Social and Financial Consequences (SFC)

Theme 4 – Supportive Messages (SM)

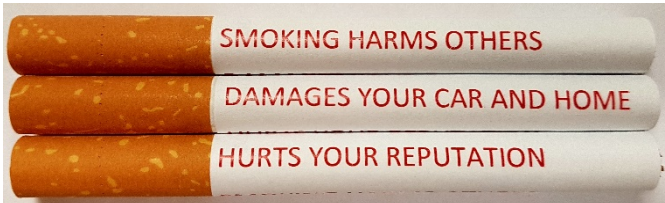
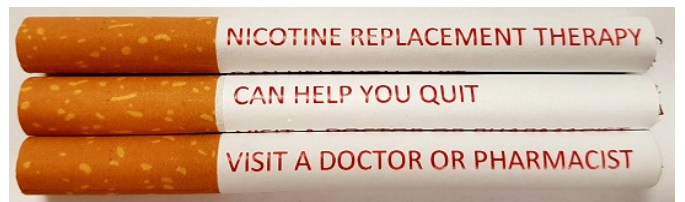
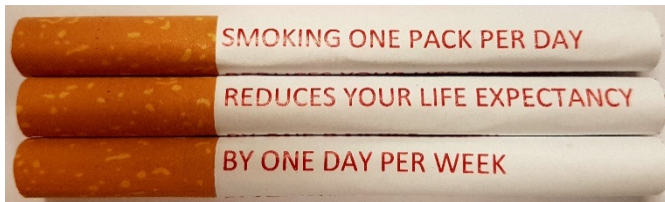
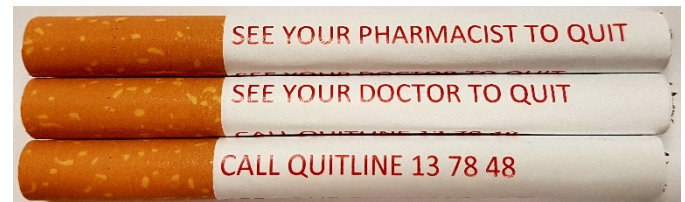
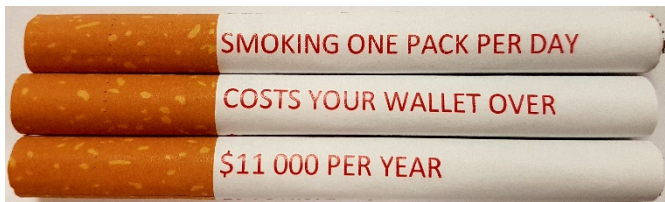


Figure 1.3 The initial set of cigarette stick warnings developed in this thesis.

1.5.4 Analytical Techniques Utilised

Four primary methods of analysis will be utilised for analysing the quantitative data throughout Chapters 4 to 7 and Chapter 9. Descriptive statistics will outline the demographic characteristics of the participant groups. Non-parametric tests will include the Kruskal-Wallis test, and the Mann-Whitney U test, which are utilised to identify significant relationships between the dependent variables (Likert-scale ratings for perceived effectiveness), and independent variables (demographics) within each participant population. Friedman test (non-parametric repeated-measures analysis) will be used to assess differences by ranks in participants' ratings of the current packaging warnings and cigarette stick themes. These non-parametric tests were chosen as they are suitable for ordinal variables where participant responses are not normally distributed. The non-parametric tests will be performed using SPSS version 24. Lastly, proportional odds logistic regression analysis will be conducted using R version 3.2.4 ordinal statistical package. This regression model gives data which can be transformed into odds ratios and confidence intervals, which is used to predict the likelihood of categorical dependent variables influencing perceived effectiveness of the presented materials (current packaging and cigarette stick warnings).

Qualitative data in the online surveys (Chapters 4-7 and Chapter 9) will be analysed by conceptual content analysis. This method involves the identification, coding, and quantification of key concepts raised by participants in relation to each open text comment box, which are linked to individual Likert-scale questions. This method allows for easy assessment of positive and negative impacts on the perceptions of the presented warnings and messages, and will guide refining of these warnings and messages throughout the thesis. Assessments of congruence (triangulation) between the quantitative and qualitative components of the online surveys will be conducted, with positively and negatively geared themes compared against the overall Likert-scale scores, and scores specific to key demographic variables.

Theme 1 – Immediate and Short-Term Consequences (ISC)



Theme 2 – Long-Term and Mortality Consequences (LMC)



Theme 3 – Social and Financial Consequences (SFC)



Theme 4 – Supportive Messages to Quit (SMQ)



Figure 1.4 The refined cigarette-stick warnings and themes utilised in Chapters 7 and 8.



Figure 1.5 The final cigarette-stick warnings and messages used in Chapter 9.

Thematic analysis will be utilised for the qualitative data from interviews and focus groups in Chapters 6 and 8, using NVivo (version 11). This method involves not only the identification and coding of key themes raised by participants, but also the interrelation between these concepts. This includes mapping how the intervention themes were related to each other as well as the interventional materials utilised. Responses to the separate semi-structured questions will be individually analysed using thematic analysis, with the themes across questions then compared to identify the overall emerging themes.

1.5.5 Interpretation of Results

Triangulation of the overall dataset, through incorporating both quantitative and qualitative findings within this mixed methods research, was then performed to determine the overall findings of the research and answer the research aims and hypotheses posited in Section 1.3. Quantitative findings across the surveys were compared to identify both consistent patterns and unique findings from the Likert scale questions, especially relating to intervention themes perceived as the most or least effective, and the impact of demographic variables on Likert

scale ratings. Qualitative findings and the major themes identified across the online surveys were also compared to assess for differences in the major themes raised by the various populations enrolled in each survey. Qualitative findings from the interviews and focus groups were also compared to both the quantitative and qualitative findings in the online surveys. These comparisons across the quantitative and qualitative data between multiple populations allowed the development of an overall understanding of at what level warnings and messages were perceived as effective, and the reasons behind perceived effectiveness or ineffectiveness. This overall understanding is described in the discussion chapter of this thesis (Chapter 10), with subsequent conclusions and recommendations provided in the final chapter (Chapter 11).

1.6 CONCEPTUAL FRAMEWORK

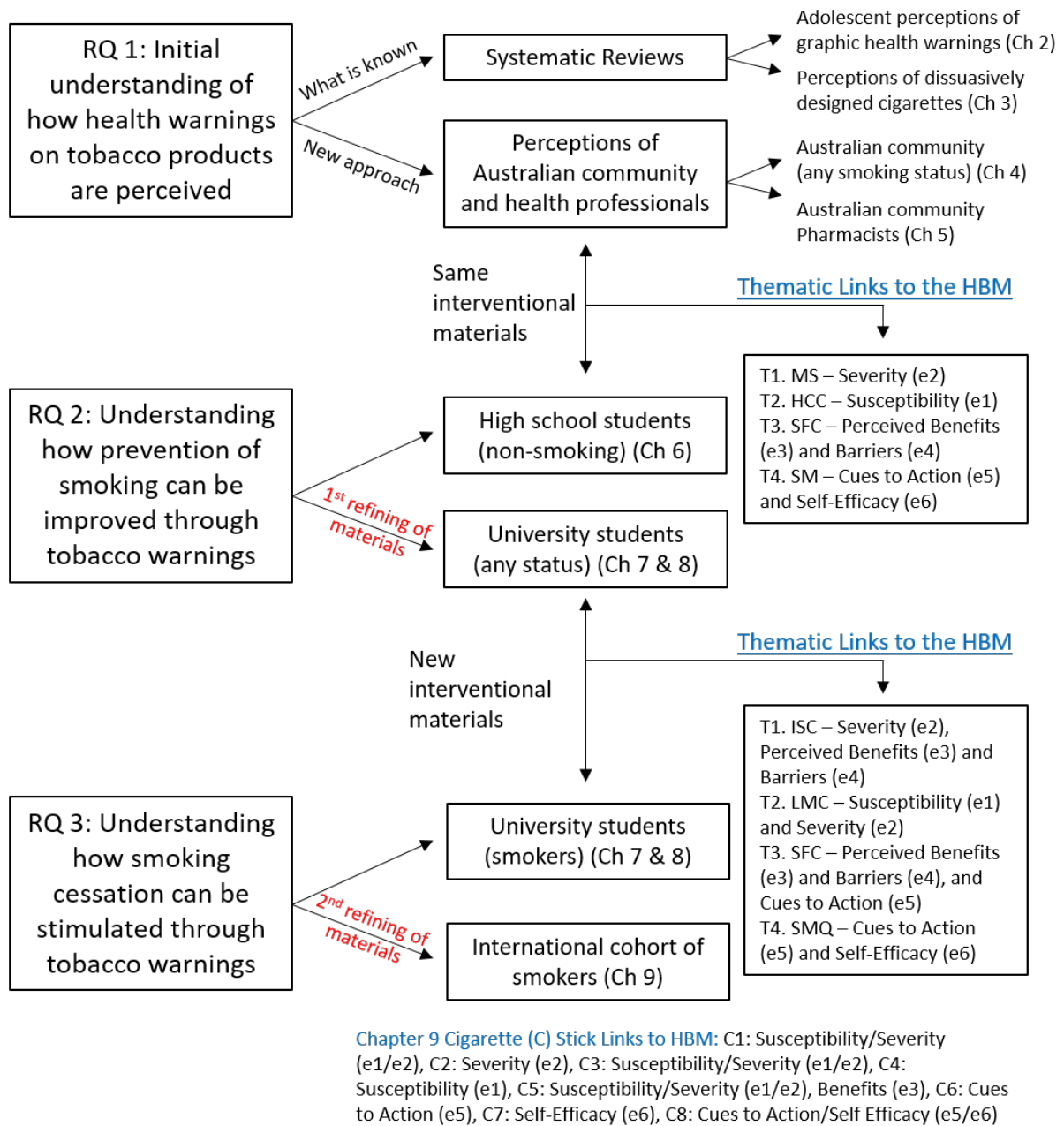
1.6.1 Thesis Outline

This thesis is composed of eleven chapters, which together aim to address the research aims, hypothesis, and questions stated thus far. After this introductory chapter:

- ❖ Chapter 2 is a systematic review aiming to better understand how adolescents and young adults perceive health warnings on tobacco products, as there is relatively little data available regarding their perceptions. The findings from this chapter inform on the methodology and intervention materials for Chapters 6-8, all of which involve adolescent or young adult participants, and contributed to both RQ1 and RQ2.
- ❖ Chapter 3 is a systematic review aiming to better understanding how cigarette sticks are perceived in the recent literature, due to the novelty of this form of public health intervention. The findings of this review led to the initial development of cigarette sticks warnings throughout Chapters 4-9, and contributed to answering RQ2 and RQ3.
- ❖ Chapter 4 involved an online survey of the Australian community which served to gain an initial understanding of how cigarette packaging and stick warnings are perceived. The data from this study served to refine future warnings, and contributed to all RQs.

- ❖ Chapter 5 involved an online survey and interviews of Australian community pharmacists to identify how health professionals perceive cigarette packaging and cigarette stick warnings, and the primary drive(s) for quitting cited by smokers. The data from this study served to refine future warnings, and contributed to all RQs.
- ❖ Chapter 6 involved an online survey of school students to identify how the vulnerable adolescent population perceives cigarette packaging and cigarette stick warnings. Preventing smoking and addiction amongst the younger age groups is essential in minimising tobacco use. The data from this survey contributed to answering RQ1 and RQ2. The data from Chapters 4 to 6 was used to refine the interventional materials for evaluation through Chapters 7 to 9.
- ❖ Chapter 7 involved an online survey of university students to identify how the young adult population perceives cigarette packaging and updated cigarette stick warnings. Young adults are a vulnerable population within the university environment, due to the culture of social drinking and smoking. The data from this survey was used to shape the Chapter 8 semi-structured interviews to gather more in-depth qualitative data behind their perceptions. The data from this study contributed to all RQs.
- ❖ Chapter 8 involved focus groups and interviews of university students to build upon the quantitative findings from Chapter 7, and was also used to refine the final set of interventional materials evaluated in Chapter 9. The data from this study contributed to all RQs.

Conceptual Framework of Thesis



Legend:

Interventional themes: MS (Mortality Statistics), HCC (Health Condition Consequences), SFC (Social and Financial Consequences), SM (Supportive Messages), ISC (Immediate and Short-Term Consequences), LMC (Long-Term and Mortality Consequences), SMQ (Supportive Messages to Quit).

Figure 1.6 Illustration of the conceptual framework of the thesis.

- ❖ Chapter 9 involved an online survey of an international cohort of smokers, to add weight to findings relating to RQ3. Smokers from four countries were chosen (Australia, Canada, the United Kingdom, and United States) to comprise the cohort, with the Australian participants acting as the direct comparison with the previous studies, and as the control compared to smokers from the other countries. These countries were chosen due to their similar level of tobacco-control interventions employed, and due to the primary language being English, which avoids any translation issues. The data from this study contributed to all RQs.
- ❖ Chapter 10 discusses the overall findings of this research, including how cigarette packaging and cigarette stick warnings were perceived across the multiple participant groups involved. This chapter also discusses the implications of the findings for practitioners, policymakers, and public health.
- ❖ Chapter 11 draws the final conclusions for the overall research, including logistics for cigarette packaging and cigarette stick warnings, and makes recommendations for the implementation of cigarette stick warnings and for future research.

1.7 CHAPTER SUMMARY

This chapter has outlined current tobacco use in Australia, and detailed the recent history of anti-tobacco health warnings in Australia, including their effectiveness in reducing tobacco use, and shortcomings limiting their effectiveness. This chapter also presents the reasoning behind the current research and the methodological and theoretical techniques utilised, including the adoption of the Health Belief Model. The reasoning behind the design of the interventional materials, and their subsequent refinement have also been detailed. This chapter concludes with an outline of the thesis chapters and how they address the research questions in this thesis.

Table 1.2 Thesis Outline, Chapter Details, and Submission Status of Publication Chapters*

Chapter (Abbreviated Titles)	Chapter Contents	Author Contributions	Submission Status
<u>ONE: General Introduction</u>	A brief introduction to tobacco use in Australia, and the status of anti-tobacco interventions aimed at improving public health. This chapter also discusses the strengths and limitations of current packaging interventions, and the theoretical background for the cigarette-stick interventions being evaluated in this thesis.	AD wrote the introductory chapter, with PAT, BG, and BMA reviewing each draft before approving the final version.	N/A
<u>TWO: Systematic Review of Adolescent Perceptions of Tobacco Packaging Warnings</u>	A systematic review investigating the perception of adolescents on currently implemented anti-tobacco packaging interventions. Graphic health warning and plain packaging interventions were evaluated in this review, to identify how adolescents have responded to these public health interventions.	AD designed and carried out the systematic search and quality appraisal, and wrote the manuscript drafts. BMA independently conducted quality appraisal checks. PAT, BG, and BMA reviewed each draft, and approved the final version.	Published in <i>Systematic Reviews</i>
<u>THREE: Systematic Review of Perceptions of Dissuasively Designed Cigarettes</u>	A systematic review investigating the current literature on dissuasively designed cigarette sticks, and health warnings on cigarette sticks. Different sized and coloured cigarette sticks, and those with warnings were evaluated to identify effective aspects of these cigarettes which may reduce tobacco use.	AD designed and carried out the systematic search and quality appraisal, and wrote the manuscript drafts. BMA conducted quality appraisal checks. PAT, BG, and BMA reviewed each draft, and approved the final version.	Published in <i>Tobacco Induced Diseases</i>
<u>FOUR: Australian Perceptions of Health Warnings on Cigarette Packaging and Cigarette Sticks</u>	An online survey of the Australian community, and their perceptions of the effectiveness of current anti-tobacco packaging warnings, and proposed health warnings and messages on cigarette sticks. This included specific warnings considered effective, and general acceptance of the inclusion of warnings on cigarette sticks in Australia.	AD designed the survey and wrote the ethics application. BG and BMA reviewed the survey and assisted in preparation of the ethics application. AD and BMA analysed the data. AD wrote the manuscript, and PAT and BMA reviewed the final manuscript.	Submitted to <i>International Journal of Public Health</i>

<p>FIVE: Pharmacist Perceptions of Health Warnings on Cigarette Sticks</p>	<p>An online survey and face to face interviews of Australian community pharmacists, gathering their experiences of assisting smokers with quit attempts. These experiences included common drivers cited for quitting smoking, which shape their perceptions of health warnings and messages considered effective in prompting current smokers to quit.</p>	<p>AD designed the survey and wrote the ethics application. BG and BMA reviewed the survey and assisted in the preparation of the ethics application. PAT assisted with pharmacist recruitment. AD carried out the interviews. AD and BMA analysed the data. AD wrote the manuscript, and BMA reviewed the manuscript.</p>	<p>Published in <i>International Journal of Pharmacy Practice</i></p>
<p>SIX: High School Student Perceptions of Health Warnings on Cigarette Sticks</p>	<p>An online survey of Australian high-school students, and their perceptions of the effectiveness of current anti-tobacco packaging warnings, and proposed health warnings and messages on cigarette sticks. This included specific warnings considered effective, and their general acceptance of the inclusion of warnings and messages on cigarette sticks in Australia.</p>	<p>AD designed the survey and wrote the ethics application. BG and BMA reviewed the survey and assisted in preparation of the ethics application. AD and BMA analysed the data. AD wrote the manuscript, and PAT and BMA reviewed the final manuscript.</p>	<p>Published in <i>Frontiers in Public Health</i></p>
<p>SEVEN: University Student Perceptions of Health Warnings on Cigarette Sticks (Survey)</p>	<p>An online survey of Australian university students, and their perceptions of the effectiveness of current anti-tobacco packaging warnings, and proposed health warnings and messages on cigarette sticks. This included specific warnings considered effective, and their general acceptance of the inclusion of warnings and messages on cigarette sticks in Australia.</p>	<p>AD designed the survey and wrote the ethics application. BG, PAT and BMA reviewed the survey and assisted in preparation of the ethics application. AD and BMA analysed the data. AD wrote the manuscript, and PAT and BMA reviewed the final manuscript.</p>	<p>Published in <i>Health Communication</i></p>
<p>EIGHT: University Student Perceptions of Health Warnings on Cigarette Sticks (Focus Groups)</p>	<p>A combination of focus groups and phone interviews to explore Australian university students' perceptions of the effectiveness of current anti-tobacco packaging warnings, and proposed health warnings and messages on cigarette sticks. This included their experiences with smoking and quitting, and which specific warnings and messages were considered most effective as anti-tobacco interventions.</p>	<p>AD, BG and BMA designed the semi-structured questions and conducted the focus groups and telephone interviews. AD wrote the introduction and methodology for the manuscript, and both AD and BMA analysed the qualitative data and wrote the results and discussion. AD wrote the final manuscript, reviewed by PAT and BMA.</p>	<p>Accepted in <i>Psychology Research and Behavior Management</i></p>

<p>NINE: Smoker Perceptions of Health Warnings on Cigarette Sticks</p>	<p>An online survey of an international cohort of smokers, and their perceptions of the effectiveness of current anti-tobacco packaging warnings, and proposed health warnings and messages on cigarette sticks. This included specific warnings considered effective, and their general acceptance of the inclusion of warnings on cigarette sticks in their respective countries.</p>	<p>AD designed the survey and wrote the ethics application. BG and BMA reviewed the survey and assisted in preparation of the ethics application. AD and BMA analysed the data. AD wrote the manuscript, and PAT and BMA reviewed the final draft of the manuscript.</p>	<p>Accepted in <i>Tobacco Induced Diseases</i></p>
<p>TEN: General Discussion</p>	<p>A discussion of the collective findings of the research, including the general consensus on the most effective warnings presented to participants, their acceptance of the proposal of cigarette-stick health warnings being implemented, and how these warnings might integrate within current anti-tobacco public health campaigns.</p>	<p>AD wrote the discussion chapter, with PAT, BG, and BMA reviewing each draft before approving the final version.</p>	<p>N/A</p>
<p>ELEVEN: Conclusions and Recommendations</p>	<p>Final conclusions of the research and recommendations for future research were proposed, and included the implementation of health warnings on individual tobacco products in the Australian market.</p>	<p>AD wrote the conclusions and recommendations chapter, with PAT, BG, and BMA reviewing each draft before approving the final version.</p>	<p>N/A</p>

* Chapters 2-9 are publication-based chapters in this thesis

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Chapter TWO: A Systematic Review of the Perceptions of Adolescents on Graphic Health Warnings and Plain Packaging of Cigarettes

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This chapter details the methodology and findings of a systematic review investigating the perceptions of adolescents towards cigarette packaging interventions. As a key target group for anti-tobacco interventions, understanding the perceptions of adolescents was essential in developing the cigarette-stick warnings and messages being evaluated in this research. This chapter discusses the impact of graphic images and plain packaging of cigarettes on the beliefs and behaviours of smoking and non-smoking adolescents.

2.1 ABSTRACT

Background: Graphic health warnings on tobacco packaging, and the plain packaging of tobacco products are key tobacco control interventions. This systematic review investigated the perceptions of adolescents towards these packaging interventions.

Methods: Published, original-research, English-language articles from the 1st January 2000 to 1st September 2017 were identified through a systematic literature search of the PubMed, CINAHL, PsycINFO, Web of Science, and Scopus databases. Articles describing investigations into the perceptions of adolescents aged 11 to 19 years (inclusive) towards graphic health warnings and/or plain-packaged cigarettes were included in this review.

Results: Nineteen articles, involving 15 935 adolescent participants, of which 72.85% were non-smokers or ex-smokers, and 27.15% occasional or daily smokers met the eligibility criteria. Graphic health warnings were perceived as more effective than text-only warnings, with warnings depicting lung cancer, and oral diseases being perceived as particularly effective. Health warnings increased viewer fear, anxiety, shock, and guilt, and were considered effective in preventing non-smokers from experimenting with tobacco, and prompting current smokers to quit. Plain packaging reduced the attractiveness and other positive attributes of cigarette packaging, with darker colours found to be the most effective. When used in combination, plain packaging increased the visibility of graphic health warnings, with participants also perceiving them as having an increased tar content, having more serious health risks, and increased thoughts of quitting amongst smokers.

Conclusions: Graphic health warnings and plain packaging appear to increase adolescent awareness of the dangers of tobacco use. Further research into the most effective warnings to use in combination with plain packaging is needed to ensure the greatest reduction in tobacco use, and prevent tobacco-attributable morbidity and mortality in this vulnerable population.

2.2 BACKGROUND

Tobacco use continues to be a major contributor to global morbidity and mortality, being responsible for an estimated 7 million deaths per year, and the attributable cause of death for over half of persistent tobacco users.^{1,2} Multiple forms of cancer, and cardiovascular and respiratory diseases are the adverse outcomes of greatest concern, with their risk and severity being influenced by individual patient factors, alongside the cumulative exposure to carcinogenic constituents over the lifetime of a smoker.^{3,4} Therefore, initial tobacco experimentation and the development of nicotine addiction during the formative years when the brain is still maturing is linked not only to more significant risks to long-term health, productivity, and life expectancy, but also a greater tendency to continue the addiction into adulthood.^{5,6} Physiological and sociological differences to adult populations increase the likelihood of addiction, where adolescents can experience significant peer pressure to experiment with drugs such as tobacco, which contributes to the majority of active adult smokers having started smoking during their teenage years.^{7,8}

This issue is compounded by a long history of tobacco industry marketing tactics targeting adolescents and young adults in preference over older adults, as they are vital to the survival of the industry as the next ‘generation’ of smokers.⁹⁻¹² Whilst tobacco manufacturers have insisted that their packaging and other marketing techniques are meant only to retain brand loyalty amongst adult smokers, internal tobacco manufacturer documents show otherwise.⁹⁻¹² These targeted marketing strategies are the product of decades of research into attractive colours, shapes, logos, and descriptors meant to appeal to and attract adolescents and young adults, and create brand loyalty early in the life of a smoker.⁹⁻¹¹ The use of attractive packaging, filters, and variant descriptors such as ‘light’, ‘mild’, and ‘smooth’ have been shown to create misconceptions amongst both smokers and non-smokers on the relative safety of different cigarette brands and variants within brands.⁹⁻¹¹

In response to these marketing strategies, and to curb the use of tobacco amongst adolescents, there have been a range of interventions and programs implemented, including tax increases, banned point-of-sale advertising, mass media campaigns, and school and parental-based educational programs. As part of the World Health Organisation's Framework Convention on Tobacco Control (FCTC), articles 11 and 13 relate to the packaging and labelling of tobacco products, and tobacco advertising, promotion and sponsorship respectively.¹⁵ These aim to guide FCTC signatories in removing misleading impressions created by tobacco marketing, advertising, and branding, and to ensure the use of sufficiently-sized text and pictorial health warnings, to inform and educate the public on the dangers of tobacco use.¹⁵

Countries implementing these bans make tobacco packaging one of the last available methods for tobacco manufacturers to promote their products, and differentiate them from competitor's products.^{16,17} However, even this 'last bastion' for advertising is being increasingly controlled, through mandated pictorial and graphic health warnings, and the standardised (plain) packaging of tobacco products, first introduced in Australia in late 2012, and now present and planned for introduction in several other countries.¹⁸ Reviews evaluating the effectiveness of these recent implementations of graphic health warnings (GHW) and plain packaging (PP) have been ongoing, with the growing body of international evidence supporting their use.¹⁸⁻²² However, no review to date has focused on the effects of these interventions on adolescents. This systematic review therefore aims to assess the perceptions of adolescents towards graphic health warnings and plain packaging of cigarette packaging, which are aimed at reducing tobacco use amongst this vulnerable population. There was significant interest in identifying how younger persons perceive tobacco use as a measure of social standing, the potential for harm caused by tobacco use, and how these perceptions were influenced by the packaging of tobacco products. This review aimed to answer the question: *How does tobacco packaging and labelling influence adolescents' perceptions of tobacco products?*

2.3 METHODS

This review was conducted as part of a larger research project, using a protocol that is not currently published. The PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines were used as a reporting guide for this systematic review (see **Appendix 2.1**).²³

2.3.1 Eligibility Criteria

Eligible articles were those that gathered the self-reported perceptions of adolescents towards cigarette packaging which were either plain-packaged, displayed graphic health warnings, or both. These perceptions include any reported measure relating to perceived risks and attractiveness of packaging, as well as perceptions of the packs themselves, or smokers who use the packs. For this review, the relevant adolescent age was considered as being between the ages of 11 and 19 years old (inclusive). This is the general age range of adolescents enrolled in middle school and high school, and where the use of tobacco generally becomes of concern within educational systems. Original-research articles published between 1st January 2000 and 1st September 2017, in the English language were eligible for inclusion, whereas reviews, opinions, letters, and protocols were excluded. Articles which discussed the perceptions of young adults (18 to 35 years) or adults only were excluded, as well as those that did not differentiate data collected between different age groups if both adolescent and adult participants were enrolled. Other reasons for exclusion included the presentation and evaluation of text-only warnings on tobacco products, studies which did not gather self-reported adolescent participants' perceptions (such as eye-tracking studies), studies that did not include GHW and PP perceptions as their primary outcome measure, and studies which asked participants to recall warnings they had seen in day-to-day life.

2.3.2 Search Strategy and Study Selection

Eligible articles were identified through a systematic literature search of the PubMed, CINAHL, PsycINFO, Web of Science, and Scopus databases. Searches utilised MeSH terms and combinations of the following words and their appropriate iterations; adolescent, perception, cigarette, plain packaging, graphic health warning, belief, behaviour, smoking, tobacco, warning, and young (see **Appendix 2.2** for the detailed search strategy). Two authors (AD and BMA) were independently involved in article searching and screening, and cross-checked each other's final lists of eligible articles. Disagreements relating to article eligibility was resolved by consensus amongst all four authors. Titles were read to identify potentially relevant articles, and we initially included any article that appeared to present cigarette packaging to participants of any age or smoking status. Abstracts were reviewed, and articles which involved adolescent participants' responses to cigarette packaging were retained, and those that matched the exclusion criteria were removed from the review. Eligible articles had their citations (using Google Scholar) and reference lists scanned to identify additional articles.

2.3.3 Data Extraction and Quality Appraisal

Data extraction was initially performed by a single author (AD), then independently cross-checked by a second author (BMA). Data extracted from eligible articles included; author details, year published, country of participant origin, participant numbers and age range, gender distribution, smoking status, study design, interventions employed, and outcomes reported. The primary outcomes of interest for this review were the perceptions of adolescents towards cigarette packaging that displayed graphic health warnings, were plain packaged, or both. Responses gathered included 'choice preferences' and Likert-scale ratings of: packaging attractiveness, perceived cigarette taste, perceived health risks, warning intensity, perceived smoker attributes, preferred pack selection, personal relevance of warnings, and perceived effectiveness in preventing smoking in non-smokers, and prompting current smokers to quit.

Study quality was assessed using validated checklists from the Joanna Briggs Institute (JBI). The JBI ‘Checklist for Analytical Cross Sectional Studies’ was used for sixteen studies,²⁴ and the JBI ‘Checklist for Randomized Controlled Trials’ was used for three studies.²⁵ These checklists assess for study clarity, appropriateness of methodological design, analysis, presentation of results, and alignment of results and discussion to research objectives.

2.3.4 Data Analysis

All outcome items were listed in a database, separated by type of intervention (GHW, PP, or both). Commonly described outcome items across the eligible articles (such as attractiveness of packaging for plain packaging studies, and perceived health risk across warnings for graphic health warning studies) were compared and reported relative to the intervention employed. Choice-based preferences and Likert-scale ratings which were identical or considered similar by authors (such as ‘appeal’ and ‘attractiveness’) were compared and reported when describing the perceptions of adolescents to give clarity to the overall findings of each intervention type. Other findings relating to adolescent perceptions, such as the opinions of participants towards cigarette packaging warnings, were recorded separately and used to support the primary outcomes. The results of studies which did not receive a high quality score during the quality assessment were taken into consideration and are identified within the results.

2.4 RESULTS

2.4.1 Study Characteristics

Figure 2.1 illustrates the resulting number of eligible articles from the search strategy. The search strategy initially identified 576 potentially eligible articles (after duplicates were removed), which was reduced to 90 after abstract reading. Full texts were then read, resulting in a final number of 19 eligible articles. Common reasons for ineligibility were; participant population being young adults, lack of distinguishing results between adolescents and older participants, queried participants on their perceptions without presenting interventional

materials, displayed text-only warnings on cigarette packaging, or presented television/mass-media warnings.

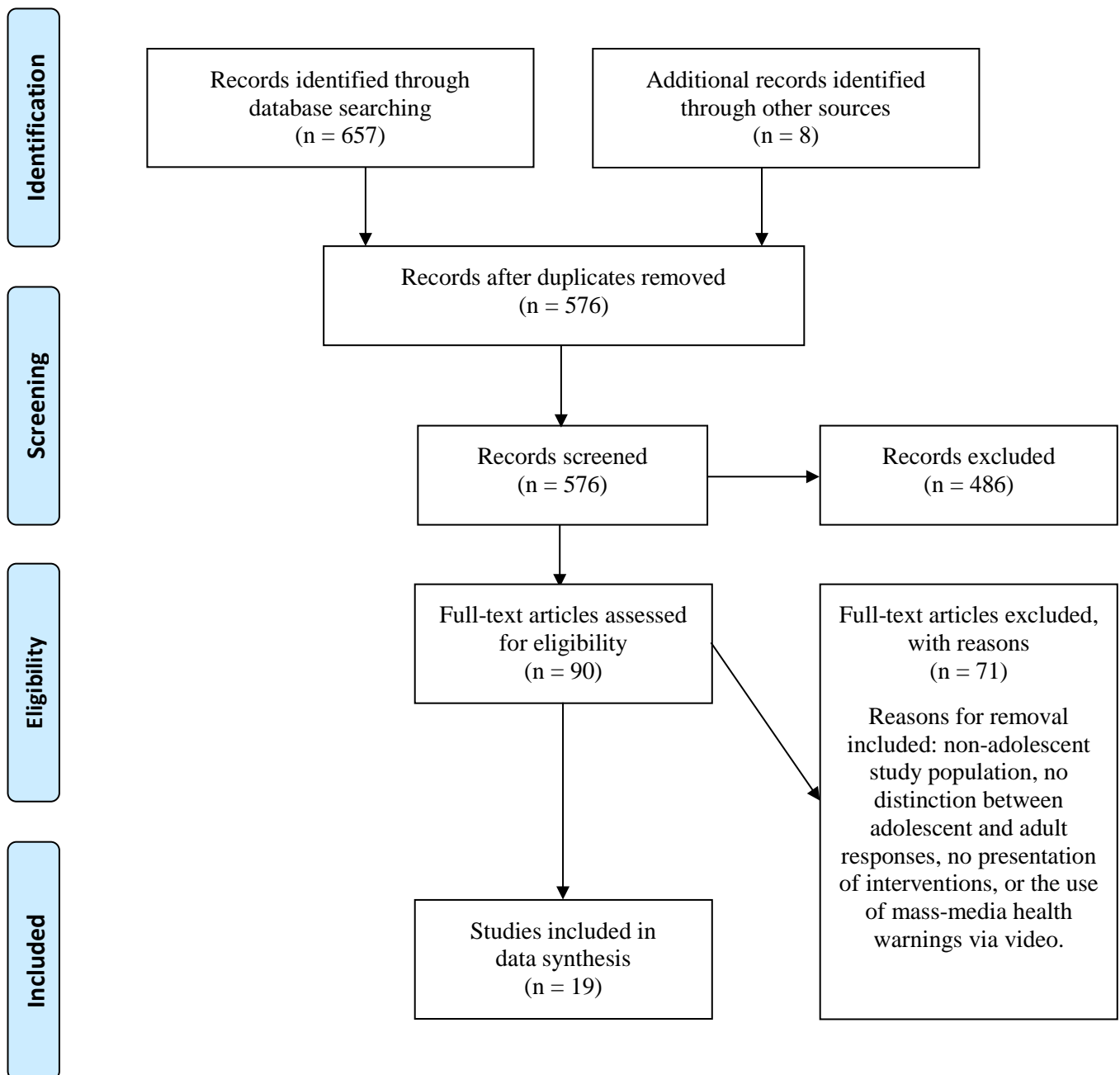


Figure 2.1 Flow chart of systematic literature search.

Table 2.1 details the study and participant characteristics of each article included in this review.

A total of 15 935 participants were included in the 19 studies reviewed, 7 267 (45.46%) of which were male, 8 659 (54.58%) female, and 9 (0.06%) not-stated, all between the ages of 11 and 19 years. Nearly three-quarters (72.85%) of participants were non-smokers or ex-smokers,

and the remainder (27.15%) were occasional or daily smokers. Seven studies were conducted in Europe (n = 6 150), one in Oceania (n = 1 087), three in Asia (n = 4 130), six in North America (n = 2 958), one in Africa (n = 544), and one both in Europe and North America (n = 1 066).

The 19 eligible studies all utilised a cross-sectional design, and used either face to face or electronic means to gather quantitative data from participants on their perceptions of a range of interventional tobacco-related materials. This included their perceptions of a wide range of cigarette packaging materials, including their perceptions of health risks and tar delivery, pack attractiveness, smoker attributes, pack attributes, personal relevance of warnings, and warning credibility. For the purposes of this review, pictorial and graphic health warnings, testimonials, and lived-experiences will be grouped under and abbreviated as GHW, and plain packaging (including plain white and plain brown packs) will be abbreviated as PP. Nine studies evaluated perceptions towards different GHWs,^{27,28,31,35,37,38,40,43,44} seven evaluated perceptions towards branded versus PP cigarette packages,^{26,30,32,33,34,39,42} and three evaluated perceptions towards a combination of GHWs and PP.^{29,36,41}

2.4.2 Quality Appraisal

Sixteen studies were assessed by the JBI ‘Checklist for Analytical Cross Sectional Studies’ and scored out of eight, with four or below indicating low quality, five to six as moderate quality, and seven to eight as high quality.²⁴ Fourteen were found to be of high quality, and two of moderate quality.^{37,40} Three studies were assessed by the JBI ‘Checklist for Randomized Controlled Trials’ and scored out of thirteen, with seven or below indicating low quality, eight to ten as moderate quality, and ten and above as high quality.²⁵ All three RCTs scored were of high quality.^{29,36,41} **Table 2.2** details the quality appraisal outcomes of each study, and the responses of participants to their respective interventional materials.

Table 2.1 Participant and methodological characteristics of articles eligible for inclusion in this systematic review (n = 19).

Year Published & Main Author	Location, Participant Numbers & Age Range	Gender Distribution		Participant Smoking Status			Mode of Study & Interventions Employed	Data Collection & Outcomes Reported
		M%	F%	NS%	EX%	S%		
2009 Hammond ²⁶	UK n = 806 11-17 years	51.6	48.4	72.6	-	27.4	An online survey displaying six pairs of cigarette packs (using two brands), with branded, plain white, and plain brown packaging used, all displaying the same GHW.	Participants chose from each pair (or indicated 'no difference') which pack would have: most tar delivery, smoothest taste, reduced health risks, highest attractiveness, and choice to smoke.
2009 Vardavas ²⁷	Greece n = 574 12-18 years	46.0	54.0	80.6	-	19.4	An in-school digital survey using computer generated images, displaying pairs of seven existing text-only warnings with a comparative proposed GHWs on un-branded packaging.	Participants rated warnings using 5-point Likert scales on perceived effectiveness in preventing smoking, depicting the impact of smoking on health, and perceived warning strength.
2010* Fong ²⁸	China n = 396 13-17 years	50.8	49.2	87.9	8.1	4.0	Digitally constructed warnings were presented in person as photographs to adult and adolescent residents of four Chinese cities. Five pairs of cigarette packaging (four pairs with text-only versus GHW) were displayed.	Participants ranked and rated warnings using 5-point Likert scales on effectiveness in motivating smokers to quit, preventing youth smoking, informing the public on the harms of smoking, and showing government anti-tobacco initiative.
2010 Germain ²⁹	Australia n = 1 087 14-17 years	49.4	50.6	60.4	21.9	39.7	An online survey, with each participant randomly viewing one of 15 packs, varying in brand presented (3 brands), degree of brand prominence, and size of GHW (3 x 5 design).	Participants rated on 5-point Likert scales; five perceived pack attributes, five perceived smoker attributes, and seven perceived cigarette attributes.
2011 Hammond ³⁰	USA n = 826 18-19 years	-	100	60.9	15.0	39.1	An online survey with participants viewing eight packages grouped into four categories: female-oriented brand with descriptors, female-oriented brand without descriptors, plain, and non-female-oriented brand.	Participants rated on 5-point Likert scales: brand appeal, brand taste, tar quantity, and health risks for each package. Participants also indicated on seven perceived attributes per pack (e.g. glamour, coolness, popularity), and their preferred pack.
2012a Hammond ³¹	Mexico n = 528 16-18 years	50.0	50.0	51.1	-	48.9	Face to face survey with participants viewing warnings from 2 of 15 health-effect themes, each of which contained 1 text-only, and 4 to 6 pictorial warnings. Each theme included; graphic health warnings, lived experiences, symbolic representations, and testimonials.	Participants rated 11 measures on 10-point Likert scales, including perceived message: credibility, personal relevance, and affective responses. Four of these 11 items related to perceived effectiveness, including motivating smokers to quit, and preventing non-smokers from smoking.
2012b Hammond ³²	UK n = 947 16-19 years	-	100	68.9	-	31.1	An online survey with participants assigned to one of four categories, each containing 10 cigarette packages: female-oriented brand with descriptors, female-oriented brand without descriptors, plain, and non-female-oriented brand.	Participants rated on 5-point Likert scales: brand appeal, brand taste, tar quantity, and health risks for each package. Participants also indicated on seven perceived attributes per pack (e.g. glamour, coolness, popularity), and their preferred pack.

2012 Moodie 33	UK n = 658 10-17 years	47.3	52.7	90.9	-	9.1	An online survey with participants viewing several colours of plain cigarette packs with a text 'Smoking Kills' warning (white, red, green, light blue), and a brown plain pack of standard, sliding, and super-slim designs.	Participants rated the four coloured packs on 5-point Likert scales their perceived taste and harm. The standard brown plain pack was rated on eight perception items (four pack and four smoker items), and preference compared to other designs.
2013 Ford 34	UK n = 1 025 11-16 years	51.5	48.5	100	-	-	In-home surveys with participants viewing four branded packs (standard, slim, novel opening mechanism, and striking colour), and one plain pack with the same text warning.	Participants rated 11 items on 5-point semantic scales relating to package attractiveness, coolness, perceived harm, eye-catching, interest in smoking, and liking/disliking the pack.
2013a* Hammond 35	USA n = 510 16-18 years	52.4	47.6	69.2	-	30.8	An online survey with participants randomly assigned to view two of nine sets of GHWs proposed by the FDA (6-7 warnings per set), with each GHW per set displaying the same text warning.	Participants rated several warning aspects on 10-point scales, including: increase in concerns of health risks, efficacy motivating smokers to quit and preventing youth from smoking, and overall warning effectiveness.
2013b Hammond 36	UK n = 762 11-17 years	54.9	45.1	93.8	1.0	4.9	An online survey with participants viewing six pairs of packs, comparing a regular pack to white or brown plain packs with moderate-sized text or graphic warnings (40%), or large-sized (80%) graphic warnings (2 x 3 model).	Participants selected from each pair (or indicated 'no difference') which pack would have: most tar delivery, smoother taste, reduced health risks, highest attractiveness, would prompt to start smoking, and choice to smoke.
2013 Pepper 37	USA n = 386 11-17 years	100	-	100	-	-	An online survey with participants randomly viewing one of four pack categories; addiction text-only warning, addiction text and image, lung cancer text-only warning, and lung cancer text and image (2 x 2 model).	Participants rated 5-point scales the perceived effectiveness of their warning in discouraging them from smoking, and the perceived likelihood and severity of suffering from the described condition (addiction or lung cancer).
2015* Alaouie 38	Lebanon n = 1 412 13-18 years	42.9	57.1	90.4% ex-smoker or non-smoker		9.6	Face to face interviews across 28 schools and universities, with students presented with two of five GHW on plain white packs compared to a locally available text-only warning.	Participants rated on 5-point Likert scales their perceived: message usefulness, noticeability, susceptibility, effectiveness, fear-arousal, self-efficacy in changing behaviour, intentions to not-smoke, and influencing family and close-contacts.
2015 Babineau 39	Ireland n = 1 378 16-17 years	55.7	43.7	78.6	4.2	17.2	In-school surveys for students across 27 schools. Pairs of packaging for three brands were presented. Packs were either branded or plain, with identical GHWs (lung damage).	Participants chose one pack (or indicated 'no difference') from each pair based on: pack attractiveness, perceived health risks, perceptions of popular smoker attributes, and pack preference.
2016 Adebiyi 40	Nigeria n = 544 13-17 years	44.7	55.3	98.3	-	1.7	In-school surveys in two schools in a single community, with participants viewing four GHWs: smoking harming children, and causing airway cancer, stroke, and impotence.	Participants indicated if each warning evoked: fear; shock, anxiety, or indifference. They also utilised a 3-point Likert scale on the effectiveness of each GHWs in preventing smoking initiation.
2016 Andrews 41	USA, Spain, France n = 1 066 13-18 years	50.0	50.0	-	-	100	An online survey with participants viewing one of eight packs (four plain and four branded) with varying levels of graphicness of GHWs, depicting the risks of smoking causing mouth cancer (2 x 4 model).	Participants rated using 6- and 7-point scales in response to the pack their: cigarette cravings, evoked fear (4 items), pack feelings (3 items e.g. embarrassed), and thoughts of quitting (4 items).

2016 Mutti 42	Mexico n = 359 16-18 years	48.5	51.5	42.9	-	47.1	A face to face electronic survey with participants viewing a set of 12 gender-specific packs that were either fully-branded or plain with brand name and descriptors.	Participants rated (yes/no/no difference) each pack on appeal, perceived taste, and perceived harm, with perceived smoker-traits also rated (e.g. femininity, glamour, coolness, and popularity).
2016 Netemeyer 43	USA n = 349 13-18 years	53.0	47.0	58.5	-	41.5	An online survey with participants randomly viewing one of nine cigarette packages containing a combined text and GHW.	Participants rated: fear, guilt, and disgust evoked, perceived graphicness of the warning, and personal and perceived peer consideration of smoking after viewing.
2017 Reid 44	India, Bangladesh, China, Korea n = 2 322 16-18 years	50.2	49.8	77.3	-	22.7 [^]	Online survey in Korea and China, and computer-assisted interviews in India and Bangladesh. Participants viewed 2 of 15 sets of cigarette packaging warning. Each set included 5-6 warnings on the same consequence of smoking, and included: one text-only warning, GHW, lived-experience, and testimonial.	Participants were assessed on their perceptions of the potential health effects of smoking for all 15 sets of warning after viewing their randomly assigned two sets. Participants either 'agreed', 'disagreed', or responded 'don't know' to each health consequences listed.

GHW: Graphic Health Warning Alaouie 2015: smoking prevalence higher in males (18.2% vs. 3.4%) – statistics do not include narghile smoking

*Adult smokers participated in this study, though their results have been omitted in this review

[^] There were significant differences in smoking status between different countries (see **Table 2**)

Table 2.2 Quality appraisal outcomes and study outcomes for each of the eligible studies (n = 19).

Year Published & Main Author	Quality Appraisal Outcome	Intervention Type* & Analyses Used	Key Findings for Adolescent Perceptions of Graphic Health Warnings and/or Plain Packaging^
2009 Hammond 26	High (Cross-Sectional)	PP; Chi-Square, Linear Regression	<ul style="list-style-type: none"> Both brands with plain white packs were perceived as less attractive, non-preferred, and having a lower tar content compared to the branded packs. One pack brand was also considered as having a lower health risk, and one brand as having a less-smooth taste. The plain brown packs were less attractive and less smooth for one brand, and less attractive, less smooth, higher risk, and non-preferred for the other brand compared to branded packs. All p-values for these stated differences are < .001.
2009 Vardavas 27	High (Cross-Sectional)	GHW vs. text warnings; Chi-Square, Multivariate logistic regression	<ul style="list-style-type: none"> GHWs were considered more effective than text-only warnings for 71.6% to 96.1% of participants, both in preventing non-smoking participants from smoking, and in describing the effects of smoking on health. Up to 84% of participants rated GHW as 'effective' or 'very effective' (4 or 5 out of 5) in preventing smoking initiation. The GHW depicting lung cancer was rated as the most effective, followed by the GHW depicting foetal damage caused when smoking whilst pregnant. Female participants had significantly higher effectiveness ratings of the GHWs depicting foetal damage, and protecting children from smoke (p < .05).
2010* Fong 28	High (Cross-Sectional)	GHW vs. text warnings; Chi-Square, mixed-model ANOVA	<ul style="list-style-type: none"> The four GHW packets were both rated and ranked as the most effective in motivating smokers to quit and preventing youth smoking, significantly higher than the six text warnings (p < .001), with the GHW depicting lung cancer rating the most effective, followed by the mouth disease, gangrene, and clogged arteries warnings (p < .05 between each warning). The four GHW (with lung cancer as the highest rated) were also the most effective in informing the public on the dangers of smoking, with 81.5% of adolescents stating that packaging within China should contain more health information, and 78.9% stating that packaging should include pictures instead of text-only warnings.
2010 Germain 29	High (RCT)	GHW/PP; Chi-Square, ANOVA, Principal Component Analysis	<ul style="list-style-type: none"> Mean ratings of all positive pack, smoker, and cigarette attributes significantly reduced as branding and colour were progressively removed from packaging (p < .001), with 'lower class' perceptions concurrently becoming stronger (p = .043). Smoking status was found to predict responses to pack ratings (p < .05), with established smokers having the most favourable perceptions of all packs. The addition of a larger GHW also had results dependent on smoker status, with experimenters and active smokers having the largest drop in perceptions of positive pack characteristics compared to susceptible and non-susceptible non-smokers (p < .01).
2011 Hammond 30	High (Cross-Sectional)	PP; Linear Regression	<ul style="list-style-type: none"> Compared to standard packs, of the eight brands used, plain packages were consistently the least appealing, were perceived as the worst tasting for six of the brands, had lower levels of tar for two of the brands, and were considered less harmful for two of the brands (all p < .05). Plain packs also received significantly fewer positive ratings for every smoker trait (glamour, femininity, slimness, coolness, popularity, attractiveness, and sophistication) compared to standard packs (p < .001). Significantly fewer participants preferred plain packs (p < .001).
2012a Hammond 31	High (Cross-Sectional)	GHW; Linear Mixed Effects models	<ul style="list-style-type: none"> Text-only warnings were the lowest rated for all 15 health effects (p < .001), with the graphic warnings being rated as more effective than both the symbolic and lived experience warnings (p < .001), and those depicting external health effects perceived as more effective than those depicting internal health effects (p < .001). Lived experience warnings that depicted effects on others were rated as more effective than those that depicted effects on oneself (p < .001), and susceptible non-smokers had significantly higher ratings than non-susceptible non-smokers (p = .02).

2012b Hammond 32	High (Cross-Sectional)	PP; Linear Regression	<ul style="list-style-type: none"> • Plain packs received the lowest appeal ($p = .013$), and taste ratings ($p = .027$), were less likely selected as a preferred pack ($p = .026$), and were considered to have higher tar compared to the fully branded packs ($p = .024$). • Fully branded packs were also considered to have the lowest health risks compared to all other categories ($p = .006$). • For perceived smoker traits, plain packs received the lowest ratings for all seven attributes: femininity, slimness, glamorous, coolness, popularity, attractiveness, and sophistication (all $p < .05$).
2012 Moodie 33	High (Cross-Sectional)	PP; Chi-Square	<ul style="list-style-type: none"> • Half of participants associated colour and strength of taste, and colour and perceived harm, with the red pack considered the strongest tasting and most harmful, and the light blue pack and white packs as weaker tasting and being the least harmful. • The brown plain pack was seen as largely unattractive, cheap, and uncool, and used by boring, unfashionable, and older people. Smokers displayed less negativity towards the pack compared to non-smokers. • Smokers were more likely ($p < .001$) to prefer a pack, with the slide pack being the most popular of the brown plain packs.
2013 Ford 34	High (Cross-Sectional)	PP; Principal Components Analysis	<ul style="list-style-type: none"> • The mean ratings for all 11 items for all packs (e.g. attractiveness, coolness, harmfulness) were generally negative (none > 3 out of 5), with the plain pack being the most negatively rated, with mean scores ranging from 1.24 to 1.99 ($p < .01$). • The standard pack was also more negatively rated than the three novelty packs. • Unlike the branded packs, the plain pack showed no association between the 11 rated aspects, and smoking susceptibility.
2013a* Hammond 35	High (Cross-Sectional)	GHW; Linear Mixed Effects models	<ul style="list-style-type: none"> • Full-colour warnings were rated more effective than black and white warnings ($p = .004$), as were real-people over comic book-style ($p < .001$), and those featuring quitline information ($p < .001$), particularly for current over non-smokers ($p = .046$). • Those with personal information were higher rated over those that did not ($p < .004$), as were those with graphic content compared to those that did not ($p < .001$), particularly for females over males. Mean scores were higher for 'minority race respondents' compared to 'white respondents' ($p = .002$).
2013b Hammond 36	High (Cross-Sectional)	GHW/PP; Chi-Square, Generalised Estimating Equation model	<ul style="list-style-type: none"> • Compared to branded packs, plain packs were considered less attractive, less likely to encourage smoking uptake, and had higher-impact health warnings. Brown packs, and those with graphic health warnings were also less likely perceived to have a smooth taste, present a lower health risk, or contain a lower amount of tar (all $p < .001$). • Larger GHWs were rated as the least attractive compared to moderate-size GHWs ($p = .001$) and text warnings ($p < .001$), were the least smooth tasting ($p < .001$ and $p < .001$ respectively), the least likely perceived to have a lower health risk ($p < .001$ compared to text warnings), the least likely perceived to have lower levels of tar ($p < .001$ and $p < .001$ respectively), and were perceived as having the highest impact on health ($p < .001$ and $p < .001$ respectively).
2013 Pepper 37	Moderate (Cross-Sectional)	GHW; Linear Regression, ANOVA	<ul style="list-style-type: none"> • The lung cancer warnings (both text-only and text plus image) received higher ratings than the addiction warnings, with 60% of assigned participants rating them 5 out of 5 for discouraging smoking, compared to 34% for addiction warnings ($p < .001$). • There were no significant differences in deterring smoking or perceived risk for text vs. text plus image for either category. • Over half of assigned participants believed they would develop lung cancer if they smoked regularly, and over two-thirds held this belief for developing nicotine addiction, with both categories also generally being considered as very severe.
2015* Alaouie 38	High (Cross-Sectional)	GHW; McNemar Test	<ul style="list-style-type: none"> • Participants perceived all GHWs as significantly more effective for all items compared to the text-only warning ($p < .001$). • Overall, compared to the text-warnings, the lung cancer GHW received significantly higher effectiveness rating, followed by tooth decay, and death (all $p < .01$) except for female smokers due to low participant numbers. • All warnings were significantly more effective than text warnings (all $p < .001$) in preventing non-smokers from smoking.
2015 Babineau 39	High (Cross-Sectional)	PP; Chi-Square, Generalised Estimating Equation	<ul style="list-style-type: none"> • Two of the branded packs were perceived to be more attractive, healthier, and used by 'popular' individuals, and were chosen twice as frequently compared to plain packs (all $p < .001$). • One pack brand (with pink and purple colouring) had a lower margin for choice ($p < .001$) and did not experience differences in attractiveness ($p = .08$), between the two packs, though the branded pack was perceived as healthier ($p < .001$). • Female participants were significantly more likely than males to associate this brand with popularity ($p = .03$).

2016 Adebiyi 40	Moderate (Cross- Sectional)	GHW; Bivariate analysis	<ul style="list-style-type: none"> • Responses to the four GHWs included fear in 37.3%-56.4%, shock in 23.3%-37.3%, anxiety in 2.9%-21.1%, and indifference in 3.3%-20.0% of participants. The GHW suggesting that smoking causes impotence had the highest indifference rating. • The GHW depicting airway cancer had the highest fear and shock ratings, and the lowest ratings for anxiety and indifference, and perceived as the most effective in preventing adolescents from smoking, especially those <15 years ($p < .05$). • The GHW stating cigarette smoke harming children received the highest frequency of anxiety.
2016 Andrews 41	High (RCT)	GHW/PP; Multivariate Analysis	<ul style="list-style-type: none"> • The two most graphic health warnings significantly increased thoughts of quitting, and evoked fear, and reduced feelings towards the pack, and cigarette cravings compared to the control and low-graphic health warning (all $p < .05$). • Plain packaging led to significant reductions in cigarette craving and feelings towards the pack ($p < .05$), and increased evoked fear ($p < .05$), but had no effect in increasing thoughts of quitting. • There were no combined effects overall for PP and GHWs, though there were some combined effects in France and Spain in reducing cravings and pack feelings respectively, though there were smaller cell sizes and reduced statistical power.
2016 Mutti 42	High (RCT)	PP; Chi-Square, Linear Regression models	<ul style="list-style-type: none"> • Plain (with descriptor) packages received significantly lower ratings for appeal and taste (both $p < .001$) compared to branded packs, though there was no significant difference in perceptions of harm. • Female participants were more likely to give higher appeal and taste scores, and rate packs as less harmful compared to males ($p < .001$, $< .001$, $= .02$ respectively). • Smokers were more likely to give higher taste ratings, and consider packs as less harmful compared to non-smokers ($p < .05$). • Non-smokers rated branded packs significantly higher for all positive smoker-image traits (all $p < .05$), whilst smokers only rated two traits higher from branded compared to plain packs (stylish and sophistication, both $p < .05$). • Older adolescent participants also rated positive smoker-image traits higher than younger participants.
2016 Netemeyer 43	High (Cross- Sectional)	GHW; Linear Regression models	<ul style="list-style-type: none"> • Perceived graphicness was associated with an increase in evoked fear and guilt ($p < .01$) for smokers and non-smokers. • Smokers had lower levels of disgust with increased graphicness compared to non-smokers. • Increased graphicness also led to increased hesitance (reduced personal consideration) towards smoking. • Stronger emotions in response to higher levels of perceived graphicness were more significant in smokers compared to non-smokers.
2017 Reid 44	High (Cross- Sectional)	GHW; Chi-Square, ANOVA, Logistic Regression	<ul style="list-style-type: none"> • Perceptions of the health effects of smoking significantly increased for those who viewed the; mouth cancer, heart disease, emphysema, and stroke (China and Korea), throat cancer (Bangladesh and Korea), skin aging (India), impotence (India, China, and Korea), and gangrene (Bangladesh, India, and Korea) warnings (all $p < .05$). • Three-quarters of participants in China, Bangladesh, and Korea, and half in India also believed that cigarette packages should include more health-related information than the current packaging warnings were displaying in their respective country.

* GHW = Graphic Health Warning (includes any form of pictorial warning, lived experience, and testimonials); PP = Plain Packaging

^ Results in these studies discussing adult participants, or adolescent perceptions of text-only warnings were excluded from this table.

2.4.3 Graphic Health Warnings

Graphic images evaluated

Nine studies in this review reported on adolescent perceptions on the effectiveness of text warnings compared to GHWs,^{27,28,31,37,38,44} and/or between different GHWs on cigarette packaging.^{31,35,37,38,40,43,44} GHWs were perceived as more effective than text warnings across most outcome measures in these studies. This included their ability to communicate the negative health effects of smoking,^{27,28,31,37,44} prevent non-smokers from smoking,^{27,28,31,38} and motivate current smokers to quit.^{28,31} Two studies gathered specific reactions towards warning type, with graphic warnings considered more useful, credible, personable, and noticeable compared to text warnings, and more capable in arousing fear, and influencing a reader's self-efficacy in changing their smoking behaviours and discussing smoking with others.^{31,38} One study found no difference in participants' perceptions of text warnings vs. text plus pictorial warnings, though we considered the pictures used in the study as not being as graphic in comparison to warnings utilised in other studies.³⁷ This study also found that nearly half of participants did not believe that they would develop lung cancer if they became regular smokers, and nearly one third holding this belief relating to smoking and addiction. However, this study received a 'moderate' quality score during quality assessment, with issues such as ambiguity in the questions asked to participants potentially affecting the accuracy of these findings.³⁷

Standout and poorly rated graphic images

When comparing multiple GHWs, most studies identified that GHW depicting respiratory or lung cancer were perceived as the most effective compared to other GHWs.^{27,28,37,38,40} Studies that aimed to gauge specific reactions towards diseases portrayed in GHWs, found that lung cancer, and an increased perceived graphicness of warnings resulted in higher ratings for inciting fear, guilt, and shock.^{40,43} Other GHWs of note included those that were increasingly

graphic, those depicting foetal damage caused when smoking whilst pregnant,²⁷ and those depicting oral diseases.^{28,38,43} Impotence was the least effective of four warnings in one study, receiving the highest ‘indifference’ ratings by participants.⁴⁰ Skin aging was also poorly rated in one study, with participants in only one of four countries having an increased awareness of this consequence of smoking.⁴⁴ Studies comparing methods for delivering GHWs also found that colour warnings were perceived as more effective than black and white warnings, those depicting real people as having a greater impact than those that were symbolic or cartoon-styled, and those that included Quit-line information over those that did not.^{31,35} Graphic images were perceived as more effective than symbolic or shared lived experiences, and those that depicted external rather than internal health effects.⁴¹

Influencing participant characteristics

Some studies found significant differences in participant perceptions related to demographic characteristics; namely age, gender, and smoking status. One study found that female participants had significantly higher ratings for the warnings depicting foetal damage when smoking, and protecting children from cigarette smoke.²⁷ One study found that younger participants (those under 15 years) experienced higher levels of fear and shock, and would be less likely to smoke when shown a warning depicting airway cancer (though the results of this study should be interpreted with caution due to receiving a moderate quality score.⁴⁰ Smokers in particular reported higher levels of guilt with increased graphicness compared to non-smokers, though had lower levels of disgust towards graphic warnings.⁴³ In the two studies that asked participants relating to their overall perceptions of health warnings on tobacco products, a majority (>75%) in both studies indicated that cigarette packaging should include more health related information, including the use of graphic images.^{28,44}

2.4.4 Plain Packaging

Overall perceptions of plain packaging

Seven studies investigated adolescent participants' perceptions of plain packaged cigarettes, with most of the studies comparing white and/or brown plain packaged cigarettes to fully branded, or partially branded packs (with or without accompanying health warnings).^{26,30,32,33,34,39,42} One study evaluated multiple colours of plain-packaged cigarettes,³³ and one study evaluated plain-packaged cigarettes versus novelty branded cigarette packs.³⁴ In comparison to fully branded or partially branded packs, most of these studies identified that the brown-coloured, plain packaged cigarettes were perceived by participants as having the lowest attractiveness/appeal, inferior taste, increased tar content, and an increased risk of causing ill health.^{26,30,32,34,39,42} White packs were also perceived as less attractive and not-preferred compared to branded packs in one study.²⁶

Impact of branding elements

Whilst some participants recognised that cigarette packaging does not influence health risk and tar delivery,²⁶ a concerning theme which arose in some studies was the misperception that PP cigarettes had a lower tar content, reduced health risk, or were better tasting compared to branded cigarettes.^{26,30,33} Colouration used when plain packaging cigarettes was found to be a critical aspect in one study, with half of participants associating the colour of the pack with cigarette harm and taste.³³ Whilst the brown plain pack was perceived as it was in other studies (unattractive, cheap, and uncool), the red pack was perceived as the strongest tasting and most harmful, whilst the white and light blue packs were perceived as being weaker tasting and the least harmful.^{26,33} However one study found that for two of the brands presented, brown plain packs were perceived as having a reduced tar content and would cause less harm.²⁶ Smokers in one study also showed less negativity towards a brown plain pack compared to non-smokers.³³ Text descriptors on packaging (such as 'smooth' and 'gold') were also found to sometimes

significantly influence participant perceptions when used on plain packs, perceiving them as containing less tar, having a lower health risk, and more attractive.²⁶

Perceived pack and smoker attributes

Apart from comparisons of adolescent perceptions of cigarette quality and safety, several studies investigated perceptions of positive pack attributes, such as coolness, glamour, popularity, and femininity (for female participants). Akin to the perceptions of quality and safety, plain packaged cigarettes were similarly the lowest rated for these measures compared to partially or fully branded packs.^{30,32} Perceived smoker attributes were also assessed in several of these studies, where participants rated their perceptions of a smoker of branded compared to plain packaged cigarettes, with characteristics such as being cool, popular, attractive, and sophisticated being significantly lower than branded packaging.^{30,32,33,39,42} Five studies also explored participants' views on their preferred pack, and plain packs were consistently the least likely to be chosen compared to both standard and novelty branded packs.^{26,30,32,34,39}

Influencing participant characteristics

Female participants were more likely to associate a pink and purple branded pack with a positive smoker attribute (popularity) in one study,³⁹ and gave higher appeal and taste scores, and lower harm scores compared to males in another study.⁴² This study also found that smokers gave higher taste ratings and considered smoking to be less harmful, whilst non-smokers gave significantly higher positive ratings for all smoker-image traits.⁴² Older adolescents in this study also rated positive smoker-image traits.⁴²

2.4.5 Combination of Graphic Health Warnings and Plain Packaging

Three studies investigated adolescent perceptions of packaging with varied combinations of PP and GHW interventions.^{29,36,41} Similar to the studies above evaluating the perceptions of either intervention used alone, GHWs increased perceptions of ill-health, thoughts of quitting, elicited fear, and reduced positive perceptions (such as attractiveness towards the pack), whilst PP also reduced packaging attractiveness, reduced intent to take up smoking, and affected perceptions of taste and tar content.^{29,36,41} They also found that combining both types of intervention (the gradual removal of branding elements, and increased size or graphicness of GHW), led to further reduced positive pack perceptions,^{29,36} and reduced cigarette cravings and pack attractiveness.⁴¹

Influencing participant characteristics

Several perceptions were influenced by smoking status in two of the studies, whilst age and gender appeared to have no impact in any study. Smokers indicated higher positive perceptions towards all packs, and a larger decrease in positive perceptions in response to large GHWs in one study,²⁹ with another study's smokers rating packs as more attractive and having a smoother taste than non-smokers.³⁶ One study reported that the American participants showed no significant differences in response to the combination of PP and GHW, whilst their French and Spanish counterparts indicated a reduction in cigarette cravings and pack attractiveness.⁴¹

2.5 DISCUSSION

The objective of this systematic review was to identify and evaluate recent research investigating the perceptions of adolescents towards graphic health warnings and plain packaging of tobacco products. Participants in the 19 eligible articles generally perceived GHW as being effective in modifying their smoking behaviours and portraying the negative health effects of smoking compared to text warnings. PP was also perceived effective in contributing to an increased awareness of the health risks of smoking, and reducing the attractiveness,

popularity, and coolness of packaging and smoking. These findings support the position of the World Health Organization to ensure '*consumers of tobacco products have a fundamental right to accurate information about the risks of smoking and other forms of tobacco use*'.⁴⁵ Adolescent risk perceptions differ from those of adults, and may be more likely to engage in risky behaviours with the potential to have an adverse effect on personal health, stemming from a combination of targeted marketing and peer-effects experienced during adolescence.⁷ This emphasises the need for the development of tobacco packaging interventions to consider population differences, to ensure reductions in tobacco use amongst both adolescents and adults.^{7,46}

The 'Health Belief Model' is a theoretical framework which predicts health-related behaviours (such as tobacco use) as being influenced by multiple internal and external factors, such as the perceived susceptibility and severity of tobacco-attributable diseases, benefits and barriers in modifying behaviours, and cues and self-efficacy in changing these behaviours.⁴⁷ Therefore, by minimising the attractive branding aspects of tobacco products, whilst simultaneously drawing attention to the health risks associated with tobacco use, GHWs and PP may act as prompts to quit amongst smokers, minimise the prevalence of experimental and daily tobacco use amongst adolescents, and the resulting continued use of tobacco into adulthood.^{7,8}

In this review, pictorial health warnings were consistently perceived as more effective than text-only warnings in communicating the health risks associated with tobacco use, and modifying non-smoker and smoker behaviours.^{27,28,31,37,38,44} This is supported by a recent meta-analysis that included both adults and adolescents, which reported that pictorial warnings attracted more attention, caused strong reactions, incited more negative attitudes towards packaging and smoking, and were more effective in reducing tobacco use.¹⁹ The increased size and 'graphicness' (also referred to as strengthening) of health warnings has also been found to be an important aspect of individual warnings, resulting in improved knowledge of the risks of

tobacco use and intentions to quit smoking.²⁰ In this review, GHWs depicting lung cancer were perceived by participants as being the most effective, followed by those depicting oral diseases.^{27,28,37,40} In comparison to text-only messages, GHWs which clearly depict negative (particularly external) health consequences of tobacco use have been theorised to have a greater public reach as they require minimal levels of health literacy for basic understanding. This is made more important by the trend of increased smoking prevalence amongst those with a lower level of education.⁴⁸⁻⁵⁰ However, depicting short term external health effects as opposed to longer-term chronic diseases may be more effective on adolescents, due to the ‘remoteness’ of conditions such as lung and mouth cancers.^{31,51} Further research is needed into the development of ‘ideal’ GHWs which can modify adolescent as well as adult perceptions and behaviours, especially considering some health effects in this review, such as skin aging and impotence (believed to be very important to adolescents), were perceived as less effective than other GHWs.^{27,40}

Similar to the findings in this review of the perceptions of adolescents towards plain packaging, a large systematic review (and a post-publication update) of both adolescents and adults identified significant reductions in packaging attractiveness as branding elements were removed.^{21,22} Perceptions of cigarette taste, safety, and quality, and pack and smoker attributes were also consistent with the findings of this review.^{21,22} Though plain packaging was perceived as effective in influencing adolescent opinions of packaging and smoking when used alone, there were misperceptions identified amongst participants. Brightly coloured plain packaging can lead to perceptions of reduced tar content, reduced negative health consequences, and increased attractiveness of cigarette packaging.^{26,33,36} Whilst the use of dark green/brown plain packaging initially implemented in Australia (and recently several other countries) may avoid this issue,¹⁸ some participants in one study perceived this colour as being less dangerous than branded packaging.³⁰ This emphasises the need for plain packaged

products to not only be dissuasively coloured, but also be accompanied by informative GHWs to ensure a reduction in pack attractiveness and increased perceived harm.^{30,39} The effects of PP regulations stems not only from its negation of attractive branding colours, but also via the removal of variant descriptors, meant to distinguish sub-types of cigarette products and attract and retain brand loyalty.⁹⁻¹¹ The banning of certain misleading descriptors such as ‘light’ and ‘mild’ has been an effective first step, though manufacturers have replaced these terms with others such as ‘smooth’ or ‘gold advance’, also capable of deceiving the public on the tar content, taste, and health risks of cigarettes.⁹⁻¹¹

Adolescent perceptions can be significantly influenced by demographic characteristics, such as smoking status, with several studies in this review reporting that current smokers (and to a smaller extent ex-smokers) were generally less affected by GHWs (and plain packs) compared to non-smokers.^{29,33,42,43} ‘Optimistic bias’ as described within these studies is a critical issue particularly amongst younger smokers, who believe themselves to be less vulnerable to the health consequences of smoking.^{29,33,42,43} As earlier indicated, future research should therefore focus on the development of targeted GHWs that can prompt cognitive reactions across a wide range of demographic profiles to facilitate the highest reduction in tobacco use. This was demonstrated in some of the included studies, such as female participants having higher perceived effectiveness ratings of foetal damage from smoking,²⁷ and higher attractiveness ratings of ‘female-oriented’ packaging.³⁹

As adolescence is often a time for experimentation and risk-taking behaviours, during which there can be a quick loss of autonomy (with some researchers positing that this can occur after the first use of tobacco), reducing the attractiveness and glamour of tobacco packaging whilst highlighting the dangers is paramount.^{52,53} With regards to message framing, loss-framed messages dominate mass media and packaging warnings, describing the negative consequences of smoking, whereas gain-framed messages describe the benefits of not smoking, or quitting.⁵⁴

Whilst previous research has identified that graphic loss-framed warnings can have a higher rate of recall, some evidence suggests adult smokers experience greater reductions in tobacco use when shown gain-framed warnings.^{55,56} Research into adolescent reactions to loss versus gain-framed messages would be ideal in ensuring the implementation of the most effective combination of GHWs and PP.

Apart from issues relating to misperceptions of warning irrelevance and optimistic bias amongst adolescents, a recent study investigating the 6-month, 2-year, and 5-year effects of GHWs found that though there was an increase in cognitive processing of warnings post-implementation, the 5-year survey found that there was a subsequent decrease back to pre-implementation levels.⁵⁶ This finding alongside similar findings in adult participants demonstrate that GHW are most effective shortly after implementation but suffer from a loss of effectiveness over time, requiring a constant updating or rotation of warnings.^{56,57} It has also been suggested that PP would inhibit the loss of effectiveness of GHWs.⁵⁷ Two other studies have assessed the real-world impacts of PP alone on adolescents. One study found that only one-fifth of adolescents had noticed PP nearly a year after implementation,⁵⁸ whilst the other found that participants demonstrated an increase in support for PP, never-smokers reported they would be less likely to try smoking, and current smokers reported increased thoughts about quitting.⁵⁹ Whilst some results of these studies into the effects of GHWs and PP are promising, it is difficult to distinguish changes in responses pre- and post-implementation from concurrent trends in tobacco use and anti-tobacco interventions such as taxation policies and mass-media campaigns.

Further research into the perceptions of adolescents in comparison to adults towards graphic health warnings and plain packaging is needed to identify the most effective combination of these interventions, especially when used alongside other interventions, such as mass-media campaigns. School and parental-based intervention programs, which focus on health risks

associated with smoking displayed on cigarette packaging may also be beneficial in reducing adolescent tobacco use.⁶⁰

2.5.1 Strengths and Limitations

The large number and geographical spread of participants included in this review allows for an increased generalisability of these findings across different populations and cultures, and may be of relevance to many countries hoping to implement, or update their anti-tobacco policies. This review also has several limitations, such as being unable to extrapolate the results to young adults, though similar in age, may undergo several perceptual changes secondary to their coming of legal age in purchasing tobacco. Their exposure to environments in which tobacco use is considered more socially appropriate compared to the school environment (e.g. workplaces, bars, and university) may also lead to altered perceptions. The search terms and search engines used, and restriction to English-only articles may have also omitted literature eligible for inclusion, though scanning the reference and citation lists or eligible articles should have minimised this effect.

The use of electronic and internet surveys in many of the studies have their own limitations, such as preventing participants from viewing realistic 3D objects and facilitating tactile sensations, potentially not drawing a representative sample of the population, and having the perceptions given by adolescents potentially affected by nearby persons, such as their parents or teachers. A single exposure to the interventional materials in these studies is also a noteworthy limitation, as the responses given by participants may not be reflective of real-world conditions of multiple exposures after time and the potential for a stagnation of effects. Lastly, self-reporting bias was identified as a limitation in many of the included studies, where adolescents may report what they believe the researchers want to hear, rather than their true perceptions.

2.6 CONCLUSION

Preventing tobacco use amongst adolescents and the resulting continued use into adulthood requires the implementation of carefully designed and targeted anti-tobacco interventions. Dark-coloured packaging without branding elements, and graphic health warnings depicting health consequences of smoking, such as lung cancer and oral diseases, appear to be perceived as more effective than bright coloured packaging, and other chronic tobacco-related issues respectively. As adolescents do not appear to perceive the threat of continued tobacco use in the same manner as adults, tailoring anti-tobacco interventions such as graphic health warnings and plain packaging towards this vulnerable population is essential in addressing adolescent tobacco use. Further research aimed at identifying the most concerning and emotion-responsive health conditions that could be depicted on packaging, in addition to plain packaging, would be a reasonable next step in anti-tobacco packaging interventions.

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Appendix 2.1 – PRISMA Checklist for the Systematic Review in Chapter 2

Section/topic	#	Checklist item	Reported on page #
TITLE			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	17
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	17
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	18-19
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	19
METHODS			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	20
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	20
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	20-21
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	21, Appendix 2.2
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	20-21
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	21
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	21

Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	21
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	19-21
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each meta-analysis.	21
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	21-23
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	N/A
RESULTS			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	21-22
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	Table 2.1
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	Table 2.2
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	23-34
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	Table 2.2
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	26
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	N/A
DISCUSSION			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	34-38

Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	39
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	40
FUNDING			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	41

Appendix 2.2 – Search Strategy for the Systematic Review in Chapter 2

General search terms utilised:

adolescent, perception, cigarette, plain packaging, graphic health warning, belief, behaviour, smoking, tobacco, warning, and young

PubMed search: 1st January 2000 to 1st September 2017 date range

((adolescent[MeSH Terms]) AND percep*[Title/Abstract]) AND tobacco[Title/Abstract]

((adolescent[MeSH Terms]) AND percep*[Title/Abstract]) AND cigar*[Title/Abstract]

((adolescent[MeSH Terms]) AND percep*[Title/Abstract]) AND smok*[Title/Abstract]

((youth[MeSH Terms]) AND percep*[Title/Abstract]) AND tobacco[Title/Abstract]

((youth[MeSH Terms]) AND percep*[Title/Abstract]) AND smok*[Title/Abstract]

((youth[MeSH Terms]) AND percep*[Title/Abstract]) AND cigar*[Title/Abstract]

((adolescent behavior[MeSH Terms]) AND smok*[Title/Abstract]) AND warning*[Title/Abstract]

((adolescent behavior[MeSH Terms]) AND tob*[Title/Abstract]) AND warning*[Title/Abstract]

((adolescent behavior[MeSH Terms]) AND cigar*[Title/Abstract]) AND warning*[Title/Abstract]

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((((adolescent behavior[MeSH Terms]) AND cigar*[Title/Abstract]) AND warning*[Title/Abstract] AND plain[Title/Abstract] ("2010/01/01"[PDat] : "2017/09/01"[PDat])))

((adolescent[MeSH Terms]) AND plain[Title/Abstract]) AND perception[Title/Abstract]

((adolescent[MeSH Terms]) AND plain packaging[Title/Abstract]) AND perception[Title/Abstract]

((adolescent[MeSH Terms]) AND graphic [Title/Abstract]) AND perception[Title/Abstract]

((adolescent[MeSH Terms]) AND belief[Title/Abstract]) AND smok*) AND warning

((adolescent[MeSH Terms]) AND belief[Title/Abstract]) AND plain[Title/Abstract]

Chapter THREE: A Systematic Review of Smoker and Non-Smoker Perceptions of Visually Unappealing Cigarette Sticks

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This chapter details the methodology and findings of a systematic review of recent literature evaluating modifications of individual cigarette sticks. This was essential in informing the development of the cigarette-stick warnings being evaluated in this research. This chapter discusses the impact of alterations made to the size and colourations of cigarette sticks, and the addition of a limited range of health warnings included on individual cigarette sticks.

3.1 ABSTRACT

Introduction: Cigarette stick appearance can significantly contribute to perceptions of cigarette taste, harm, and appeal, and may be modified to reduce positive perceptions of cigarettes and other tobacco products. A systematic review was conducted to investigate how smokers and non-smokers identify cigarettes as being attractive or unattractive, and the resulting perceptions of cigarette appeal, perceived harm, and impact on quitting intentions.

Methods: Eligible articles were identified using database searches conducted with a date range of January 1990 to May 2017 in PubMed, CINAHL, PsycINFO, Google Scholar and Web of Science. Articles were included if they evaluated the perceptions of participants of any smoking status towards visual cigarette stick attributes. We identified studies describing visual attributes of cigarette sticks and the resulting perceptions of participants. Changes or differences in quitting intentions, cigarette appeal, perceptions of taste, and cigarette harm, and the likelihood of smoking uptake were recorded. Data were grouped into two main categories; those of physical cigarette design, and those including health messages on cigarette sticks.

Results: Of the 950 identified non-duplicated records, nine matched the eligibility criteria. These studies were all conducted in developed countries, and largely enrolled adolescent and young adult smokers and non-smokers. Slim, lighter coloured, and branded cigarettes were favoured over longer, broader, or darker coloured cigarettes, and those without any branding or embellishments. Health warnings including 'Minutes of life lost', 'Smoking kills', and carcinogenic constituents reduced cigarette attractiveness and increased quitting intentions.

Conclusion: Cigarette appeal and resulting smoking behaviours can be influenced by several visual attributes of individual cigarettes. Unappealing visual attributes of cigarette sticks, including modifications to the size and colour of cigarettes, and the inclusion of health warnings on cigarette sticks may serve as an effective tobacco control method, potentially leading to a reduction in tobacco use.

3.2 INTRODUCTION

Public education on the dangers of tobacco use is an integral component of the World Health Organisation's (WHO) Framework Convention on Tobacco Control (FCTC) guidelines,¹ with over 100 countries having implemented the mandatory inclusion of written health warnings and graphic images on the packaging of all tobacco products.² These interventions have affected perceptions towards the harm caused by tobacco, and increased quit attempts for smokers, leading to health benefits for the smoker and their community.³⁻⁵

The more recent implementation of plain/standardised packaging of tobacco products occurred in late 2012 in Australia, in 2016 in France and the UK, and in early-mid 2017 in Hungary and Norway, with New Zealand and Ireland also planning to implement these change in 2018. The removal of branding colours and imagery increases the prominence of written and illustrative health warnings, and led to a reduction in the prevalence of smoking amongst Australians, and is hoped to do the same for the countries that follow suit for plain packaging.⁶ Plain packaging is also theorised to reduce false perceptions of cigarette harm, and minimises the effects of brand appeal, which is particularly important to protect youth and young adults.⁶⁻¹¹ These changes also improve smokers' recognition of the harms of smoking, which can be negated by the presence of appealing colours and other persuasive aspects of tobacco packaging and branding.^{12,13} Plain packaging legislation has also affected individual cigarette appearance, which are to be either all-white, or white with a cork tip.¹⁴⁻¹⁶

Tobacco manufacturers expend significant resources into identifying the most appealing combination of cigarette stick and packaging features to distinguish their products from competitors and ensuring brand loyalty, which is often attained early during the life of a smoker.¹⁷⁻¹⁹ Notable physical aspects of cigarettes include length, diameter, filter, colouration, patterns, and textual messages. Modifying these attributes could oppose the persuasive

methods employed by tobacco manufacturers, who have designed cigarettes to appeal to segmented populations relative to their psychological and psychosocial needs, such as young women, who prefer slim designs and white colouration.¹⁷⁻¹⁹ Conversely, invoking negative perceptions towards tobacco products, through the use of dissuasive methods, and making it harder for smokers and non-smokers to avoid or ignore the intended health messages may therefore incite quit attempts amongst smokers, and a reduction in non-smokers from smoking. The objective of this systematic review is to consolidate current research evaluating the perceptions of smokers, non-smokers, and ex-smokers towards various visual cigarette stick attributes. The findings of this review may direct further research into eliciting methods for deterring smokers and non-smokers from tobacco products.

3.3 METHODS

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement was used as a reporting guide for this systematic review.²⁰

3.3.1 Study Selection

Articles were eligible for inclusion if they were English-language, original-research papers, and gathered the perceptions of participants of any smoking status towards visual cigarette stick attributes. Articles that reported modifications to cigarette packaging alone, or perceptions towards non-visual cigarette attributes were excluded from this review.

3.3.2 Data Sources

Published English language articles were identified through electronic searches from 1990 to May 2017 in PubMed, CINAHL, PsychINFO, Google Scholar, and Web of Science. Search terms included the following combinations: ‘cigarette stick warning’, ‘novel cigarette warning’, ‘tobacco health warning’, ‘cigarette stick perceptions’, ‘cigarette label warning’, ‘cigarette novel packaging’, ‘dissuasive cigarette’, ‘cigarette health labelling/labeling’, and

‘tobacco warning labelling/labeling’. Titles were read to identify potentially relevant articles, and we initially included any article that appeared to include modifications of either tobacco packaging or cigarette sticks. Abstracts were reviewed, and articles discussing only modifications to tobacco packaging were subsequently removed, while articles discussing changes to cigarette sticks were retained for full article review. Eligible articles had their reference lists searched to identify additional articles for inclusion.

3.3.3 Synthesis of Results

Data extracted included: basic study characteristics (sample sizes, gender and age distribution, participant smoking status, and location of participants), types of cigarette stick presented and their relevant visual attributes, and the resulting perceptions of participants. The primary outcomes for this review are the effect of visual cigarette stick attributes on cigarette appeal and expected strength of taste, the resulting perceptions of cigarette harm, changes in quitting intentions, and the likelihood of smoking uptake. Data were grouped into categories of cigarette attribute: those involving physical design changes (including changes in length, colouration, diameter, and embellishments), and those utilising written or illustrative health messages.

3.3.4 Quality Appraisal

Eligible studies were assessed for quality using the Critical Appraisal Skills Programme (CASP) Qualitative Research Checklist, and the Joanna Briggs Institute Critical Appraisal Checklist for Qualitative Research.²¹⁻²² These two checklists assess for study clarity and appropriateness relative to the aims and objectives listed, the methodological processes used, the appropriateness of collection and representation of data, and the clarity of representation of findings and conclusions. Both AD and BMA independently assessed all eligible studies for quality. A score of at least 8 out of 10 in both checklists resulted in articles being considered as high quality, at least 6 out of 10 as medium quality, and 5 or less as low quality.

3.4 RESULTS

3.4.1 Study Characteristics

Figure 3.1 illustrates the article selection process. The search strategy initially identified 3 536 articles, which was reduced to 950 after duplicates were removed. After titles and abstracts were scanned, a further 858 articles were removed, leaving 92 articles which appeared to discuss either cigarette packaging or cigarette stick modifications. After full article review, a further 83 articles were removed, with the most common reason being that these articles only evaluated the effects of cigarette packaging, and not cigarette sticks. This resulted in nine studies which met the inclusion criteria for this review. **Table 3.1** details study and participant characteristics, and quality scores. A secondary search was conducted due to the low number of eligible articles, utilising Boolean operators and cigarette, tobacco, smoking, stick, label, labelling, labelling, and warning. No additional eligible articles were found.

Of the nine included studies, four were identified as having high quality, four as moderate quality, and one as low quality. Checklist items commonly not addressed were the cultural or theoretical background of the researchers, and the potential influences of the researchers on the participants and vice versa. There were no disagreements between the two reviewers on the quality scores for any study. Studies investigating participant perceptions of capsule cigarettes only were excluded from this review. The authors believe that the unique packaging and flavouring aspects of these products would confound the perceptions of participants towards visual-only attributes. **Table 3.2** contains a summary of the cigarette attributes evaluated, and analytical methods utilised within each eligible study. Five studies evaluated perceptions towards physical design aspects of cigarette sticks, including variations in cigarette length, diameter, colouration, and branding. Three studies evaluated perceptions towards health messages included on cigarette sticks, and one study evaluated both physical design attributes and health warnings on cigarette sticks. Four studies used computer-generated or photographed

cigarettes to gather quantitative data through online surveys or interviews, identifying how differences in cigarette appearance affected rankings of appeal, quitting intentions, and intent to purchase. Three studies used locally available or modified cigarettes and one study used photographs of cigarettes to invoke open discussions with participants on their perceptions, and one study utilised a mixed-methods approach using modified cigarettes in one-on-one interviews, to gather participant perceptions of cigarette taste, harm, and appeal.

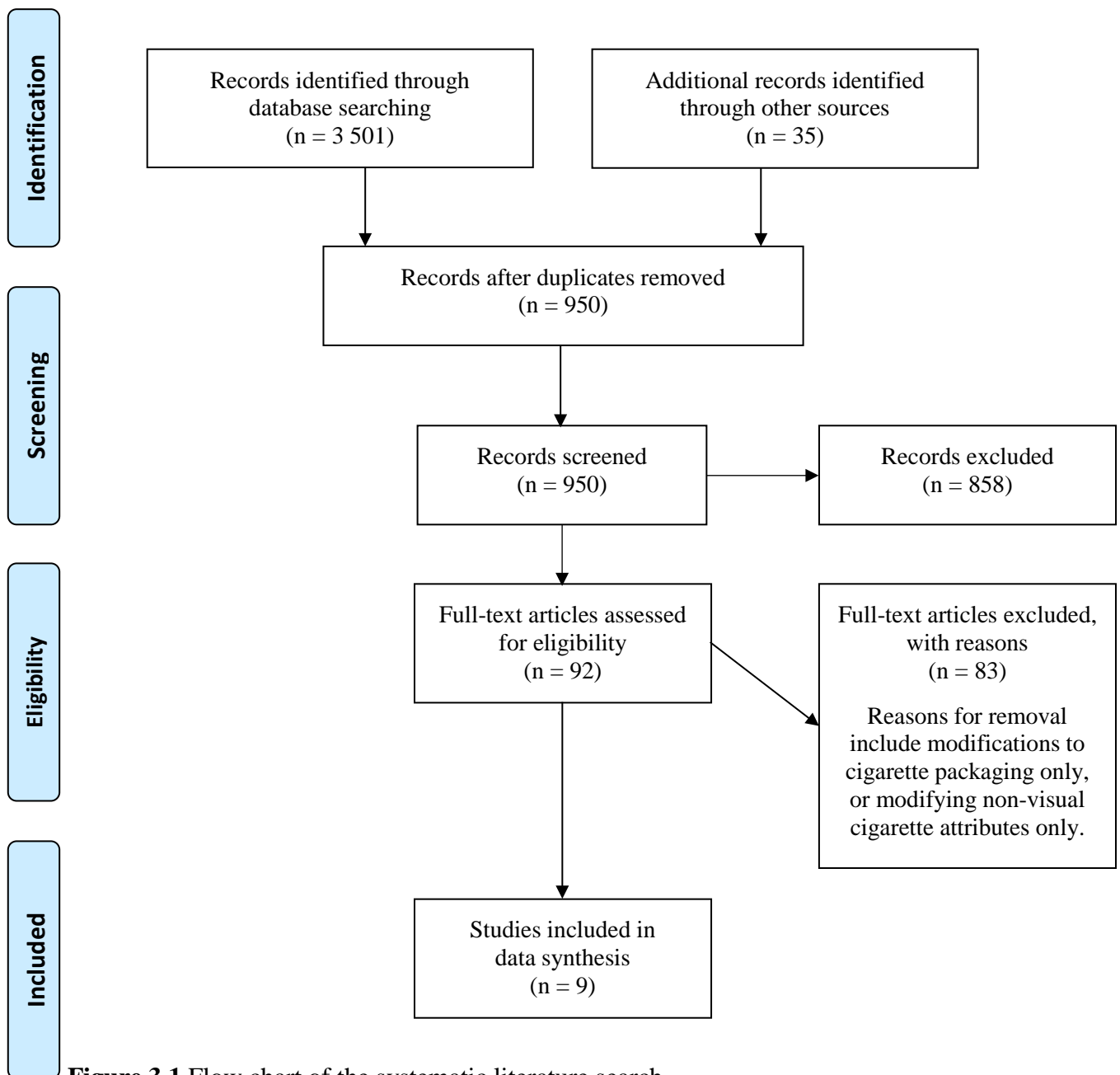


Figure 3.1 Flow chart of the systematic literature search.

Table 3.1 Study characteristics and participant demographics for eligible articles.

Author and Study Year	Year Conducted	Participant Numbers	Study Country	Study Design	Gender % (m : f)	Age Range (years)	Smoking Status of Participants	Quality Score [#]
Borland and Savvas (2013)²³	2011	160	Australia	Online Survey	50 : 50	18 - 29	80.6% active smokers ^{&} 19.4% ex-smokers	JB1 8 CASP 10
Ford <i>et al</i> (2014)²⁴	2011	48	Scotland	Focus Groups	50 : 50	15	19% active smokers* 10% ex-smokers 71% never smoker	JB1 9 CASP 8
Hoek and Robertson (2015)²⁵	2011	9 13	New Zealand	Focus Groups Interviews	0 : 100	18 - 25	100% active smokers (45% daily smokers)	JB1 9 CASP 8
Moodie <i>et al</i> (2015a)²⁶	2013	75	Scotland	Focus Groups	0 : 100	12 - 24	32% occasional smokers 68% non-smokers	JB1 7 CASP 7
O'Connor <i>et al</i> (2015)²⁷	2011	1 220	USA	Interviews	55 : 45	18 - 35	48.3% active smokers ^α 28.9% ex-smokers 22.8% never smoked	JB1 7 CASP 7
Hoek <i>et al</i> (2015)²⁸	2014	313	New Zealand	Online Survey	49.5 : 50.5	18+	79.5% daily smokers 20.5% social smokers	JB1 8 CASP 8
Hassan and Shiu (2015)²⁹	2012	88 120	Scotland Greece	Interviews	39 : 61 60 : 40	86% <30 80% <30	100% smokers 100% smokers	JB1 4 CASP 5
Moodie <i>et al</i> (2015b)³⁰	2012	49	Scotland	Focus Groups	0 : 100	16 - 24	100% smokers*	JB1 7 CASP 7
Moodie <i>et al</i> (2016)³¹	2014	1 205	UK	Interviews	50 : 50 [^]	11 - 16	~21% smoker [^] ~79% never smoker [^]	JB1 7 CASP 7

Both the JBI and CASP quality appraisal checklists have maximum scores of 10

* Definition of smoking in these studies was smoking at least once per week

[^] Gender distribution and smoking status were not specifically stated, though data described allowed an estimation

& Of the active smokers, 10.1% stated that they smoked less than daily

^α Definition of a smoker in this study was smoking within the past 30 days

Table 3.2 Summary of interventions, participant tasks, and analytical methods utilized within each included study.

Study	Cigarettes Presented	Cigarette Modifications	Control Cigarettes	Modified Cigarettes Displayed to Participants	Participant Task(s) and Discussion(s)	Analytical Methods
Borland and Savvas (2013)²³	Computer Generated	Physical Design	White with cork filter	Fourteen cigarettes, including: slim, short, extra-long, embellished, and branded	Ranking of attractiveness, quality, and taste	ANOVA
Ford <i>et al</i> (2014)²⁴	Locally Available	Physical Design	None stated	Eight cigarettes with combinations of varied length, diameter, brands, and colour	Open discussions and ranking of attractiveness, strength, perceived harm	Thematic Analysis (NVivo)
Hoek and Robertson (2015)²⁵	Photographs	Physical Design	None stated	Twenty cigarettes with white, tan, bright, or dark colours on the stick and filter	Discussions on cigarette attractiveness and health risks of cigarette use	Thematic Analysis (NVivo)
Moodie <i>et al</i> (2015a)²⁶	Locally Available	Physical Design	White with cork filter	Eleven cigarettes of varied diameter, length, colour, branding, and embellishments	Ranking of cigarette appeal, taste, and harm	None
O'Connor <i>et al</i> (2015)²⁷	Modified Cigarettes	Physical Design	None stated	Three cigarettes: one shorter without a filter, and two filtered king size, one with a white filter and one with a cork filter	Perceptions of cigarette appeal, taste, and harm	X ² , Logistic Regression
Hoek <i>et al</i> (2015)²⁸	Computer Generated	Physical Design and Health Messages	White with cork filter	Five cigarettes: one clean white, one with 'Smoking Kills', one with 'Minutes of life lost', and two with dissuasive colours	Intent to purchase, and cigarette appeal	ANOVA, t-tests
Hassan and Shiu (2015)²⁹	Photographs (Scotland) Modified (Greece)	Health Messages	White with cork filter (Scotland only)	One cigarette listing five toxic cigarette constituents (Scotland only) and one with 'Minutes of life lost' (Scotland and Greece)	Rating of cigarette attractiveness (Scotland) Quitting intentions (Scotland and Greece)	X ² , ANOVA, t-tests
Moodie <i>et al</i> (2015b)³⁰	Modified Cigarettes	Health Message	None stated	Four cigarettes with 'Smoking Kills' in a variety of positions	Open discussions on perceptions of cigarettes	Thematic Analysis
Moodie <i>et al</i> (2016)³¹	Photograph	Health Message	White with cork filter	One cigarette with 'Smoking Kills' printed in red on its shaft	Perceived efficacy of warning and perceptions of warnings on cigarettes	X ² , Logistic Regression

3.4.2 Study Findings

The findings of the nine eligible studies have been grouped under two main headings. The first section of the results discusses perceptions of participants towards physical cigarette design, and details responses to modifications in cigarette length, diameter, and colour. This includes the presence of coloured bands, logos and embellishments. The second section discusses perceptions of health warnings on cigarettes, and details the responses given by participants towards the inclusion of textual messages either on the filter or shaft of cigarettes. Three health messages were evaluated: 'Smoking Kills', 'Toxic constituents', and 'Minutes of Life Lost'. Differences in participant perceptions relating to smoking status or demographic identities has been clarified throughout the results when included in each eligible article.

3.4.3 Perceptions of Physical Cigarette Design

Borland and Savvas (2013) found that physical appearance, embellishments, and the branding of cigarettes significantly affected their attractiveness, perceived quality, and perceived strength of taste. The standard dimension cigarette received the best attractiveness, quality, and choice preference scores amongst smokers. Gold banded, and branded cigarettes were also found to be more favourable to smokers, compared to white or blue tipping, or un-branded cigarettes. Men viewed the slim cigarettes less favourably than women, with women also more strongly associating cigarette attractiveness with quality.²³

Ford *et al* (2014) found that any cigarette not aligning with the participants' opinion of 'standard' received significant attention. Unlike the responses reported by Borland and Savvas (2013), these younger participants felt the slim and super-slim cigarettes were more 'cool' and 'fancy', less harmful than the larger cigarettes, and scored the highest ratings for attractiveness. The cigarettes considered as 'standard' were seen to be the most 'plain' and 'boring', and more closely linked with the stigma associated with smoking. Decorative branding and brighter colours also received more positive ratings amongst participants, whereas the longer length brown cigarette was seen as 'boring' or 'cheap' and more unpleasant than the lighter coloured

cigarettes. Lastly, there were mixed reactions to the king-size white-tipped cigarette, as the larger size was associated with stronger taste and being more harmful, though the white colouration had the opposite effect.²⁴

The focus groups in Hoek and Robertson (2015) indicated that white cigarettes were more strongly associated with freedom of choice, financial superiority, and a higher social status. Tan coloured cigarettes were instead associated with a lack of discretion and ‘stereotypical’ addicted smokers, who experience more social discrimination. Cigarettes that were more brightly coloured (silver, bright red, and lilac) were found to be attractive and possibly assisted in avoiding social stigma, and supported differentiation from ‘stereotypical’ smokers, who are normally seen as being distasteful or unhealthy.²⁵

The in-depth interviews conducted in this study found that although some smokers stated that they would smoke cigarettes no matter the colour, though the darker colours were generally associated with poor health and sickness, and thought more likely to motivate cessation attempts. The participants indicated that these dark colourations opposed their desire to appear ‘innocent’, ‘clean’, and ‘sophisticated’ whilst smoking, with these attributes more strongly aligned with the white cigarettes.²⁵

Similar results were found by Moodie *et al* (2015a), with the pink-coloured cigarette in particular receiving a largely positive response from both non-smokers and occasional smokers, by being regarded as ‘young’, ‘fun’, ‘pretty’, and incited an interest in smoking amongst participants. This effect was strengthened by the perception that the pink cigarette would have a more pleasant taste, and would cause less harm compared to the other cigarettes presented. Similar responses were also given towards the black aromatised cigarette (which included a gold band), with its unusual colour piquing interest and appeal, and giving it a sense of ‘class’, though occasional smokers had mixed reactions to the black cigarette.²⁶ Unlike the pink cigarette however, its colour was perceived to imply a stronger taste and greater level of

harm caused. The aroma of the black cigarette also strengthened its appeal, with participants likening it to 'liquorice' or a 'candle'. Non-smokers generally found cigarettes to be less appealing than occasional smokers. Responses towards the slimmer cigarettes in this study concurred with those reported in the study by Ford *et al* (2014), where their appeal was generally rated high in comparison to 'standard' cigarette appearance. This was largely due to perceived discretion, and a sense of reduced strength, better taste/flavour, and reduced harm caused. Some participants mentioned that these cigarettes would likely contain less harmful ingredients, and may be a suitable option for those who want to quit, smoke casually, or are just starting to smoke. Decorative designs and logos on these slim cigarettes also enhanced their appeal, making them appear 'cute' or 'cool'.²⁶

The largest study included in this review by O'Connor *et al* (2015) found that the two cigarettes with filters were generally received more positively than the cigarette without a filter, despite being shorter, which led to higher appeal ratings in the earlier research by Ford *et al* (2014). The cork tipped cigarette was considered the most attractive, and perceived to have the best taste, and was the most favourable to try, despite nearly half of the participants expecting the white tipped cigarette to be the least dangerous of the presented cigarettes. Compared to never-smokers, current smokers were more likely to choose the cork and white-tipped cigarettes, whilst men, and ex-smokers were most likely to choose the cork-tipped cigarette. The cigarette without a filter was considered to be the most dangerous, and received the lowest rating for willingness to try, with most smokers perceiving a decrease in potential harm from the included filters.²⁷

Hoek *et al* (2015) utilised a 'Best-Worst Choice' model, where participants indicated which cigarettes they would most and least likely choose based on the images presented. The cigarettes intentionally designed to be unappealing with dissuasive colours were less likely to be selected by respondents than the standard (brown tip) or feminine (white tip) cigarettes, and were significantly less appealing compared to the standard cigarette.²⁸

3.4.4 Perceptions of Health Messages on Cigarettes

Hoek *et al* (2015) also evaluated participants' perceptions of health warnings on cigarettes. The 'Minutes of Life Lost' cigarette was the least selected, and had the lowest appeal rating amongst participants, due to its blunt and morbid message. The responses were assessed by type of smoker (daily or intermittent), gender, ethnicity, and age. Intermittent smokers had lower ratings of cigarettes with warnings on them, whereas daily smokers were more affected by cigarette colour. Women had lower ratings for all dissuasive cigarettes, whilst men had a lower average rating for the standard and the feminine cigarettes. Maori/Pacific participants reported lower ratings for most dissuasive, and feminine cigarettes. Age appeared to increase negative ratings for all dissuasive cigarettes, with highest negative ratings for the >55 year olds, followed by the 35-54 year olds in contrast to the 18-34 year olds.²⁸

The Scottish participants in the study by Hassan and Shiu (2015) showed significant differences in cigarette attractiveness between the intervention and control groups, though there was no significant difference in attractiveness when comparing the two intervention cigarettes. Post-exposure quitting intentions were also significantly different, including between the two intervention cigarettes, with the 'Minutes of life lost' cigarette eliciting a greater increase in quitting intentions compared to the 'Toxic constituents' cigarette. The Greek participants in this study corroborated these results, reporting significant increases in post-exposure quitting intentions, after being given the 'Minutes of life lost' cigarette to hold.²⁹

Moodie *et al* (2015b) found that some participants viewed the 'Smoking Kills' messages as being ineffective, due to the warning already being present on cigarette packaging. However, many participants indicated that the constant display of the health message whilst smoking served as a persistent reminder of the harms of smoking, as well as creating a perceived reduction in social standing. The location of the health warning also influenced participant responses, with some participants stating they could easily obscure the warning if it was placed only on the filter. However, others thought placement on the filter would result in a prolonged

duration of exposure, being visible in ashtrays (or elsewhere) after the cigarette has been discarded, serving as a constant reminder for other viewers. The optimal position identified for placement was down the length of the cigarette paper, which was utilised in the subsequent study by Moodie *et al* (2016).^{30,31}

Most participants in Moodie *et al* (2016) (especially never-smokers) viewed on-cigarette health warnings as being effective in preventing people from starting smoking, and they thought such warnings would prompt smokers to give up smoking. Most participants, including half of current smokers, also supported the inclusion of warnings on all manufactured cigarettes.³¹

3.5 DISCUSSION

This systematic review aimed to identify how modifications to visual appearance affects perceptions towards cigarette sticks, and demonstrated that these modifications can affect cigarette appeal, perceived strength of taste and harm, quitting intentions, and likelihood of taking up smoking. Identified responses to cigarette appearance include feelings of social standing, sophistication, perceived quality, pleasurable effects, and level of harm associated with smoking. Altering the appearance of tobacco packaging through the inclusion of health warnings, graphic images, and plain packaging may have contributed in reducing the health and financial impacts of tobacco use.^{2,4,5,32} However, as some researchers argue that as the cigarette stick is the item which is actually consumed when smoking, this form of public health intervention would be of greater, or additional benefit.^{28,31,33} Modifications to cigarette appearance that trigger a reduction in persuasive and an increase in dissuasive visual attributes can potentially reduce the attractiveness of cigarettes, leading to an increased likelihood of cessation attempts.^{16,18,25,29,31,32}

Dissuasive cigarette sticks are theorised to disrupt the intended persona of smokers, weaken the distinctive attributes that smokers seek, and lessen the appeal of smoking on non-smokers.²⁸ Distinctive attributes such as high social standing are achieved through long-term loyalty to a brand considered to be of high quality.²⁸ Tobacco research and marketing into persuasive

cigarette and cigarette packaging attributes, as evidenced by internal tobacco manufacturer research, has led to significant cultural acceptance and admiration towards smoking, which still has a residual influence including within countries with strict regulations on tobacco advertising.^{6,17-19,34-37} While these perceptions towards smoking have diminished over time, there are still inaccurate perceptions towards cigarette appearance such as the perception of slim, white-tipped, and embellished cigarettes as being of increased quality and reduced harm.^{24,26,28} Several low and middle-income countries have fewer restrictions on tobacco product marketing and advertising, as shown by Smith *et al* 2016, with over 3 200 (99.75% of sampled) cigarette sticks from 14 countries sporting decorate colours and designs, with these attributes theorised to convey luxury, femininity, and reduced cigarette harm.³⁸

Two types of cigarette attributes were investigated in this review; those involving differences in cigarette dimension or colouration, and those involving the addition of health warnings on cigarettes. Although these studies demonstrated the potential public health benefits of implementing visually unappealing cigarettes, it must be noted that global generalisability of the results could be affected by the limited number of nationalities included in this review.^{16,25,28-30} These countries have different levels of tobacco control policies, likely affecting the general perceptions of their respective populations towards tobacco products.³⁹

Familiarity was a strong factor for cigarette attraction, with the modified appearances of cigarettes theorised to disrupt cue consistency and expectations, invoking dissonance amongst smokers, particularly established smokers.^{16,25,28} Responses from young, female smokers in the study by Hoek and Robertson (2015) demonstrated the residual impact of decades of marketing by the tobacco industry, where white, slim cigarettes were associated with glamour, femininity and sophistication.²⁵ Younger participants and non-smokers however did not experience the same reaction, as they found many cigarettes interesting or attractive if they differed from their expectation of a 'standard' cigarette.²⁴ However, some changes received positive responses

from most groups, such as the inclusion of gold banding or light colourations, which were associated with an increase in style and glamour.^{11,14,28}

Dark colourations, however, were associated with sickness and dirtiness, and seen as a dissent to the desired persona of smokers.²⁵ This led to smokers reporting a reduction in the perceived enjoyment experienced from these cigarettes, as well as a perceived reduction in product quality.²⁵ Hoek and Robertson (2015) discussed this work extending on the Cue Consistency Theory, where specific designs are used to appeal to a certain population, often young women, and therefore the intentional design of dissuasive cigarettes can deter these populations from tobacco products.²⁵ These findings were unsurprising, given the extensive internal research performed by tobacco companies.^{18,19}

Smoker characteristics such as age, gender, and ethnicity have been shown to influence cigarette preference in other studies,⁴¹ with the long and ultra-long cigarettes being popular amongst women, African Americans, those of a higher socioeconomic status, and those within the middle aged (45 years) and older age groups.^{19,40} This was theorised to be as a result of social, societal, and marketing forces within the United States, made more alarming by the perception of reduced harm of long and ultra-long cigarettes, and the substantially increased cotinine, urinary total 4-(methylnitrosamino)-1-(3-pyridyl)-1-butanonol (NNAL), and cadmium levels of these smokers.^{40,42,43}

Implementing health warnings on cigarette sticks may encounter logistical barriers, particularly the inclusion of meaningful messages on a small surface area. Moodie *et al* (2015b; 2016) used only a single message ‘Smoking Kills’ which is already a well-established health warning utilised on tobacco packaging.³⁰ This message is short and easily understood, allowing it to be placed in a variety of orientations on individual cigarettes, and in a large font size. However, one smoker responded that “You know smoking kills anyway” and others reported it as being a lecturing message rather than being an informative or novel message.^{28,30}

Moodie (2016) also investigated the opinions of 12 packaging and marketing experts on the novel health messages introduced in Moodie *et al* (2015b), including an on-cigarette health warning. These experts described the message ‘Smoking Kills’ as powerful and effective, and could be easily incorporated onto cigarettes using non-toxic, vegetable-based inks which are already utilised on cigarette papers. They also described the increased exposure of smokers to the on-cigarette warning as opposed to pack-warnings, and the potentially significant psychological impact of the warning to both smokers and observers.⁴⁴

Hassan and Shiu (2015) found that the more novel message ‘Minutes of life lost’, experienced the lowest attractiveness ratings, and yielded the highest change in quitting intentions after being viewed by the participants. This on-stick warning, which covered a significant surface area of the cigarette, may affect both smokers and non-smokers/casual smokers, through inciting quit attempts and preventing cigarette experimentation respectively. The cigarette listing toxic constituents was considered not as off-putting as the ‘Minutes of life lost’ cigarette, and may have had its effectiveness reduced by a lack of understanding of the impact of the chemicals listed.²⁹ Studies conducted in the UK, USA, Australia, Canada, and Mexico showed that smokers are largely unaware of the toxic constituents of cigarettes and the harm they cause; thereby negating the effect of this warning.^{27,45,46} This review found that the inclusion of health warnings on cigarettes were particularly effective in changing the perceptions of participants, and validate the decision to regulate cigarette stick appearance in Australia as part of the Tobacco Plain Packaging Act, and further supports the decision of other FCTC signatories to begin standardising cigarette appearance.

Further research with larger numbers and demographic profiles of participants is needed to better evaluate the generalisable effects of unappealing visual cigarette attributes on the perceptions of smokers and non-smokers toward smoking. This will give a better understanding of their efficacy in influencing smoking cessation and preventing smoking uptake. As adolescents (particularly women) are the primary targets for marketing strategies by tobacco

companies, larger-scale evaluations of dissuasive colourations and cautionary health warnings within this specific population would also be of benefit. Focus groups and one-on-one interviews utilising modified cigarettes will likely retrieve the most comprehensive data, as opposed to online questionnaires utilising photographs or illustrations, as thought processes underlying the perceptions of participants is more valuable than quantitative responses and the ranking of cigarettes. Widely-recognised ‘danger’ symbols (such as the iconic ‘skull and crossbones’) might also be effective in supplementing text messages. Additional aspects of sensory appeal such as taste and smell, and perceived cigarette strength can also contribute to misperceptions of cigarette harm, and could be altered to dissuade smokers and non-smokers from tobacco products.^{24,26} Alternative novel techniques for the communication of the harms of smoking that also require further research include pack inserts (currently utilised only in Canada), audio messages, and Quick Response (QR) codes.^{30,31,47,48}

Limitations of this review include the small number of participants in many of the studies as well as limited sample sizes. Most studies enrolled participants under 30 years old, all studies were set in Westernised countries, three studies enrolled only women, and four studies gathered perceptions from less than 100 participants. These issues make the generalisation of results to a wider population difficult, such as to men, the middle aged and the elderly, and to less developed countries where public policy and perceptions towards smoking may be different from developed countries. Lastly, none of the studies in this review were conducted in post-plain packaging environments, which would potentially strengthening the results, through enhancing dissuasive colours and health warnings after removal of attractive visual branding on the outer packaging. Further research is needed to identify the most effective physical modifications and health warnings in reducing smoking prevalence.

3.6 CONCLUSION

There is a need to improve on quit rates, and to prevent people from commencing smoking, especially adolescents, in order to reduce health risks and positively impact on population health. Thus tobacco control interventions might include modifications to the visual attributes of the cigarette itself, the item which is actually consumed when smoking. This systematic review has identified and discussed the perceptions of physical cigarette design and health messages on cigarettes. Dissuasive visual attributes of cigarette sticks, such as larger dimensions and dark colouration, and the inclusion of health warnings on cigarette sticks may serve as an effective tobacco control method, potentially leading to a reduction in tobacco use. The ‘minutes of life lost’ warning was identified as the most effective, and should serve as the basis for future research into cigarette stick warnings, such as those that have high impact, are novel, and influence the perceptions of a wide audience.

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Chapter FOUR: Australian Perceptions of Health Warnings on Cigarette

Packaging and Cigarette Sticks

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This chapter details the methodology and findings of two online surveys investigating the perceptions of Australian adults towards current cigarette packaging warnings, and sets of cigarette-stick warnings divided into four main themes. These surveys were intended as an exploratory investigation into the perceptions of Australians, and a means to refine the health warnings used in subsequent components of the research.

4.1 ABSTRACT

Background: Ensuring continued reductions in tobacco use is essential in protecting public health. This study aims to improve anti-tobacco packaging interventions by evaluating the perceptions of Australian adults towards health warnings on cigarette packaging and on individual cigarette sticks.

Methods: Two online surveys were conducted (one using SurveyMonkey and one using Google Surveys). Participants in both surveys rated on 5-point Likert scales and commented (for the SurveyMonkey Survey only) on the effectiveness of current cigarette packaging warnings, and 12 text warnings on cigarette sticks in preventing non-smokers from smoking, and prompting current smokers to quit. The warnings were divided into four themes: mortality statistics (MS), health condition consequences (HCC), social and financial consequences (SFC), and supportive messages (SM). Themes were presented in a standardised order for the SurveyMonkey survey, and in four different orders for the Google Surveys survey (to investigate if an order effect was present in the first survey).

Results: A total of 637 adult participants (200 in SurveyMonkey and 437 in Google Survey) were recruited. Participants rated three of the presented themes as more effective than current cigarette packaging warnings. Their odds ratios (ORs) and 95% confidence intervals (CIs) are: MS (OR= 1.99; 95%CI: 1.35-2.95); HCC (OR= 1.86; 95%CI: 1.23-2.81) and SFC (OR= 2.61; 95%CI: 1.73-3.94). Current packaging warnings were considered as having lost their shock value, and minimally effective in prompting smokers to quit. Cigarette stick warnings were considered more novel and engaging, with younger participants and non-smokers being more receptive to cigarette stick warnings, especially the financial costs associated with smoking, and the 'minutes of life lost' warning.

Conclusions: Novel health warnings on cigarette sticks, such as depicting the minutes of life lost and financial consequences of smoking, may be effective alongside current packaging warnings in combatting tobacco use and protecting public health.

4.2 INTRODUCTION

Health warnings on tobacco products have become more prominent, informative, and effective in reducing tobacco use, particularly in developed countries that are signatories of the World Health Organization's (WHO) Framework Convention on Tobacco Control (FCTC).^{1,2} Australian health warnings on cigarette packaging were initially small text-only warnings, with the addition of graphic images in 2006 (despite delays instigated by tobacco manufacturers), and standardised (plain) packaging in late 2012.³⁻⁵ These interventions have reduced packaging appeal and misperceptions on cigarette safety, and increased quitting intentions amongst smokers.^{2-4,6-10} Public support for these interventions stem from both smokers and non-smokers, with smokers identifying health warnings as a major source of health information on tobacco use, surpassed only by television advertisements.¹¹ The high viewing frequency of cigarette packaging may contribute to its effectiveness amongst smokers in particular,¹²⁻¹⁴ though there have been concerns about gradual viewer disinterest, with a four-country study finding that after 5 years, cognitive processing of packaging warnings decreased to pre-implementation levels.¹⁵⁻¹⁸

The prevalence of tobacco use among Australians is at 15%,¹⁹ with further interventions being necessary to maintain declines in tobacco use. One such potentially effective method is the inclusion of health warnings on individual cigarette sticks. The few studies investigating the effectiveness of cigarette stick warnings on non-smokers and smokers, including the warnings 'Smoking Kills', 'Minutes of Life lost', and the names of carcinogenic cigarettes constituents, on non-smokers and smokers, found that they reduced cigarette appeal, and increased quit intentions.²⁰⁻²⁴ A recent systematic review found this to be an understudied area, and recommended further exploratory research to identify potentially effective warnings for implementation and evaluation.²⁵ Due to limited space on cigarettes, pictorial health warnings are impractical, making short but informative text warnings the only viable option, with

previous research describing messages that are direct and brief being more easily recalled compared to indirect or long messages.¹⁵ Cigarette stick warnings may also avoid issues experienced by small or obscured text warnings on the sides of cigarette packaging which are rarely viewed, and receive low levels of awareness and recall.^{15,26}

The Health Belief Model (HBM) describes health-related behaviours as being influenced by a person's perceived susceptibility, severity, benefits, self-efficacy, and triggers of health actions.²⁷ The inclusion of health warnings on cigarette sticks is theorised to increase the perceived susceptibility and severity of smoking-related consequences, perceived self-efficacy to avoid these threats, and perceived benefits of quitting. Similar to the effects of aggressive cigarette packaging warnings, modifying perceptions of cigarettes might substantially contribute to reductions in tobacco experimentation for non-smokers (particularly adolescents), serve as a barrier to relapse for ex-smokers, and a facilitator of quit attempts for current smokers.^{2,9,28,29} The aim of this study was to first evaluate Australians' perceived effectiveness of current tobacco packaging warnings, relating to both the medium and the messages used. We then evaluated their perceptions on the effectiveness of text-based health warnings and messages on cigarette sticks, both in preventing non-smokers from smoking, and in prompting current smokers to quit. We also aimed to gauge the level of support from participants towards the inclusion of health warnings on cigarette sticks.

4.3 METHODS

4.3.1 Study Design

This study utilised two online surveys. One survey was launched through SurveyMonkey, and distributed through social media outlets in June 2017. The social media accounts of James Cook University and the principal investigator were used as initial distribution sites, encouraging viewers to share the survey link. The second survey was launched through Google Surveys in June 2018 using the targeted audience function. The surveys were targeted at

Australians of any smoking status aged 18 years and over. Participants were presented with an information and consent sheet outlining the purpose of the survey, their rights as research participants, and details of the informed consent process. After completion, participants could enter their email address to win one of 70 \$20 Woolworths (Australian retail chain) e-gift vouchers. This research was approved by the James Cook University Human Research Ethics Committee (approval number H6949).

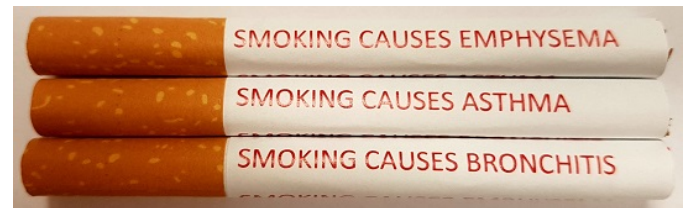
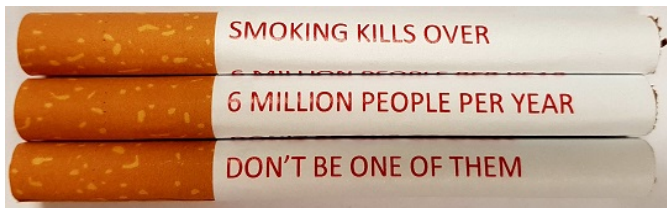
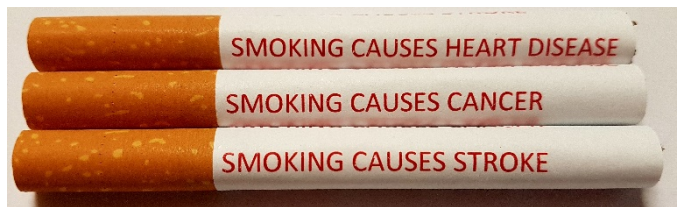
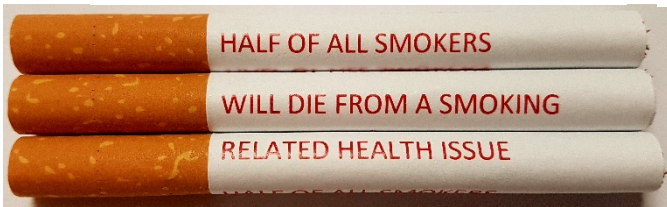
4.3.2 Procedure and Data Items Collected

Both surveys collected information on participant: age, gender, ethnic background, and smoking status. Due to restrictions on the number of questions permitted in Google Surveys, and the results from the 2017 survey, only the first survey collected information on participant state of residence, level of education, and occupation. Baseline participant perceptions on the health risks of tobacco use, and perceived effectiveness of current cigarette packaging warnings in reducing tobacco use were then gathered. Participants first rated on a 5-point Likert scale (from 'Not at all harmful' to 'Very harmful') their perceptions of how harmful smoking is to a person's health. Pictures representative of the fourteen current cigarette packaging warnings in circulation in Australia were then displayed (see **Figure 4.1**); one of a lung with emphysema, and one prompting smokers to quit. Eleven of these current packaging warnings in Australia (including the lung with emphysema) describe a negative health aspect of smoking, two describe the effects of smoking on others, and one prompting current smokers to quit. Participants rated on 5-point Likert scales (from 'Not at all effective' to 'Very effective') their opinions on the effectiveness of the cigarette packaging warnings in preventing non-smokers from smoking, and also in prompting current smokers to quit. Due to Google Survey restrictions, only participants in the 2017 SurveyMonkey survey were given the option to discuss their perceived strengths or shortcomings of current health messages and warnings, using optional open-text comments.



Theme 1 – Mortality Statistics (MS)

Theme 2 – Health Condition Consequences (HCC)



Theme 3 – Social and Financial Consequences (SFC)

Theme 4 – Supportive Messages (SM)

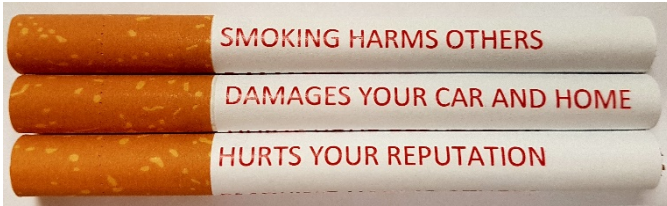
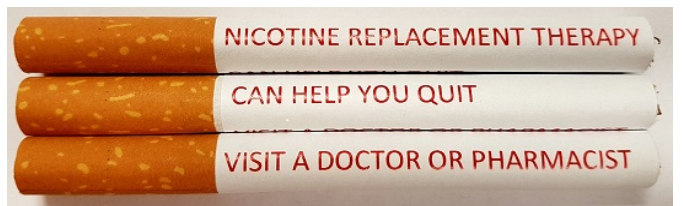
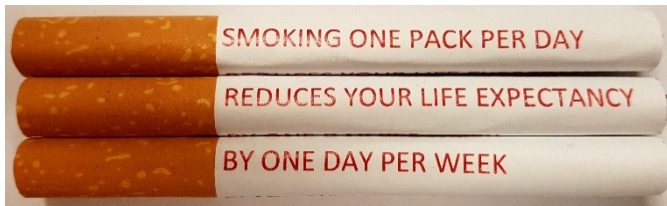
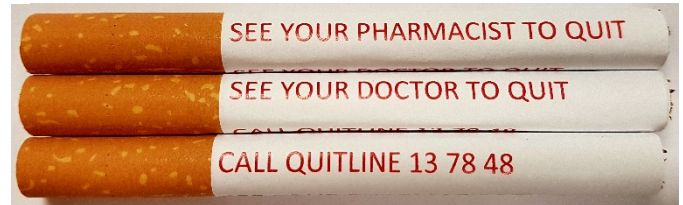
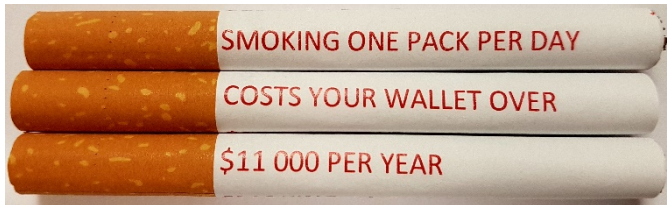


Figure 4.1 The front and back of two cigarette packaging in circulation in Australia, and the twelve cigarette warnings divided in to the four themes. Each cigarette includes three lines of text and is rotated to read the entire message.

They were also given the option to detail any specific anti-tobacco messages or warnings, either on cigarette packaging, or elsewhere that they considered to be memorable or effective. This served as baseline data for comparison with the ratings and comments given by the participants towards the cigarette-stick warnings and messages.

Photographs of twelve cigarette sticks with messages printed in red down their shafts were then displayed, with each cigarette displaying three lines of text (see **Figure 4.1**). In the 2017 survey, cigarettes were grouped and presented in four themes in a standardised order for all participants: mortality statistics (MS), health condition consequences (HCC), social and financial consequences (SFC), and supportive messages (SM) to quit smoking. After analysis of the results, there were concerns of an order effect on participant responses due to the standardised order of theme presentation. This prompted the conduct of the Google Surveys survey, which randomised participants to one of four surveys which differed in their theme presentation, with the following theme orders used; 1234, 2341, 3412, and 4123.

The warnings within theme 2 and 4 were chosen to align with current packaging warnings, theme 1 warnings were an extension of previous research into cigarette-stick warnings and current media campaigns,^{20-24,30} and theme 3 warnings were related to the current Australian tobacco climate, with increased stigma towards smokers, and soaring tobacco prices through heavy taxation.³¹ Participants were informed that these warnings could be printed onto cigarettes using non-toxic vegetable inks. Participants rated on 5-point Likert scales, how effective (from 'Not at all effective' to 'Very effective') they perceived each theme would be first in preventing non-smokers from smoking, and also in prompting current smokers to quit. Each cigarette per theme was labelled 'A', 'B', and 'C' to allow participants to include specific comments in the optional open-text boxes (SurveyMonkey survey only). Lastly, participants rated on a 5-point Likert scale, their opinion (from 'Strongly Disagree' to 'Strongly Agree') on the inclusion of health warnings on individual cigarette sticks.

4.3.3 Analysis

We first ran a descriptive analysis to determine the characteristics of the study population. Non-parametric tests (Kruskal-Wallis and Mann-Whitney U) were used (using SPSS v24) to investigate the relationships between the demographic variables and smoking status in relation to participant perceptions of the anti-tobacco health warnings, with p-values set at 0.05. Friedman Test was used to measure change in participants' perceptions across the 5 categories (current warnings and the 4 interventional themes). Post-hoc tests and Bonferroni adjustments were used to determine statistically significant differences between the categories. Proportional odds logistic regression was performed using R (v3.5.1) statistical package to evaluate between and within-theme effectiveness (in comparison to current packaging warnings) in dissuading non-smokers and smokers from smoking, and the effect of order presentation on participant responses. Responses from open-text comments were analysed independently by two authors (AD and BMA) using thematic analysis to confirm emerging themes. Findings were compared and conflicting interpretations were resolved through dialogue. Illustrative quotes are reported verbatim to support the discussion.

4.4 RESULTS

4.4.1 Demographic Profile

A total of 637 participants completed the survey; 200 in the 2017 SurveyMonkey survey, and 437 in the 2018 Google Surveys survey. Individual survey and overall demographic characteristics of participants and their baseline perceptions of the harms of smoking are shown in **Table 4.1**. Of the smoking participants, 28.6% were occasional smokers, and 39.3% intended to quit within the next 12 months, whilst 60.7% had no plans to quit. Of the ex-smoker participants, over half (58.3%) had quit more than 5 years ago, and 41.7% within the last 5 years.

4.4.2 Ratings of Perceived Warning Effectiveness

The mean rating scores (out of 5) for perceived effectiveness in preventing non-smokers from smoking were: 2.86, 3.22, 3.19, 3.46, and 2.28 for current packaging warnings, and themes 1 to 4 respectively. Theme 4 messages had significantly ($p < .05$) lower ratings compared to current packaging and the other themes. In relation to perceived effectiveness in prompting current smokers to quit, current packaging warnings had significantly ($p < .05$) lower ratings compared to themes 1 to 4 (2.54 vs 2.96, 2.90, 3.46, and 3.14 respectively).

Table 4.1 Demographic characteristics and baseline perceptions of survey participants.

Variable	SurveyMonkey (n = 200)		Google Surveys (n = 437)		Overall (n = 637)	
	N	%	N	%	N	%
Gender						
Male	64	32.0	230	52.6	294	46.2
Female	136	68.0	207	47.4	343	53.8
Age Group (years)						
18-25	70	35.0	129	29.5	199	31.2
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
ATSI	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						
Secondary School	65	32.5	-	-	-	-
Diploma	31	15.5	-	-	-	-
Bachelor's Degree	74	37.0	-	-	-	-
Postgraduate Degree	30	15.0	-	-	-	-
Occupation						
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
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
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

Table 4.2 shows the results of the proportional odds logistic regression analysis, including reference levels and points of significance. There were no significant differences in participant perceptions according to their ethnicity, level of education, or occupation. The second survey also found that there were also no order effects present as a result of the order of theme presentation. Participants perceived the warnings used on cigarette packaging and cigarette sticks as significantly more effective in preventing non-smokers from smoking, than prompting current smokers to quit (odds ratio [OR] and 95% confidence interval [CI] = 4.18; 2.72-6.43, $p < .001$).

Table 4.2 Proportional odds logistic regression model, with odds ratios for themes of cigarette stick warnings.

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							
Theme 1 warnings ¹ (MS) [^]	0.69	0.20	3.38	1.99	1.35	2.95	<.001***
Theme 2 warnings ¹ (HCC) [^]	0.62	0.21	3.03	1.86	1.23	2.81	.024*
Theme 3 warnings ¹ (SFC) [^]	0.96	0.21	4.62	2.61	1.73	3.94	<.001***
Theme 4 warnings ¹ (SM) [^]	-0.98	0.21	-4.57	0.38	0.25	0.57	<.001***
Effect on target smoking status (S = 0, N = 1) ²	1.43	0.22	-6.65	4.18	2.72	6.43	<.001***
Theme Effectiveness on Target Smoking Status							
Theme T1: Effect on smokers vs. non-smokers (N = 0, S = 1) ²	0.23	0.30	0.78	1.26	0.70	2.27	.436 ^{NS}
Theme T2: Effect on smokers vs. non-smokers (N = 0, S = 1) ²	0.11	0.30	0.36	1.12	0.62	2.01	.721 ^{NS}
Theme T3: Effect on smokers vs. non-smokers (N = 0, S = 1) ²	0.53	0.30	1.78	1.70	0.94	3.06	.076 ^{NS}
Theme T4: Effect on smokers vs. non-smokers (N = 0, S = 1) ²	2.11	0.31	6.87	8.25	4.49	15.14	<.001***
Order of Theme Presentation³							
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

¹ Reference level was the effectiveness of current packaging warnings

² N (Non-Smoker), S (Smoker), EXS (Ex-Smoker) *** <.001 ** <.01 * <.05 NS = Not significant

³ Reference level was Order 1 (theme 1234 presentation order)

[^] MS; Mortality Statistics, HCC; Health Condition Consequences, SFC; Social and Financial Consequences, SM; Supportive Messages

Participants generally rated health warnings on cigarette packaging in Australia as ineffective, particularly in prompting current smokers to quit. There was a significant ($\chi^2 = 32.459$, $p < .001$) participant group (smoking status) effect in perceptions of their effectiveness in preventing non-smokers from smoking, with 31.8% of non-smokers considering these warnings as effective, compared to 10.7% of current smokers, and 12.5% of ex-smokers.

Theme 1 cigarette warnings describing mortality statistics (MS) of smoking were rated overall as significantly ($p < .001$) more effective than current cigarette packaging warnings, with an odds ratio (OR) of 1.99 (95% confidence interval [CI]: 1.35-2.95, $p < .001$). The 18-25 year olds, and non-smokers gave higher mean ratings on the effectiveness of these warnings in preventing non-smokers from smoking, compared to the older age groups, and current and ex-smokers ($\chi^2 = 12.322$, $p = .015$ and $\chi^2 = 11.184$, $p = .025$ respectively). Over half of the 18-25 year olds (51.4%) rated these warnings as effective, compared to one-third (33.3%) of those aged 26-45 years, and less than one-third (30.8%) of those aged 46 years and over. These warnings were considered effective by 43.9% of non-smokers, compared to 28.6% of current smokers, and 20.8% of ex-smokers. Theme 2 cigarette warnings describing the well-known health condition consequences (HCC) of cigarette use had an OR of 1.86 (95% CI: 1.23-2.81, $p = .024$) compared to current packaging warnings. There was a significant smoking status effect, with nearly half of non-smokers (48.6%) rating these warnings as effective, compared to one quarter of current smokers (25.0%) and less than one fifth (16.7%) of ex-smokers ($\chi^2 = 21.473$, $p < .001$). Theme 3 cigarette warnings describing the social and financial consequences (SFC) of smoking were rated as the most effective in this study, with an odds ratio of 2.61 (95% CI 1.73-3.94, $p < .001$). Most (84.4%) 18-25 year olds rated these warnings as effective in prompting current smokers to quit, compared to 57.5% of those aged 46 and over ($\chi^2 = 14.036$, $p = .007$). Non-smokers also rated these warnings as more effective in preventing non-smokers from smoking compared to both current smokers and ex-smokers ($\chi^2 = 14.824$, $p =$

.005). Overall, theme 4 cigarette messages supporting smokers to quit were considered less effective than current packaging warnings (OR = 0.38, 95% CI: 0.25-0.57). However, in relation to the target smoking status, they were considered 8.25 times (95% CI: 4.49-15.14) more effective ($p < .001$) than current packaging warnings in prompting current smokers to quit. There were no significant differences identified in relation to participant demographics for theme 4 messages.

4.4.3 Comments on Perceived Warning Effectiveness

Data from the free-text comments in the initial 2017 SurveyMonkey survey identified three major themes; health warning effectiveness, warning novelty, and limitations which negatively impact warning effectiveness. Nearly half of participants believed that the public have become desensitised to current packaging warnings, which have lost their shock value since their initial implementation. *'As a non-smoker, the images disturb me however I think smokers don't see the images as non-smokers do'* (Female, 26-45, Non-Smoker), *'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). Both smokers and non-smokers believed that those who are addicted to tobacco products would continue to smoke regardless of packaging and mass media interventions employed. *'Most smokers know smoking is bad, but the addiction makes it so hard for most, including myself, to kick the habit, and no amount of disgusting imagery can solve this issue'* (Male, 26-45, Smoker). Participants also stated that warnings need to direct smokers on how to quit, rather than just using graphic imagery.

In comparison to current packaging warnings, several warnings utilised on cigarette sticks were considered novel and engaging, and able to cause strong emotional responses, likely resulting in reduced tobacco experimentation, and increased quitting intentions. As demonstrated in their Likert-scale ratings, the theme 1 (MS) and theme 3 (SFC) warnings were considered particularly novel and potentially effective. The 'minutes of life lost' (theme 1) cigarette was

considered useful, with participants stating it reduces the attractiveness of smoking, causing hesitation amongst smokers, and may prompt them to quit or cut-back. *'It might provide some encouragement to someone who already wanted to quit, but lacked concrete motivation'* (Female, 46+, Non-Smoker), *'Seeing how much of their life they are losing could be extremely effective at cutting down smoking'* (Male, 46+, Ex-Smoker). Describing non-health related consequences of tobacco use (theme 3) was also considered to be novel and engaging, with the financial costs of smoking in particular standing out as an important message. *'These messages put the impact smoking has on your life in perspective for me'* (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 or the extent of what their smoking impacts'* (Female, 18-25, Non-Smoker).

There was however some concern that these warnings would also 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 just like the anti-smoking packaging'* (Female, 26-45, Ex-Smoker). This was similarly the case for the theme 2 warnings (HCC), which received lower effectiveness ratings than themes 1 and 3, with nearly one-quarter of participants stating 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).

The theme 4 messages supporting smokers to quit were considered by participants as potentially more effective than negative messages. *'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). However, some believed that like the warnings used in theme 2 (HCC), these messages are

‘already out there’ and may 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).

A common concern identified throughout all of the themes included the reduced likelihood (and relevance for the theme 4 messages) of exposure for non-smokers to these warnings, and therefore a potential reduction of effectiveness. *‘Theoretically 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), *‘They don’t need these messages if they are non-smokers but may be helpful if they are contemplating taking up smoking’* (Female, 46+, Non-Smoker). Participants also criticised the lack of messages which addressed the addictive aspect of tobacco use and how smokers can quit, and that younger people underestimate the addictive potential of tobacco experimentation. Non-smokers also highlighted their concerns about smokers not considering tobacco use as a serious addiction, and viewed ‘scare-tactic’ campaigns as not sufficiently addressing this issue.

4.4.4 Opinions 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 ($\chi^2 = 49.146$, $p < .001$). 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).

4.5 DISCUSSION

In this study, we aimed to evaluate perceptions of Australians on the effectiveness of current cigarette packaging warnings, and twelve cigarette sticks with attached health warnings and messages, in reducing tobacco use. We also aimed to gauge the level of participant support towards the use of health warnings and messages on individual cigarettes. Current cigarette packaging was seen as minimally to moderately effective, and perceived as having lost their shock value since implementation. Three of the four themes of cigarette-stick warnings were considered as or more effective in preventing tobacco use amongst non-smokers, and prompting current smokers to quit in comparison to current packaging warnings. The novelty of warnings on cigarette sticks, as well as specific warnings such as the minutes of life lost and financial costs of smoking, were identified as effective aspects, and may have synergistic or cumulative effects alongside current Australian packaging warnings. There was also a high level of participant support for this public health intervention, particularly amongst non-smokers and ex-smokers.

As described by Chapman and Liberman (2005), and supported by the WHO, *'consumers of tobacco products have a fundamental right to accurate information about the risks of smoking and other forms of tobacco use'*.^{32,33} Health warnings and messages on cigarette sticks support this fundamental right, particularly for those not being exposed to written and pictorial health warnings on cigarette packaging, such as smokers who use alternative packaging or packaging covers, or adolescents and young adults who share individual cigarettes.^{34,35} Despite smokers being a key target group for this form of intervention, as the majority of Australians are non-smokers, attaining the perceptions of the majority and ensuring their continued dissuasion from tobacco products is essential in protecting public health. This is vital due to the strong links

both between adolescent and young-adult smoking, and smoking in adulthood,³⁶ and between parental smoking behaviours and adolescent smoking initiation.³⁷

Within the HBM framework, cigarette stick warnings may increase the perceived susceptibility, and perceived severity of smoking-related consequences, and cues to action (to quit smoking).²⁷ This can be achieved through the use of warnings aimed at increasing smoker and non-smoker awareness of the likelihood of suffering a smoking-related disease, as well as the social and financial consequences of tobacco use. Increasing the perceptions of the medical and non-medical risks of smoking is therefore theorised to incite ‘health promoting behaviours’, including inhibiting smoking initiation amongst non-smokers, promoting quit attempts amongst smokers, and preventing relapse amongst non-smokers. Messages akin to those in theme 3 (social and financial consequences), which received the highest effectiveness ratings on both smokers and non-smokers, have a strong potential for future implementation as health warnings. Though the listing of specific diseases associated with smoking were also positively received, their similarity to current packaging warnings indicated they might experience similar shortfalls and a more rapid loss of shock value.

Self-exemption from the harms of smoking (including addiction) is a common problem, which is amplified by contextual factors such as social norms on tobacco use, pre-existing health beliefs, and a lack of personal or familial experiences with negative consequences of tobacco use.¹¹ Adding cigarette-stick warnings to Australia’s arsenal of anti-tobacco interventions may have cumulative effects alongside current interactions, as similarly demonstrated in recent research investigating the combined effects of text plus pictorial warnings, and pictorial warnings plus standardised packaging.^{38,39} Whilst this initial research evaluating the effectiveness of health warnings cigarette sticks is promising, further research with a more diverse participant sample is needed to determine their potential real-world effectiveness. Identifying specific participant reactions, similar to previous cigarette packaging research, such

as the ability to attract attention, comprehension, credibility, emotional appeal, and personal applicability, would provide more detail as to why certain warnings are perceived as effective.¹¹

The brief exposure to each warning did not replicate real world situations of multiple exposures, reducing the applicability of these results. Also, the use of online surveys and internet-based recruitment did not necessarily draw a representative sample of the population. Whilst a larger number of smoking participants were desired, the proportion of both current and ex-smoking participants were representative of the Australian population at the time of this study. Whilst the perceptions of non-smokers (particularly those aged 18-25) are important, further research should ideally aim to recruit a higher proportion of smokers.

4.6 CONCLUSION

Further reductions in tobacco use require the renewal of anti-tobacco policies and interventions. The use of both established and novel warnings and messages on cigarette sticks may serve as an effective measure in reducing tobacco control, as they would provide additional health and other important information complementing that provided by cigarette packaging. Younger persons and non-smokers were the most receptive to these forms of interventions, and warnings which depict mortality and financial consequences of tobacco use were identified as potentially effective methods of tobacco control, and a key area for further research from this initial exploratory research of Australian perceptions.

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Chapter FIVE: Australian Community Pharmacist Experiences with Smoking Cessation and Perceptions of Health Warnings on Individual Cigarette Sticks

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This chapter details the methodology and findings of an online survey and qualitative interviews aimed at investigating the experiences of pharmacists in interacting with smokers, and their resulting perceptions on effective health warnings and messages on cigarette sticks. This component of the research was aimed at incorporating the perceptions of a ‘front-line’ health profession into the refining of health warnings and messages utilised on cigarette sticks.

5.1 ABSTRACT

Objectives: We aimed to identify the experiences of Australian community pharmacists with smokers, and their associated perceptions of effective health warnings on individual cigarette sticks.

Methods: A mixed-methods online survey was distributed to Australian pharmacists through pharmacy-specific social media pages, and the Pharmaceutical Society of Australia, followed by semi-structured face-to-face interviews with pharmacists in Townsville, Australia, who were purposively sampled. The interviews continued until data saturation was achieved. Participants described their experiences with smokers, perceptions and effectiveness ratings of current cigarette packaging warnings, and 12 text warnings (divided into four themes) on individual cigarette sticks, and their general opinions on effective anti-tobacco health warnings.

Key Findings: Seventy pharmacists participated in the survey, and seventeen pharmacists in the interviews. Both groups of pharmacists cited smoking-related personal or close-contact illness, pressure by family members or physicians, and the financial costs of smoking as being the main drivers for quit attempts. Most interviewed pharmacists interact with smokers several times per week. Cigarette stick warnings describing mortality consequences (especially the ‘minutes of life lost’ warning), and the financial consequences of tobacco use were rated as significantly more effective than current packaging warnings (Odds ratio [OR] = 2.23; 95% confidence interval [CI]: 1.12-4.12], $p = 0.02$, and 1.97; 95%CI: 1.01-3.84, $p = 0.04$ respectively).

Conclusions: Pharmacists have considerable experience assisting smokers with quitting, and based on these experiences believe that novel and tangible health warnings on cigarette sticks may be an effective future measure to combat tobacco use. Further research on the opinions of a more diverse range of health professionals and the general community will generate more robust findings regarding this method of intervention.

5.2 INTRODUCTION

Daily tobacco use in Australia has halved in the last 25 years (at 12.2% as of 2016), affording significant reductions in tobacco-attributable morbidity and mortality.¹ For smokers, quit attempts can be instigated as a result of exposure to anti-tobacco mass-media campaigns, tax increases, and health warnings and messages on tobacco products. Within Australia, strict regulations on the packaging and labelling of tobacco products, which include text and graphic pictorial warnings, and standardised packaging, have been noteworthy contributors to these reduction in tobacco use.^{2,3} Smokers have identified health warnings as a major source of health information on tobacco, and as a driver to seek advice on, and undertake quit attempts.⁴

Pharmacists in Australia are often the first point of contact for those seeking health advice, including for smoking cessation, where they can provide guidance on pharmacological and non-pharmacological therapies.⁵ Accessibility and community ratings have made pharmacists one of the most trusted professions in Australia, with smokers often describing their motivations to quit, and difficulties during past quit attempts.⁶⁻⁸ These interactions strengthen pharmacists' knowledge and the strategies they employ for other patients in similar situations.

A concern regarding the health warnings currently implemented on tobacco products is a gradual reduction in their effectiveness, with research conducted in the UK, Australia, Canada, and the USA identifying a diminishing effect of these warnings, 3-5 years after implementation.^{9,10} As there are still an estimated 15 000 annual deaths in Australia attributable to tobacco use, new strategies to achieve continued reductions in tobacco use are essential.¹¹ Novel health warnings (and novel media for these warnings) which can attract attention and induce behavioural change are theorised to ensure these continued reductions in tobacco use.¹² This is also necessary to oppose and overcome both cigarette packaging and individual cigarette stick advertising techniques, which are used to draw viewer attention and quickly establish brand loyalty amongst smokers.¹³

Accordingly, a new anti-tobacco intervention being investigated is the use of health warnings on individual cigarette sticks (in addition to current cigarette packaging warnings), with the few studies employing this strategy reporting that the majority of participants consider this to be a potentially effective public health intervention.¹⁴⁻¹⁸ However, only a small number of cigarette stick warnings (including 'Minutes of Life Lost', 'Smoking Kills', and the names of toxic cigarette constituents) have been trialled thus far, none of which have been commented on specifically by health professionals. Therefore, identifying the most effective warnings for inclusion on cigarette sticks requires further research, with the opinions of health professionals such as pharmacists being a valuable source of information for common motivators to quit smoking, to be distilled onto these cigarette stick warnings. In this study, we aimed to identify the experiences of Australian community pharmacists with smokers, and their associated perceptions of effective health warnings on individual cigarette sticks. This included an investigation into the experiences of pharmacists in assisting smokers to quit smoking, and the common motivators to quit cited by patients, and their resulting opinions on the inclusion of health warnings on cigarette sticks, including which messages are likely to be effective in reducing tobacco use.

5.3 METHODS

5.3.1 Study Design

A mixed-methods (concurrent triangulation; multiple methods of data collection used together to cross-validate findings)¹⁹ research design involving an online survey and face-to-face semi-structured interviews was utilised in this study, to ensure both sufficient participation numbers and depth of data retrieved. The survey was targeted at Australian pharmacists and distributed through pharmacy-specific social media pages (via posts from the principal investigator inviting pharmacists to participate), and the Pharmaceutical Society of Australia to their approximate 18 000 members (via a small abstract in their national monthly update newsletter) in June 2017, and was available for 4 weeks. Participants read an information and consent sheet

outlining the purpose of the survey, their rights as research participants, and details of the informed consent process. Participants could enter their email address to win one of the twenty \$20 Woolworths (an Australian retail chain) vouchers available.

The audio-recorded 15-minute interviews were conducted by AD (a registered pharmacist, and PhD student) during December 2017 and January 2018. To recruit the initial target of 15 pharmacists, ten community pharmacies located in Townsville, Australia (which usually have between two and four pharmacists on duty at any one time), were randomly selected, contacted and provided with details of the research and the structure of the interview. Random selection involved assigning a number to each pharmacy in the greater Townsville area, and using a random number generator to select the initial ten pharmacies. Individual pharmacists that agreed to participate (via response email) were purposively sampled (excluding intern pharmacists) until data saturation was achieved. Saturation was considered reached when responses to questions 6 through 9 (see **Appendix 5.1**) yielded no unique information compared to previous respondents. Each interview session was conducted with individual pharmacists at a time that was conducive for the participant, at their primary place of practice. Recordings were transcribed into NVivo by the principal investigator. This research was approved by the James Cook University Human Research Ethics Committee (H6949).

5.3.2 Procedure and Data Items Collected

Demographic information obtained in the survey included: age, gender, Australian state of practice, ethnic background, years registered as a pharmacist, and smoking status. Participants were asked about the professional resources they referred to when discussing smoking cessation, and common reasons cited by patients as the driving force behind quit attempts. Pictures of two of the fourteen current cigarette packaging warnings which have been in circulation for over 10 years in Australia were displayed, (see **Figure 5.1**); one of a lung with emphysema, and one encouraging smokers to quit. Eleven of these current packaging warnings

in Australia (including the lung with emphysema) describe a negative health aspect of smoking, two describe the effects of smoking on others, and one encourages current smokers to quit.

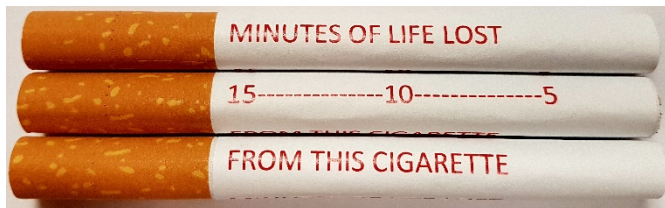
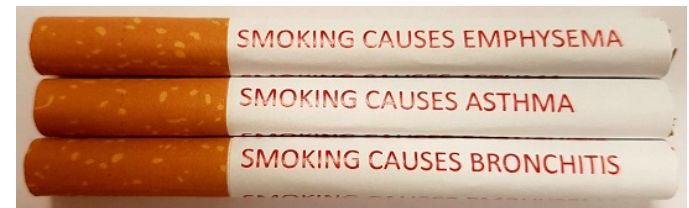
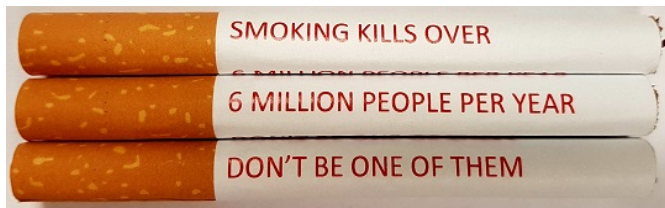
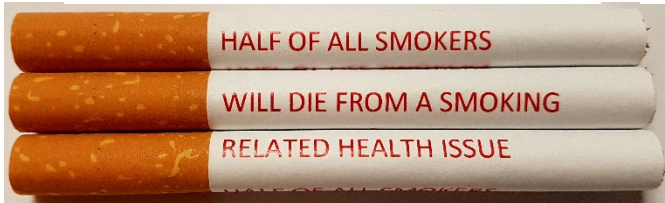
Participants were asked to rate on a 5-point Likert scale (from 'Not at all effective' to 'Very effective') and with optional open-text comments, their opinions of the effectiveness of cigarette packaging warnings in preventing non-smokers from smoking, and prompting current smokers to quit. Participants could also discuss their perceived strengths or shortcomings of current packaging warnings, and detail any anti-tobacco messages or warnings, either on cigarette packaging or elsewhere, that they considered to be effective.

Photos of twelve cigarette warnings and messages, grouped into 4 themes were then displayed: mortality statistics (MS; theme 1), health condition consequences (HCC; theme 2), social and financial consequences (SFC; theme 3), and supportive messages (SM) to quit smoking (theme 4). Each cigarette included three lines of text, printed in red down the shaft of the cigarette (see **Figure 5.1**). The warnings within theme 2 and 4 were chosen to align with current packaging warnings, theme 1 warnings were an extension of previous research into cigarette-stick warnings and current media campaigns,^{14-18,20} and theme 3 as a continuation of the current Australian tobacco climate, with increased stigma towards smokers, and soaring tobacco prices through heavy taxation.²¹ Participants rated on 5-point Likert scales how effective (from 'Not at all effective' to 'Very effective') they thought each theme would be in discouraging non-smokers from smoking, and prompting current smokers to quit. Within each theme, one cigarette warning was labelled 'A', 'B', and 'C' to allow participants to cite specific warnings using optional open-text comment boxes. Lastly, participants rated on a 5-point Likert scale, their opinions (from 'Strongly Disagree' to 'Strongly Agree') on the inclusion of health warnings on individual cigarette sticks.



Theme 1 – Mortality Statistics (MS)

Theme 2 – Health Condition Consequences (HCC)



Theme 3 – Social and Financial Consequences (SFC)

Theme 4 – Supportive Messages (SM)

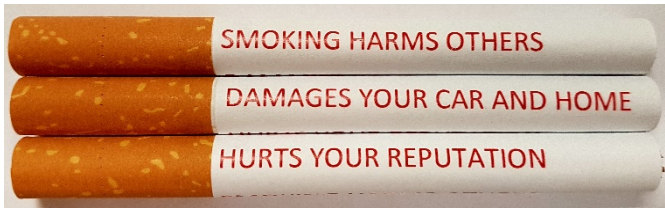
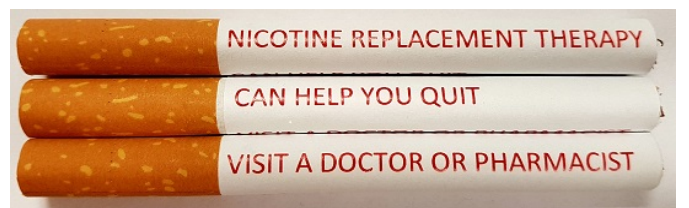
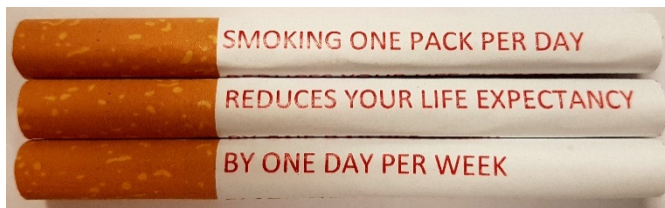
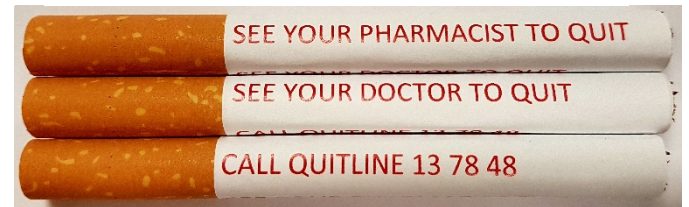
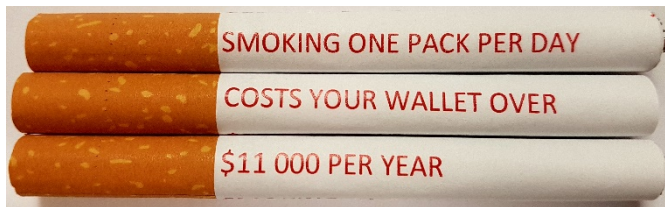


Figure 5.1 The front and back of two cigarette packaging in circulation in Australia, and the twelve cigarette warnings divided in to the four themes. Each cigarette includes three lines of text and is rotated to read the entire message.

The face to face interviews utilised nine semi-structured questions, with the first four regarding their own smoking status, experience with patients asking for quitting advice, and the most common reasons for quitting. Participants were then asked to give their opinions of current packaging warnings, followed by the cigarette stick warning themes used in the online survey. After participants responded to each question without being prompted, themes identified in the online survey were brought forward, and participants were asked to explain their thoughts regarding each theme, and whether or not they agreed or disagreed. Participants were also asked to suggest other warnings they considered as potentially effective, and how warnings could be targeted to discourage adolescents from smoking, as well as adults.

5.3.3 Analysis

Non-parametric tests (Kruskal-Wallis and Mann-Whitney U) were used to investigate the relationships between the demographic variables and smoking status in relation to participant perceptions of the anti-tobacco health warnings, with p-value limits of 0.05. Friedman Test was used to measure change in participants' perceptions across the 5 categories (current warnings and the 4 interventional themes). Post-hoc tests and Bonferroni adjustments were used to determine statistically significant differences between the categories. Data was checked for integrity, and participants with apparent random response patterns removed from the analysis. These quantitative data analyses were performed using SPSS v24. Proportional odds logistic regression was performed using R (v33.2.4) ordinal statistical package to evaluate between and within-theme effectiveness (in comparison to current packaging warnings) in preventing non-smokers from smoking, and prompting smokers to quit. The 5-point Likert scale ratings were merged to three groups to remove empty cells for data analysis; ineffective (not at all effective and minimally effective), somewhat effective, and effective (quite effective and very effective). Responses from open-text survey comments and the interviews were analysed independently by two authors (AD and BMA) using thematic analysis (NVivo) to confirm emerging themes. To establish trustworthiness of the qualitative data, findings were compared and conflicting

interpretations were resolved through dialogue. Illustrative quotes are reported verbatim to support the discussion.

5.4 RESULTS

5.4.1 Participant Demographics

Seventy pharmacists completed the online survey; their demographic characteristics are detailed in **Table 5.1**. Nearly three-quarters of pharmacists (52; 74.3%) were practicing within Queensland, and 14.3% (10) in New South Wales, 7.1% (5) in Western Australia, 1.4% (1) in South Australia, and 2.9% (2) in Victoria. The two occasional smokers both used cigarettes and had no plans to quit smoking, and the four ex-smokers had all quit more than 5 years ago.

Table 5.1 Demographic characteristics of pharmacists participating in the online survey (n = 70).

	n	%
Gender		
Male	16	22.9
Female	54	77.1
Age (Years)		
18-25	19	27.1
26-35	40	57.1
36 and older	11	15.7
Years Practicing as a Pharmacist		
<5 years	28	40.0
5-10 years	26	37.1
11-20 years	16	22.9
Ethnicity		
Caucasian	61	87.1
Asian	5	7.1
Middle Eastern	4	5.7
Smoking Status		
Non-Smoker	64	91.4
Occasional smoker	2	2.9
Ex-smoker	4	5.7
Reasons Reported by Patients for Quitting*		
To improve personal health	58	82.9
To save money	47	67.2
Due to pregnancy of self or close contact	24	34.3
Due to restrictions on where you can smoke	3	4.3

* Pharmacists were asked the list on a multiple answer question the most common reasons their patients cite for wanting to quit smoking

Seventeen pharmacists from five pharmacies participated in the interviews, 7 male and 10 female, with an average age of 32 years old, and an average of 9 years of practice. The interviewer had met most of the pharmacists previously through pharmacy-related events in Townsville, though did not have a professional or personal relationship with the participants.

Eight pharmacists had participated in the survey, and 6 months prior seen the twelve cigarette stick warnings discussed during the interviews.

5.4.2 Ratings of Current Packaging and Cigarette Stick Warnings

Table 5.2 displays the results of the Friedman Test, showing the mean ranks (out of 5) of each intervention theme, and the p-values when comparing the mean ranks between themes. The Kruskal-Wallis and Mann-Whitney U tests found no statistically significant differences in participant response according to age, years of practice, ethnicity, or smoking status (all $p > 0.05$). When asked if all individual tobacco items should contain health warnings, 60.0% (42) strongly agreed, 31.4% (22) agreed, 7.1% (5) were neutral/unsure, 1.4% (1) disagreed, and no one strongly disagreed.

Table 5.2 Mean ranks of interventions compared to current packaging warnings.

Category	Mean Rank	P values
Perceived Effectiveness on Non-Smokers		
Current Packaging Warnings	2.97 ^a	-
Theme 1 (Mortality Statistics)	3.52 ^a	<.001 ^b
Theme 2 (Health Condition Consequences)	2.87 ^a	.022 ^b
Theme 3 (Social and Financial Consequences)	3.48 ^a	<.001 ^b
Theme 4 (Supportive Messages)	2.16 ^b	.015 ^a
Perceived Effectiveness on Smokers		
Current Packaging Warnings	2.31 ^b	-
Theme 1 (Mortality Statistics)	3.53 ^a	<.001 ^b
Theme 2 (Health Condition Consequences)	2.89 ^a	.035 ^b
Theme 3 (Social and Financial Consequences)	3.40 ^a	<.001 ^b
Theme 4 (Supportive Messages)	2.87 ^{ab}	-

Means with different superscripts are significantly different ($p < .05$) when adjusting for Bonferroni correction

Table 5.3 shows the proportional odds logistic regression model, including points of statistical significance. Participants rated warnings on cigarette packaging and cigarette sticks as more effective in preventing non-smokers from smoking, than in prompting current smokers to quit (odds ratio [OR] = 4.44 and 95% confidence interval [CI] 2.23-8.81, $p < .001$). The cigarette warnings describing mortality statistics (theme 1), and social and financial consequences of smoking (theme 3) were considered more effective, both in preventing non-smokers from smoking, and encouraging current smokers to quit compared to current packaging warnings (OR= 2.23; 95%CI: 1.12-4.42, $p = .02$ and 1.97; 95%CI: 1.01-3.84, $p = 0.04$ respectively).

Table 5.3 Proportional odds logistic regression model, with odds ratios for warning themes.

Variable	Estimate	SE	Z Value	Odds Ratio	95% Confidence Intervals		P value
					Lower	Upper	
Demographic Characteristics							
Gender (Male = 0, Female = 1)	-0.8	0.39	-2.04	0.45	0.21	0.97	0.04*
Age 26-35 (18-25 = 0, 26-35 = 1)	0.8	0.38	2.05	2.23	1.06	4.69	0.04*
Age 36 and older (18-25 = 0, 36+ = 1)	0.22	0.51	0.42	1.25	0.46	3.39	0.67 ^{NS}
Overall Theme Effectiveness							
Theme 1 (Mortality Statistics) warnings ¹	0.8	0.35	-2.33	2.23	1.12	4.42	0.02*
Theme 2 (Health Condition Consequences) warnings ¹	-0.22	0.34	0.66	0.80	0.41	1.56	0.51 ^{NS}
Theme 3 (Social and Financial Consequences) warnings ¹	0.68	0.34	-2.02	1.97	1.01	3.84	0.04*
Theme 4 (Supportive Messages) ¹	-1.24	0.36	3.46	0.29	0.14	0.59	<.001***
Effect on target smoking status (S = 0, N = 1) ¹	1.49	0.35	4.22	4.44	2.23	8.81	<.001***
Theme Effectiveness on Target Smoking Status							
Theme T1: Effect on smokers (N = 0, S = 1) ²	-1.04	0.49	-2.12	0.35	0.14	0.92	0.03*
Theme T2: Effect on smokers (N = 0, S = 1) ²	-1.24	0.49	-2.54	0.29	0.11	0.76	0.01*
Theme T3: Effect on smokers (N = 0, S = 1) ²	-1.11	0.48	-2.29	0.33	0.13	0.84	0.02*
Theme T4: Effect on smokers (N = 0, S = 1) ²	2.2	0.51	-4.33	9.02	3.32	24.52	<.001***

¹ Reference level was the effectiveness of current packaging warnings

² S (Smoker), N (Non-Smoker), * <.05 *** <.001 NS = Not significant

Theme 2 warnings describing the specific health consequences of smoking were seen as a duplication of current packaging warnings and rated as similarly effective (OR = 0.80; 95%CI: 0.41-1.56, p = 0.51). Theme 4 supportive messages to quit were overall less effective than current packaging warnings (OR= 0.29; 95%CI: 0.14-0.59, p <.001), though more effective in encouraging current smokers to quit (OR= 9.02; 95%CI: 3.32-24.52, p <.001). Male participants were significantly more likely to rate the theme 1 (68.8% vs. 38.9%) and theme 3 (56.3% vs. 31.5%) warnings as effective in preventing non-smokers from smoking compared to female participants ($\chi^2 = 5.027$, p = .027) and ($\chi^2 = 5.349$, p = .023) respectively.

5.4.3 Perceptions of Effective and Ineffective Health Warnings

Interviewed pharmacists discussed smoking cessation with patients between once per month and ten times per week, with most discussing cessation approximately twice per week, and half of pharmacists noting an increased number of patients seeking advice at the start of the year,

or after tax increases on tobacco products. Motivators behind quit attempts described by patients were most often pressure by their family or physician, having personally suffered or had a close contact suffer from a smoking-related illness, trying to improve general health, or the increasing cost of tobacco products. Data saturation for the major themes was reached at the twelfth participant, requiring no further interviews after the last of the original seventeen. Major themes identified from the survey and phone interviews were: the ineffectiveness of current packaging warnings on smokers (related to warning avoidance and perceived irrelevance), and the need for warnings describing physical appearance-related effects of smoking, smoking's effect on others, and short-term consequences of smoking.

Pharmacists considered current warnings as being somewhat effective in preventing non-smokers from experimenting with tobacco, though relatively ineffective in prompting smokers to quit. Most pharmacists in the survey and interviews indicated that smokers already know the risks associated with smoking, and simply ignore the warnings currently implemented. *'The extremity of the images appear to be the worst case scenario and over time they become less shocking. It is largely un-relatable to the average person, and most smokers seem to still commonly say 'but that would never happen to me''* (Female, Survey, 26-35 years [ID# 08]).

Participants suggested improving the presence of anti-tobacco campaigns within social media, focusing on the immediate consequences of tobacco use, and the effects of smoking on children and during pregnancy. *'Anti-smoking campaigns should target their audience via new media platforms e.g. ads on YouTube, Facebook, etc.* (Male, Survey, 26-35 years [ID# 04]). *'I had a friend who quit years ago, and her prompt was wanting to have children and she knew she shouldn't have kids while smoking'* (Female, Interview, 26-35 years [ID# 74]).

The 'minutes of life lost' and 'financial cost of smoking' warnings in themes 1 and 3 respectively were perceived by most participants as being particularly effective, citing their more immediate and tangible qualities as opposed to the other warnings. *'I like the minutes of life lost, it is an important message for people, like the clock is ticking and you are losing time,*

and it is a strong narrative' (Male, Interview, 36+ years [ID# 72]). *'Shows the true costs of smoking, which might help move smokers to a contemplative phase'* (Female, Survey 26-35 years [ID# 50]). Theme 2 warnings were considered as potentially subject to poor health literacy issues, though some pharmacists in both the surveys and interviews (more-so in the latter) believed they would still have some impact. *'A lot of people don't understand the complications of these diseases, so I feel it could be easily ignored'* (Female, Survey, 26-35 years [ID# 46]). *'I don't think these are going to have any significant impact, because people know this'* (Male, Interview, 36+ years [ID# 49]). Theme 4 messages were equally or less effective than the other themes, though these messages received significant attention by pharmacists, with several stating that smokers who were contemplating quitting may find these messages as being a strong driver in initiating a quit attempt. *'More likely to be effective if the person already wants to quit'* (Female, Survey, 18-25 years [ID# 41]). *'Maybe they would put people in the contemplation phase, and some information to go and do something about it'* (Male, Interview, 26-35 years [ID# 85]).

Pharmacists who were interviewed were asked if the cigarette stick warnings would be effective for adolescents as well as adults. Most considered the warnings as being less effective in preventing adolescent smoking, though acknowledging that the presence of these warnings 'can't hurt'. Suggestions on more effective warnings for adolescents were those that highlighted the financial costs of smoking, and described more immediate and appearance-based consequences of tobacco use. *'Maybe some of the social implications, you have to go all the way over there' to have a cigarette and can't hang out with anyone else.* (Male, Interview, 26-35 years [ID# 86]). *'Image messages would be better, such as reputation, or rots your teeth, as adolescents are so vain. Something like health and fitness, "you are not going to achieve what you want if you are smoking"'* (Female, Interview, 26-35 years [ID# 83]).

5.5 DISCUSSION

Community pharmacists in this study frequently interacted (up to several times per day) with smokers who want information on quitting smoking, or want to initiate a quit attempt. These interactions involved discussions of previous quit attempts, reasons for relapse, motivators to quit, and the provision of the pharmacotherapeutic and behavioural modification management options available. Based on these experiences in assisting smokers to quit smoking, pharmacists are in the position to provide professional insight into the development of effective anti-tobacco interventions. In this study, community pharmacists' opinions on the effectiveness of health warnings on cigarette sticks were sought, with novel warnings which focussed on more immediate and tangible consequences of tobacco use, such as the 'minutes of life lost' and financial consequences of smoking, being rated and discussed as the most effective.

The use of a mixed-methods (concurrent triangulation) study reinforced the quantitative findings in the survey with additional qualitative data from the interviews, describing the reasons behind the Likert scale ratings, and overcoming inherent limitations present in each individual method. There are however limitations to consider when interpreting the results. There was a limited number of participants involved, though their demographic characteristics were roughly representative of the pharmacist population of Australia, which is female dominated (62% vs. 38%) and mostly between the ages of 25 and 40 years.²² Few participants had a personal smoking history, potentially limiting the generalisability of the results. However, whilst non-smokers are not the only target group of anti-tobacco public health interventions, they do form a majority of the Australian population, and gathering their perceptions is essential in ensuring that this majority remains dissuaded from tobacco products. Participants were also unable to physically interact with the cigarettes while participating in the online survey, which may have affected their responses.

Previous research on Australian pharmacists has found they are reasonably confident in providing smoking cessation services to patients who wanted to quit smoking. However,

discussing smoking with patients presenting with an unrelated condition was considered a barrier to providing advice, with a risk of alienating patients by discussing tobacco use.²³ Based on the results of this study, discussing smoking cessation with patients may be more successful if common motivators for quitting are used as a starting point during these conversations, such as the financial impact of smoking. This is in comparison to the common shortcomings of current packaging and the theme 2 warnings, describing the negative health consequences of tobacco use. The shock value of these warnings have faded since their initial implementation, with smokers initially demonstrating increased quit intentions, and the greatest impact from these interventions occurring immediately after implementation.^{9,10,24} This issue is compounded by a general underestimation of the risks of smoking to personal health amongst both adults and adolescents, despite a general acknowledgement of the harms of tobacco use.²⁵⁻
²⁷ This necessitates the use of novel interventions and warnings to ensure continued reductions in tobacco use.

The ‘minutes of life lost’ cigarette stick warnings used in this study has also been used in previous research, where participants similarly rated it as the most effective warning presented, having the lowest appeal rating amongst participants, and causing the greatest increase in quitting intentions.^{14,15} Previous research has also found participants were strongly in favour of including text warnings on cigarette sticks, to increase the volume of educational material on the dangers associated with tobacco use.¹⁶ Other warnings perceived in this study as effective were those describing mortality statistics related to tobacco use, and the social burden of smoking. Whilst supportive messages were perceived as less effective, recent research has suggested that messages supporting self-efficacy in quitting combined with current ‘scare-tactic’ warnings may result in the greatest increase in quitting intentions.^{28,29}

Participants in this study also suggested warnings which focus on pregnant women and children, and the impact of tobacco use on these vulnerable populations, and the effects of tobacco use on personal appearance, which are themes reported elsewhere.³⁰⁻³² As smoking

during adulthood is most often the result of experimentation during adolescence, taking advantage of the vanity of this younger age group through depicting the appearance-related consequences of tobacco use has been theorised to be more effective than the eventual development of chronic diseases, which feel less relevant to adolescents.³³⁻³⁶ Aging skin, reduced physical fitness, oral diseases, and body odour were all identified by participants in this study as potentially effective messages in reducing adolescent tobacco use.

Viewer disinterest and avoidance techniques of packaging warnings requires the development and implementation of novel warnings which can draw attention and trigger behavioural change.^{9,10} As cigarette sticks are the item consumed when smoking, they represent a novel, logical, and unavoidable medium for health warnings on the dangers associated with tobacco use. Similar to packaging research, having warnings constantly 'at hand' will either continually, or at least periodically, remind smokers on the dangers associated with tobacco use and prompt quitting intentions.²⁹ This allows cigarette stick warnings the potential to be as effective or more effective than current packaging warnings in reducing tobacco use.^{14,17,37} However, similar to graphic images on cigarette packaging, cigarette stick warnings would need to evoke a significant emotional response and ensure accurate perceptions of risk, and increased quit intentions.³⁸ Many pharmacists in the survey and interviews cited that the health warnings on cigarette sticks as being 'in your face' and likely to attract the attention of the smoker and onlookers. However, including health warnings on cigarette sticks would likely be resisted by tobacco manufacturers, as has been the case for tobacco packaging warnings and plain packaging.^{39,40} Despite years of delays, these interventions were introduced, indicating the possibility of cigarette stick warnings as being the next method for reducing tobacco use via the alteration of tobacco product packaging, labelling, and appearance.^{41,42}

Further research into the potential effectiveness of cigarette stick warnings requires the participation of a larger number, and wider range of health professionals and their experiences, including physicians and nurses, as well the general community. Identifying health literacy

limitations of vulnerable populations within the community, such as children and those of a low socioeconomic status would also be needed to ensure that implemented warnings can be easily understood and incite behavioural change.

5.6 CONCLUSION

Based on their professional experiences with smokers, pharmacists consider warnings which depict immediate and tangible consequences of tobacco use to be more novel and engaging, and effective in comparison to current cigarette packaging warnings, which have lost their shock value since their implementation. Cigarette stick warnings represent a potential new medium for communicating the risks of tobacco use to the community, resulting in a reduction in tobacco use and its associated morbidity and mortality consequences. Research into how these warnings are perceived by a wider range of health professionals and the general community is the next step in identifying how cigarette stick warnings might reduce tobacco use and its resulting morbidity and mortality.

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Pharmacist Perceptions of Health Warnings on Cigarette Sticks

(Interviews)

Participated in Questionnaire Y / N

Pharmacist Name: _____ M / F Age: _____ Yrs Reg: _____

Q1. Do you have any personal history of smoking? If so, how has it changed and why?

Q2. How often would you give advice/talk to a smoker who wants to quit smoking?

Q3. What are the most common reasons for quitting smoking that a smoker describes?

Q4. What drivers are behind these reasons for quitting?

Q5. What are your thoughts on the graphic health warnings and plain packaging of cigarettes and other tobacco products since they have been implemented in Australia?

Q6. What are your initial thoughts regarding the use of health warnings on cigarette sticks, if they were to be implemented using non-toxic vegetable oils?

Q7. Of the warnings presented, which ones stick out to you as being the most and least effective for smokers, and for non-smokers, and why?

Q8. Do you have any suggestions for future health warnings that might be effective (this might include describing certain health, social, or financial consequences of smoking, personal attacks on smokers, supportive messages to quit, or others)?

Q9. Do you think warnings on cigarette sticks would be effective on adolescents as well as adults, or should adolescents be approached in another manner?

Chapter SIX: Effectiveness of Health Warnings on Cigarette Sticks: Perceptions of School Students in Queensland, Australia

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This chapter details the methodology and findings of a mixed-methods online survey investigating the perceptions of school students in Queensland, Australia, towards current cigarette packaging warnings and sets of cigarette-stick warnings divided into four main themes. As a key target group for anti-tobacco interventions, exploring the perceptions of adolescents in this exploratory investigation is necessary in refining the warnings and messages utilised for further research in young adults.

6.1 ABSTRACT

Background: Recent research posits that anti-tobacco health warnings on cigarette packaging may gradually lose their effectiveness in dissuading adolescents from tobacco products several years after implementation. Health warnings on individual cigarette sticks represent a novel warning medium, and may further educate adolescents on the dangers associated with smoking, and reduce tobacco experimentation amongst this vulnerable population.

Methods: In an online survey of school students in Queensland, Australia, participants were requested to rate (on 5-point Likert scales) and comment on the perceived effectiveness of current cigarette packaging warnings, and 12 text warnings on cigarette sticks, in preventing non-smokers from smoking, and encouraging current smokers to quit. The warnings were divided into four themes to establish the most effective types of anti-tobacco messages: mortality statistics, health condition consequences, social and financial consequences, and supportive messages. These themes were based on current anti-tobacco interventions within Australia, and the rising cost of tobacco products, and designed to align with the Health Belief Model.

Results: Participants (N=150; Age=15-18) from five schools completed the survey, and generally viewed current packaging warnings as 'gross' and 'disgusting', and rating them as somewhat effective in preventing non-smokers from smoking. Current warnings were however considered less effective in prompting current smokers to quit with participants describing them as being un-relatable to teenagers, and smokers as having become desensitised to the warnings used. One theme of cigarette-stick warning (mortality statistics) was rated as significantly more effective ($p < .001$) than current cigarette packaging, with an odds ratio (OR) of 2.77 (95% confidence interval [CI]: 1.67-4.62). Overall, warnings were considered to be 4.71 times (95%CI: 2.72-6.43, $p < .001$) more effective on non-smokers than on smokers. Over three-quarters of participants supported using health warnings on individual cigarette sticks.

Conclusions: Current cigarette packaging warnings have retained some effectiveness in dissuading adolescents from smoking, though novel and thought-provoking text-only warnings

on cigarette sticks may serve as an additional intervention in reducing tobacco use. Further research requires identification of the most effective warnings, and the perceptions of a more diverse participant base.

6.2 INTRODUCTION

Experimenting with tobacco products during adolescence increases the likelihood of developing long-term nicotine addiction, with the majority of active adult smokers having started using tobacco before the age of 20 years.¹ Tobacco experimentation at this age often occurs as a result of cigarette sharing in social settings,² which can lead to a quick loss of autonomy, and addiction occurring more rapidly, and with lower levels of consumption compared to adults.^{3,4} This is theorised to occur as a result of an increased disruptive effect of nicotine on brain function within the maturing adolescent brain.⁵ Given the global mortality rate of an estimated 7 million deaths per year attributable to tobacco use, preventing smoking uptake during this vulnerable period is imperative in improving the health of future generations.⁶

Adolescent experimentation with tobacco products is influenced by their limited experience and understanding of the nature of addiction, and their beliefs in being personally able to avoid or control addictive behaviours at will.^{7,8} This is in spite of their awareness of the general addictive potential of nicotine, and smoking as being a leading cause of death.⁹ Their misconceptions on the consequences of tobacco may be in part due to a lack of exposure to informative cigarette packaging health warnings, which are being adopted by over 100 countries as part of the World Health Organisation's Framework Convention on Tobacco Control.¹⁰ The practice of cigarette sharing amongst adolescents results in a reduction in exposure to tobacco packaging interventions, inhibiting the viewing frequency and effectiveness of these interventions.¹¹⁻¹⁴ Whilst initially effective, recent research has also identified that packaging warnings may lose their effectiveness and impact on health-related decisions and behaviours through repeated exposures amongst both adolescents and adults.¹⁵⁻

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Factors influencing these key health-related decisions and behaviours are described in the 'Health Belief Model',¹⁹ and includes multiple individual-specific elements. In relation to

tobacco use, this includes a person's perceived susceptibility and severity of potential smoking-related consequences, the benefits and barriers to smoking and to quitting, their self-efficacy in doing so, and the cues which prompt smoking, or facilitate quitting. These elements are influenced by knowledge of the positive and negative consequences of each of these decisions. A novel anti-tobacco public health intervention being investigated is the use of health warnings and messages on individual cigarette sticks.²⁰⁻²⁴ There have only been a handful of studies investigating the potential effectiveness of a small number of cigarette stick warnings,²⁰⁻²⁴ including 'Smoking Kills', 'Minutes of life lost', and the names of carcinogenic cigarette constituents. They found that these warnings reduced cigarette attractiveness, cigarette uptake, and increased quit intentions, with a recent systematic review stating this as an understudied area with further exploratory research needed.²⁵

It is expected that this form of intervention would both compensate for the lack of warning exposure from cigarette sharing, and supplement current anti-tobacco interventions such as cigarette packaging warnings and mass media campaigns, thus enhancing reader knowledge and improve on the health-related decisions and behaviours of both adults and adolescents. These warnings may increase the perceived threat of cigarette use and their susceptibility in suffering a resulting medical illness, and increase their self-efficacy in avoiding these threats. Similar to the effects of cigarette packaging, this may lead to reductions in tobacco experimentation for non-smokers (particularly adolescents), serve as a barrier to relapse for ex-smokers, and a facilitator of quit attempts for current smokers.^{26,27}

This study aims to first investigate adolescents' perceptions towards current cigarette packaging warnings, and their effectiveness in dissuading adolescents from using tobacco products. We also aimed to investigate the potential effectiveness of cigarette stick warnings in educating adolescents on the dangers associated with tobacco use, by gauging their perceptions of how an expanded set of these messages might prevent non-smokers (especially adolescents like themselves) from smoking, and prompt current smokers to quit. Finally, we

aimed to identify adolescent support for or against the inclusion of health warnings on individual cigarette sticks.

6.3 METHODS

6.3.1 Study Design

This study utilised an online survey of mixed-methods (concurrent triangulation; which allows the use of quantitative and qualitative methods of data collection together to cross-validate findings and overcome weaknesses present in individual methods) design. An invitation email was distributed by the principal investigator to principals of private schools in Queensland in November 2017, who approved the research and forwarded the survey link (SurveyMonkey) to parents of eligible students. Students in Grades 10 to 12 (15-18 years old) were eligible, with parents of students (due to ethical requirements) being responsible for discussing participation with the students, and allowing access to the link if they approved participation. Parents were also responsible for emailing the principal investigator if they wanted their child to go into the draw to win one of the \$10 Woolworths e-gift vouchers available as an incentive for participation (Woolworths is an Australian retail chain).

6.3.2 Procedure and Data Items Collected

Initial demographic information obtained from participants included: age, gender, grade at school, school attended, and ethnic background. Pre-intervention questions were then presented, with participants first rating on a 5-point Likert scale (from 'Not at all harmful' to 'Very harmful') their perceptions of how harmful smoking is to a person's health. This was followed by pictures of two of the fourteen current cigarette packaging warnings in circulation in Australia (see **Figure 6.1**); one displaying a lung with emphysema, and one encouraging smokers to quit. Eleven of these current packaging warnings in Australia (including the lung with emphysema) describe a negative health aspect of smoking, two describe the effects of smoking on others, and one encourages current smokers to quit. The packaging warnings chosen were representative of the themes of warnings in rotation in Australia at the time of the

study. Participants rated on a 5-point Likert scale (from 'Not at all effective' to 'Very effective') their opinions of the effectiveness of the cigarette packaging warnings in preventing non-smokers from smoking, and prompting current smokers to quit. Each question had optional open-text boxes participants could use to include details relating to their chosen response on the Likert scale. Participants were then given the option to discuss their perceived strengths or shortcomings of current health messages and warnings. They were also given the option to detail any anti-tobacco messages or warnings, either on cigarette packaging, or elsewhere that they considered to be effective or memorable as anti-tobacco interventions.

Photos of twelve cigarette sticks with messages printed in red down their shafts were then displayed. Each cigarette had three lines of text, which can be read as the cigarette is rotated, depicting a full message or warning relating to tobacco use. The cigarettes were grouped into 4 themes, which were displayed on a single page in a standardised order (see **Figure 6.1**): mortality statistics (MS; Theme 1), health condition consequences (HCC; Theme 2), social and financial consequences (SFC; Theme 3), and supportive messages (SM; Theme 4) to quit smoking. The warnings within theme 2 and 4 were chosen to align with current packaging warnings, theme 1 warnings were an extension of previous research into cigarette-stick warnings and current media campaigns, and theme 3 as a continuation of the current Australian tobacco climate, with increased stigma towards smokers, and soaring tobacco prices through heavy taxation.²⁸ For each theme, participants rated on a 5-point Likert scale how effective (from 'Not at all effective' to 'Very effective') they thought each message theme would be in discouraging non-smokers from smoking, and on a second 5-point Likert scale on effectiveness in encouraging current smokers to quit. Each cigarette per theme was labelled 'A', 'B', and 'C' to allow participants to include comments on individual warnings in optional open-text boxes. Lastly, participants rated on a 5-point Likert scale their opinion (from 'Strongly Disagree' to 'Strongly Agree') on the inclusion of health warnings on individual cigarettes.

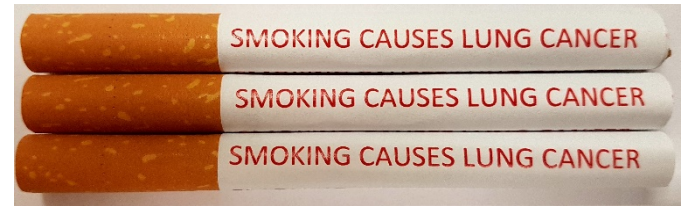
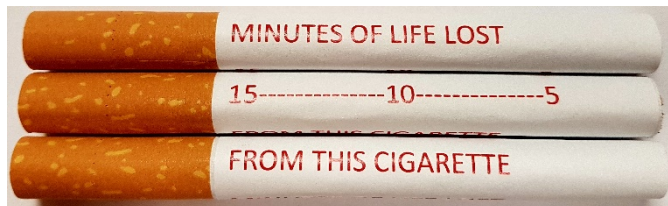
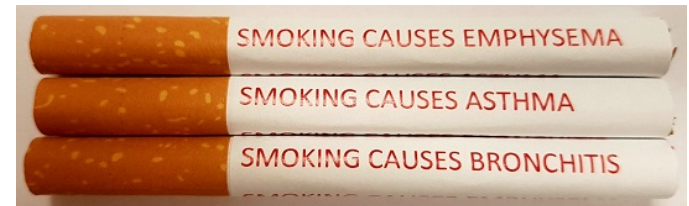
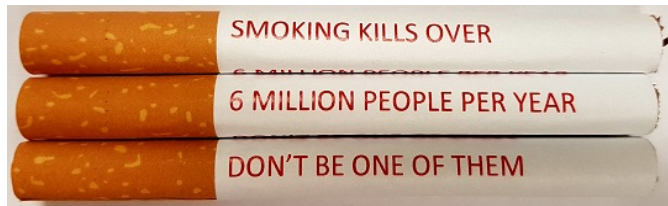
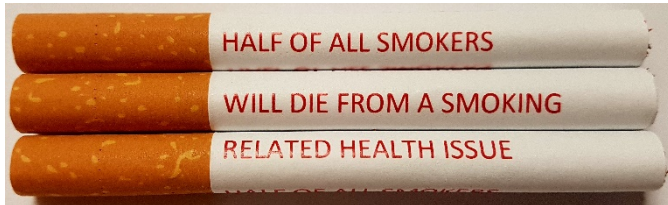
6.3.3 Analysis

We first ran a descriptive analysis to determine the characteristics of the study population. Non-parametric tests (Kruskal-Wallis and Mann-Whitney U) were used (SPSS v24; IBM Corp, Armonk, NY, USA) to investigate the relationships between the demographic variables in relation to participant perceptions of the anti-tobacco health warnings, with p-value limits of 0.05. Friedman Test was used to measure change in participants' perceptions across the 5 categories (current warnings and the 4 interventional themes). Post-hoc tests and Bonferroni adjustments were used to determine statistically significant differences between the categories. A random intercepts mixed-effects proportional odds logistic regression was performed using R (v3.3.2.4; R Core Team, Vienna, Austria) ordinal statistical package (with respondent ID as a random effect, and age group, ethnicity, gender, smoking status, and themes as fixed effects), to evaluate between and within-theme effectiveness (in comparison to current packaging warnings) in dissuading non-smokers and smokers from smoking. Responses from open-text comments were analysed independently by two authors (AD and BMA) using thematic analysis (NVivo v11; QSR International Pty Ltd, Melbourne, Australia) to confirm emerging themes. To establish trustworthiness of the qualitative data, findings were compared and conflicting interpretations were resolved through dialogue. Illustrative quotes are reported verbatim to support the discussion.



Theme 1 – Mortality Statistics (MS)

Theme 2 – Health Condition Consequences (HCC)



Theme 3 – Social and Financial Consequences (SFC)

Theme 4 – Supportive Messages (SM)

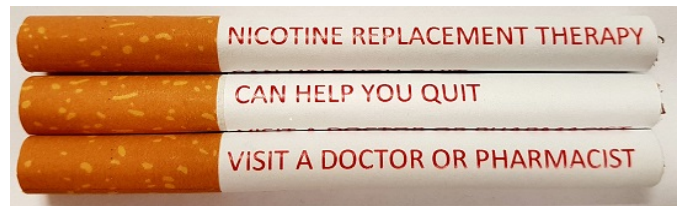
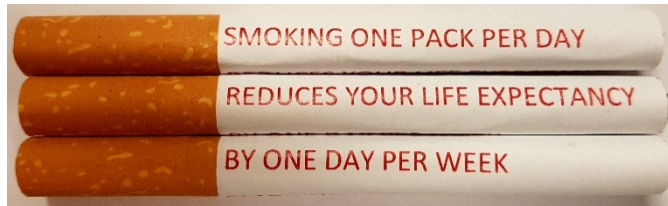
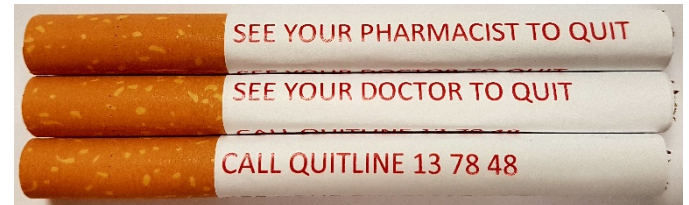
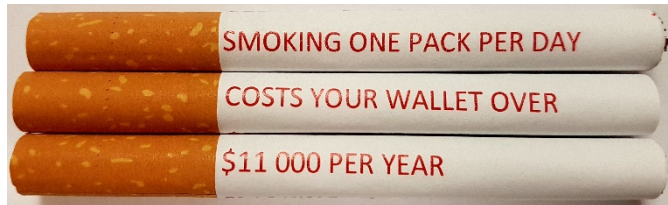


Figure 6.1 The front and back of two cigarette packaging in circulation in Australia, and the twelve cigarette warnings divided in to the four themes. Each cigarette includes three lines of text and is rotated to read the entire message.

6.4 RESULTS

6.4.1 Demographic Profile

From the five participating schools, 150 students completed the survey. Their demographic characteristics and baseline perceptions of the harms of smoking are shown in **Table 6.1**. Most participants (88.0%) resided in the South-East corner of Queensland (which accounts for two-thirds of the state's population), with the remainder residing in Central and North Queensland.

Table 6.1 Demographic characteristics and baseline perceptions of survey participants.

	N	%
Gender		
Male	54	36.0
Female	96	64.0
Age (years)		
15	20	13.3
16	74	49.3
17	48	32.0
18	8	5.3
Grade		
10	29	19.3
11	66	44.0
12	55	36.7
Ethnicity		
Caucasian	113	75.3
Aboriginal and/or Torres Strait Islander	7	4.7
Asian	11	7.3
African	2	1.3
Middle Eastern	5	3.3
Prefer not to say	12	8.0
Baseline Perceptions of Harms of Smoking		
Not at all harmful	1	0.7
Minimally harmful	6	4.0
Some harm expected	10	6.7
Quite harmful	20	13.3
Very harmful	113	75.3

Table 6.2 displays the results of the Friedman Test, showing the mean ranks (out of 5) of each theme, and the p-values when comparing the mean ranks. Chi Square analysis showed that only gender effects were present, and the other demographic variables being not significant. **Table 6.3** shows the proportional odds logistic regression model, including reference levels and points of significance. As an overall effect, participants perceived the warnings used on cigarette packaging and cigarette sticks as significantly ($p < .001$) more effective in preventing non-smokers from smoking, than in encouraging current smokers to quit with an odds ratio (OR) of 4.71 (95% confidence interval [CI]: 2.83-7.84).

Table 6.2 Mean ranks of interventions compared to current packaging warnings.

Category	Mean Rank	P values
Perceived Effectiveness in Preventing Non-Smokers from Smoking		
Current warnings	2.99 ^{bc}	-
Theme 1 (Mortality Statistics)	3.53 ^a	<0.01 ^c , <0.001 ^d
Theme 2 (Health Condition Consequences)	2.94 ^{ce}	<0.001 ^d
Theme 3 (Social and Financial Consequences)	3.24 ^{ae}	<0.001 ^d
Theme 4 (Supportive Messages)	2.29 ^d	<0.001 ^b
Perceived Effectiveness in Prompting Current Smokers to Quit		
Current warnings	2.57 ^c	-
Theme 1 (Mortality Statistics)	3.25 ^a	<0.001 ^c
Theme 2 (Health Condition Consequences)	2.89 ^b	<0.05 ^a ,
Theme 3 (Social and Financial Consequences)	3.32 ^a	<0.001 ^c , <0.05 ^b
Theme 4 (Supportive Messages)	2.97 ^{abc}	-

Means with different superscripts are significantly different ($p < .05$) when adjusting for Bonferroni correction

Table 6.3 Proportional odds logistic regression model, with odds ratios for themes of cigarette stick warnings.

Variable	Estimate	SE	Z Value	Odds Ratio	95% Confidence Intervals		P value
					Lower	Upper	
Demographic Characteristics							
Gender (Male = 0, Female = 1)	-0.22	0.39	0.57	0.80	0.37	1.72	0.566 ^{NS}
Overall Theme Effectiveness							
Theme 1 warnings ² (MS) [^]	1.02	0.26	3.90	2.77	1.67	4.62	<.001 ^{***}
Theme 2 warnings ² (HCC) [^]	-0.21	0.25	-0.83	0.81	0.50	1.32	0.405 ^{NS}
Theme 3 warnings ² (SFC) [^]	0.43	0.26	1.67	1.54	0.92	2.56	0.095 ^{NS}
Theme 4 warnings ² (SM) [^]	-1.26	0.26	-4.90	0.28	0.17	0.47	<.001 ^{***}
Effect on target smoking status (S = 0, N = 1) ¹	1.55	0.26	-5.94	4.71	2.83	7.84	<.001 ^{***}
Theme Effectiveness on Target Smoking Status							
Theme T1: Effect on smokers (N = 0, S = 1) ¹	0.04	0.36	0.12	1.04	0.51	2.11	0.908 ^{NS}
Theme T2: Effect on smokers (N = 0, S = 1) ¹	0.55	0.36	1.54	1.73	0.86	3.51	0.124 ^{NS}
Theme T3: Effect on smokers (N = 0, S = 1) ¹	0.64	0.36	1.76	1.90	0.94	3.84	0.079 ^{NS}
Theme T4: Effect on smokers (N = 0, S = 1) ¹	1.89	0.37	5.18	6.62	3.21	13.67	<.001 ^{***}

¹ N (Non-Smoker), S (Smoker) *** <.001 ** <.01 * <.05 NS = Not significant

² Reference level was the effectiveness of current packaging warnings

[^] MS; Mortality Statistics, HCC; Health Condition Consequences, SFC; Social and Financial Consequences, SM; Supportive Messages

6.4.2 Health Warning Effectiveness: Cigarette Packaging

Prior to being shown the interventional materials, nearly three-quarters (74.7%) of participants indicated that they had seen cigarette packaging. In response to the cigarette packaging warnings displayed, adolescents considered the warnings currently implemented on cigarette packaging to be somewhat effective in preventing non-smokers from smoking, though less so

in prompting current smokers to quit (see **Table 6.2** and **Table 6.3**). Most adolescents had strong personal opinions of the packaging warnings, describing them in the open-text comments as being ‘graphic’, ‘disgusting’, or ‘gross’ in appearance, and considered them as effective in preventing themselves and other young people from smoking. *‘I thought it was quite shocking and would put people off smoking’* (ID#147, Male, 17 years), *‘It’s gross and would definitely put me off smoking’* (ID#100, Male, 17 years), *‘Makes you never want to touch a cigarette’* (ID#3, Female, 16 years), *‘I think the packaging is enough of a reason not to smoke’* (ID#85, Female, 16 years).

However, participants also described their perceived shortcomings of current packaging warnings, with desensitisation to the warnings being common amongst smokers, warnings that were too weak to cause emotional reactions, and poor relatability of depicted chronic diseases to teenagers being the most commonly cited. *‘People who smoke have been doing so for a long time and don’t particularly care about the health risks’* (ID#19, Female, 17 years), *‘If someone wants to smoke they will just ignore the warnings’* (ID#24, Female, 16 years), *‘The packaging discourages me from smoking, though there are people who continue to smoke regardless of the packaging, which is sad’* (ID#56, Female, 17 years), *‘Should continue to be changed as people begin to get used to the disturbing images’* (ID#148, Male, 17 years), *‘The packaging seems to be directed towards adults, so it does not directly confront adolescents and young adults’* (ID#132, Male, 17 years).

6.4.3 Health Warning Effectiveness: Cigarette Sticks

Amongst the four themes of cigarette-stick warnings displayed, theme 1 cigarette warnings describing mortality statistics (MS) from smoking were rated as the most effective (OR=2.77; 95% CI: 1.67-4.62, $p < .001$) by adolescents, both in preventing non-smokers from smoking, and in encouraging current smokers to quit compared to current packaging warnings and the other themes presented. Female participants were significantly ($\chi^2 = 7.743$, $p < .05$) more likely to rate these warnings as effective in preventing non-smokers from smoking (61.5%) compared

to males (48.1%). The cigarette describing the ‘minutes of life lost’ was identified within the open-text comments as being the most effective warning in this theme, considered a novel and powerful message that would likely result in significant changes in smoking-related behaviours. ‘*Smokers can actually see how much of their life they are losing*’ (ID#54, Female, 16 years), ‘*Seeing this as you smoke would discourage smoking and dull the experience*’ (ID#147, Male, 17 years).

Theme 2 cigarettes warnings describing health condition consequences (HCC) of cigarette use were rated as similarly effective as current packaging warnings (OR=0.81; 95% CI: 0.50-1.32, $p = .405$). The similarity between this theme and current packaging warnings was cited as an important limiting factor, with participants perceiving them as being a repetition of packaging warnings, likely resulting in the similar effectiveness ratings. ‘*Everybody already knows smoking is bad and causes these diseases*’ (ID#123, Female, 16 years), ‘*The diseases mentioned are too common*’ (ID#61, Female, 17 years), ‘*People already know the effects, this won’t do anything*’ (ID#66, Female, 17 years). Theme 3 cigarette warnings describing social and financial consequences (SFC) of cigarette use were also rated as similarly effective as current packaging warnings (OR=1.54: 95% CI: 0.92-2.56, $p = .095$), though the cigarette stick depicting the financial costs of smoking was identified within the open-text comments as being notable and potentially effective. ‘*Some people don’t know or consider the long term effects other than health*’ (ID#74, Male, 16 years), ‘*Sadly people are now driven by money, so mentioning finances is effective*’ (ID#56, Female, 17 years).

Overall, the theme 4 cigarette messages supporting smokers to quit (SM) were considered 0.28 times (95% CI: 0.17-0.47) less effective than current packaging warnings. However, in relation to smoking status, they were considered 6.62 times (95% CI: 3.21-13.67) more effective ($p < .001$) than current packaging warnings in prompting current smokers to quit. Open-text comments towards this theme was mixed, with participants acknowledging the need for positive messages which gave options for smokers to quit, though also believed that smokers

would not be phased by this form of message in comparison to negative messages. *'They would have to have the will to quit first, and this might tip them over the edge'* (ID#123, Female, 16 years), *'The supportive messages can work for people who want to quit but haven't got the motivation'* (ID#54, Female, 16 years), *'They know how bad smoking is and they can't stop, a bit of writing will not stop anything'* (ID#30, Male, 17 years), *'A lot of people don't like being told what to do, especially if it involves their health'* (ID#147, Male, 17 years).

6.4.4 Opinions of Health Warnings on Tobacco Products

Over three-quarters (78.7%) of participants either 'Agreed' or 'Strongly Agreed' to the inclusion of health warnings and messages on individual cigarette sticks. Female participants were significantly more likely to agree (83.3%) compared to male (70.4%) participants ($\chi^2 = 5.986$, $p = .05$). Comments towards this question were generally positive, including by participants that had generally low ratings of the effectiveness of the cigarette stick warnings. The prolonged visibility of these warnings, and their effect on the aesthetic of smoking were both identified as contributors to the potential effectiveness of this form of anti-tobacco intervention. *'Being printed on the cigarette instead of the packet means it would be impossible not to notice'* (ID#74, Male, 16 years), *'Seeing these warnings as you smoke or having other people see it would discourage smoking and dull the experience'* (ID#147, Male, 17 years), *'It's better than messages on cigarette packets as smokers can actually think about what these messages mean whilst they are smoking'* (ID#54, Female, 16 years), *'Warnings scare people out of smoking and have had an impact on many smokers to stop, and prevented many non-smokers from starting'* (ID#104, Female, 17 years). However, some noted that they would be ignored in a similar manner to current packaging warnings, especially by current smokers. *'They might provoke thought though not make a complete difference'* (ID#74, Female, 16 years). *'Would still probably suffer from loss of impact over time'* (ID#123, Female, 16 years).

6.5 DISCUSSION

This study aimed to first investigate the perceptions of adolescents on the effectiveness of current cigarette packaging warnings implemented in Australia, including their strengths and shortcomings. We also aimed to investigate their perceptions on the effectiveness of twelve cigarette sticks with attached text health warnings and messages compared to current cigarette packaging warnings, both in preventing non-smokers from smoking and encouraging current smokers to quit. We found that adolescents consider current packaging warnings as having retained some of their effectiveness in preventing non-smokers from smoking, though were relatively ineffective in prompting current smokers to quit. We also found that warnings describing the mortality statistics relating to tobacco use, and the financial consequences of smoking were considered novel and effective by adolescents.

The implementation of novel and cost-effective anti-tobacco interventions are theorised to be essential in reducing tobacco use and its associated morbidity and mortality.²⁹ This is essential in particular for adolescents as a vulnerable population, as they have a limited understanding of addiction and other health consequences of tobacco use,^{7,8} coupled with the increased potential for neural disruption of nicotine,⁴ and exposure to peer pressure and social tobacco experimentation.¹² The specific and calculable losses of time (and to a lesser extent money), and mortality statistics of tobacco, compared to the threats of potential future ill health resulting from tobacco use may be perceived as more relatable, memorable, and effective. Previous research into the effectiveness of the ‘minutes of life lost’ warning on cigarettes found it to have the lowest appeal ratings and greatest increase in quitting intentions.^{20,21} Whilst no previous research has investigated the effectiveness of cigarette stick warnings describing the financial consequences of smoking, tax increases and the rising cost of legal tobacco products were described by participants in this study as well as elsewhere as being a strong motivator for quit attempts.^{30,31} The general public, including smokers, have also been found to support tax increases of tobacco products, particularly if the revenue raised contributed to quit-smoking

efforts.^{32,33} These findings and findings from similar research suggest that further research into warnings describing the minutes of life lost and mortality statistics from smoking,^{20,21} and specific financial consequences of smoking may foster reductions in tobacco use, in addition to those achieved through the current packaging warnings.

The shortcomings of current packaging warnings described by participants in this study were also similar to those identified in previous research,^{17,18} and was supported by the similar Likert scale ratings for the theme 2 warnings describing specific health consequences of tobacco use. The gradual diminishing of warning effectiveness,¹⁷ and adolescent perceptions of personal imperviousness to the described health consequences,^{34,35} require the use of warnings and messages that are novel, attract attention, and more relevant to adolescents. This may have contributed to the higher ratings of theme 1 and 3 warnings, which participants noted as being more novel and personable, as opposed to being ‘common-knowledge’ or ‘generic’. Increasing the perceived threat of negative consequences related to tobacco use, and their perceived severity, and promoting cues to action and self-efficacy through the use of cigarette-stick warnings, may increase resistance to peer pressure and other trigger factors to smoking, which are often encountered during adolescence.¹⁹ As key elements of the Health Belief Model, we theorise that cigarette stick warnings achieve these effects through their own messages, as well as a cumulative or synergistic effect alongside cigarette packaging warnings, mass media campaigns, and other anti-tobacco interventions employed within the community. Shifting the balance of risks vs. benefits to emphasise the risks of tobacco use is therefore theorised to increase the likelihood of health promoting behaviours, which in the case of adolescents would ideally be a continuation of aversion towards tobacco products.

The high approval rating of including health warnings on cigarette sticks has been previously reported, including in the use of simple and well-recognised messages such as ‘Smoking Kills’.²²⁻²⁴ As the cigarette stick is the item consumed when smoking, it stands to reason that it should be made a component of the anti-tobacco arsenal and designed to be less attractive to

reduce the appeal of smoking, in addition to unattractive and informative cigarette packaging, which may be hidden, discarded, or otherwise avoided by adolescents.^{21,36} Though some smokers will either have no interest in quitting, and will not quit regardless of their awareness of the harms of smoking, these cigarette stick warnings may impact on risk taking behaviours of most adolescents.

Whilst this study found data supporting the effectiveness of cigarette stick warnings on adolescents, there are limitations to be considered when interpreting the results. The themes were presented in a standardised as opposed to a randomised manner, though all were presented on the same page, allowing students to adjust their Likert scale ratings easily. There was also a lack of blinding, which does not allow the effect of bias to be taken into account when interpreting the results. Due to the controlled, at-home environment of participation, we were ethically restricted from asking participants of their smoking status and experiences, and were unable to assess participant responses in real-world scenarios. Also, only private school and Catholic education students were enrolled, due to the overloading of Queensland public schools with research activities, potentially affecting the generalisability of the results to adolescents enrolled in public schools. Due to the online nature of the research, we were not able to gauge the response rate, nor the participants' level of understanding of the warnings shown, particularly of those describing health consequences of tobacco. Participants were also unable to hold cigarettes and experience tactile sensations which may have influenced their responses. Lastly, one of the warning images was misplaced into theme 3 (social and financial consequences of smoking), where its message was more akin to theme 1, potentially affecting the theme 3 Likert ratings.

Based on the findings of this study, further research into the effectiveness of warnings on cigarette sticks, including which warnings are likely to elicit the greatest anti-tobacco effects on adolescents and potentially adults is a reasonable next step. To confirm the findings of this study and improve the generalisability of the results, a larger and more diverse cohort of school

students is needed. The minutes of life lost message was rated as the most effective in this study and other studies utilising this message,^{20,21} and requires further investigation amongst a more diverse range of demographics to assess if it might be a universally-effective message.

6.6 CONCLUSION

Reducing the prevalence of tobacco use, particularly amongst adolescents, is a major requirement for the future health of the global community, and a reduction in tobacco-attributable morbidity and mortality. Making the cigarette stick an educational tool alongside cigarette packaging interventions may further prevent the goal of the tobacco industry in recruiting the next generation of smokers. Cigarette stick warnings (such as describing the minutes of life lost per cigarette, and the financial consequences of smoking) which are novel and more relatable to viewers' appear to be the most effective. These interventions were strongly supported by adolescents in this study, who agreed that these warnings should be included on all cigarette sticks. Future effective warnings as suggested by adolescents in this study include the effects of smoking on children and other family members, and should be the focus for further research investigating the effectiveness of these warnings in preventing non-smokers from smoking, and encouraging current smokers to quit.

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Chapter SEVEN: Australian University Student Perceptions of Health

Messages on Cigarette Sticks

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This chapter details the methodology and findings of a mixed-methods online survey investigating the perceptions of university students towards current cigarette packaging warnings, and a refined set of cigarette stick warnings and messages divided into four themes. Gathering their perceptions is essential, as young adult university students are a vulnerable population relating to tobacco and other drug use, due to a combination of unique stressors and environmental influences.

7.1 ABSTRACT

Introduction: University students are exposed to casual smoking, increasing their risk of developing nicotine addiction, which can extend into adulthood. A novel anti-tobacco intervention being investigated is the use of health warnings on individual cigarette sticks. We explored the perceptions of university students on the effectiveness of health warnings on cigarette packaging and individual cigarette sticks.

Methods: An online survey was distributed to first-year university students enrolled at a regional university in North-Eastern Australia. Participants rated on 5-point Likert scales and in open-text comment boxes, the effectiveness of current cigarette packaging warnings, and 12 text warnings (divided into four themes; immediate and short-term consequences [ISC], long-term and mortality consequences [LMC], social and financial consequences [SFC], and supportive messages to quit [SMQ]) on individual cigarette sticks, in preventing non-smokers from smoking, and in encouraging current smokers to quit.

Results: Participants (n = 479; Mean age = 22 years) rated three themes (ISC, LMC, and SFC) as being overall more effective (all $p < .001$) than current packaging warnings (Odds Ratios [OR] and 95% Confidence Interval [CI] = 5.93 [4.51-7.80], 3.60 [2.79-4.64], and 2.86 [2.21-3.69] respectively). Participants described a desensitisation to current packaging warnings, and the novel warnings displayed potentially overcoming this issue, with over 85% agreeing that individual cigarette sticks should include health warnings.

Conclusion: Health warnings on cigarette sticks may serve as an effective means in reducing tobacco use, with the provision of this additional intervention for communicating the health and other negative consequences of smoking likely reinforcing the effects of current packaging warnings.

7.2 INTRODUCTION

Tobacco use during adolescence and early adulthood is strongly linked to continued use later in life, with most adult smokers having started using tobacco products during their teenage years or early-to-mid-twenties.¹ This is theorised to occur at least in part due to the increased disruptive effect of nicotine on brain function within a maturing brain, leading to a more rapid loss of autonomy, and addiction occurring with lower cumulative exposure compared to adults.²⁻⁴ The final years of adolescence, where many high-school finishers attend college present a unique set of challenges and experiences, including exposure to and experimentation with alcohol and other drugs, including tobacco.⁵⁻⁷

Each day in the United States, nearly 4 000 adolescents smoke their very first cigarette, and approximately 13% of college-aged students (18-24 years) smoke regularly.^{8,9} Similarly in Australia, 14% of those aged 18-24 years smoke at least weekly, many of which started smoking in their earlier teenage years, making them more likely to develop nicotine addiction that persists well into adulthood.¹⁰ Factors influencing tobacco use amongst this age group include having relatives and friends who smoke, exposure to tobacco advertising by manufacturers (including sponsored events and novelty tobacco products), increased periods of mental stress and anxiety, or as a means to promote and maintain weight loss.¹¹⁻¹³

Preventative measures to curb tobacco use include mass media campaigns, tax increases, tobacco packaging warnings, and an increased availability of smoking cessation medications, and educational/supportive call-lines and websites. Most of these preventative measures are detailed with minimum recommendations for signatories in Part 3 of the World Health Organisation's (WHO) framework convention on tobacco control (FCTC).¹⁴ Reducing the demand for tobacco products through public education is an integral part of the framework, with Article 11 of Part 3 describing recommendations for the 'packaging and labelling of tobacco products'. The use of packaging health warnings, and the removal of false or

misleading aspects of packaging are included, which normally minimise the perceptions of the negative health effects of tobacco use.¹⁴

There has been much research conducted on university-aged persons across several countries evaluating the effectiveness of health warnings on tobacco packaging as well as other packaging modifications, and how these interventions influence perceptions of the harm caused by tobacco products.¹⁵⁻²⁵ Pictorial health warnings, particularly those which are considered gruesome, have been shown to be effective in reducing the attractiveness of smoking, and lowered intentions to smoke amongst adolescents and young adults.^{20-22,24,25}

The 'Health Belief Model' (HBM) describes how health-related decisions and behaviours are shaped by a person's perceptions, including the perceived susceptibility and severity of resulting consequences, benefits and barriers, and self-efficacy and cues to action. These elements are influenced by knowledge of the positive and negative outcomes from these decisions.²⁶ The high viewing frequency of cigarette packaging with warnings alongside other anti-tobacco interventions have been successful in combatting the misperceptions of the harm caused by tobacco products by increasing the perceived susceptibility and severity of smoking, and smoking-related illnesses.^{27,28} There have however been concerns about the effectiveness of packaging interventions. A large four-country study found that after 5 years, cognitive processing in response to warnings amongst adults decreased to levels similar to those seen before their implementation.^{28,29} Current packaging interventions primarily focus on two of the six elements of the HBM (perceived susceptibility and severity), and fail to address the other elements, such as outlining the benefits of quitting, addressing barriers when quitting, and improving smoker self-efficacy in undertaking quit attempts.

An intervention being investigated as a supplement to current tobacco packaging warnings are cigarette stick warnings,³⁰⁻³⁴ with a recent systematic review theorising that the novelty of cigarette stick warnings, their likelihood for more frequent viewing, and being more difficult to avoid, would contribute to further reductions in tobacco use.³⁵ Addressing more elements of

the HBM, as well as acting as an additional source of anti-smoking education, is expected to improve non-smoker and smoker awareness of the consequences of smoking, and promote cessation amongst current smokers. The primary aim of the present study was to investigate Australian young-adult university students' perceived effectiveness of cigarette stick warnings in preventing non-smokers from smoking and encouraging current smokers to quit. We also aimed to identify which individual cigarette stick warnings were perceived as the most effective and why, and in addition how receptive the participants were to the proposal of cigarette stick warnings being implemented within Australia.

7.3 METHODS

7.3.1 Study design and recruitment

This study utilised a mixed-methods online survey (concurrent triangulation; which allows the use of quantitative and qualitative methods of data collection together to cross-validate findings and overcome inherent weaknesses present in individual methods), distributed to first year undergraduate students enrolled at two regional Australian university campuses in March 2018. Eligible students were invited via email to participate in the survey (launched through SurveyMonkey), and presented with an information and consent sheet outlining the purpose of the survey, their rights as research participants, and detailing the informed consent process. After completion, participants could choose to enter their email address to win one of the 70 \$20 Bunnings (Australian retail chain) e-gift vouchers. This research was approved by the ethics committee of the institution at which the study was conducted.

7.3.2 Procedure and data items

Initial demographic information included participant age, gender, campus attended, degree being studied, ethnic background, and smoking status. Baseline participant perceptions on the health risks of tobacco use, and effectiveness of current cigarette packaging warnings in reducing tobacco use were then gathered. Participants rated on a 5-point Likert scale (from 'Not at all harmful' to 'Very harmful') their perceptions of how harmful smoking is to a

person's health. This was followed by pictures of two of the fourteen cigarette packaging warnings currently in circulation in Australia, (see **Figure 7.1**); one displaying a lung with emphysema, and one encouraging smokers to quit. This was followed by pictures of two of the fourteen current cigarette packaging warnings currently in circulation in Australia, (see **Figure 7.1**); one displaying a lung with emphysema, and one encouraging smokers to quit. These two packaging warnings were both locally available at the time of the study (due to warning rotation utilised in Australia), and considered as representative of the themes used in Australia, as eleven of the current packaging warnings (including the lung with emphysema) describe a negative health aspect of smoking, two describe the effects of smoking on others, and one which prompts current smokers to quit. Participants rated on a 5-point Likert scale (from 'Not at all effective' to 'Very effective') their opinions of the effectiveness of the cigarette packaging warnings in preventing non-smokers from smoking, and prompting current smokers to quit. Each Likert-scale question had optional open-text comment boxes for participants to detail reasons for their rating. The baseline perceptions of participants is required for within and cross-theme comparison with the interventional materials. Participants were also given the opportunity to share their perceptions of the strengths or shortcomings of current health warnings, and detail any specific anti-tobacco messages or warnings that they considered to be memorable or effective.

The interventional materials were then displayed, composed of twelve cigarette sticks with messages printed in red down their shafts. Each cigarette had three lines of text, which can be read as the cigarette is rotated, depicting a full message or warning relating to tobacco use. The cigarettes were grouped and presented in four themes in a standardised order for all participants (see **Figure 7.1**): immediate and short-term consequences of smoking (ISC), long-term and mortality consequences of smoking (LMC), social and financial consequences of smoking (SFC), and supportive messages to quit smoking (SMQ). These themes (and the individual warnings used) were informed by previous research, where the most effective warnings have

been retained for continued evaluation, and ineffective warnings either discarded or improved based on participant responses,³⁰⁻³⁵ and were designed to align with the HBM, and current anti-tobacco techniques utilised within Australia. For each theme, participants rated on 5-point Likert scales how effective (from 'Not at all effective' to 'Very effective') they thought each message theme would be in discouraging non-smokers from smoking, and encouraging current smokers to quit. Each cigarette per theme was labelled 'A', 'B', and 'C' to allow participants to cite individual cigarettes using open-text comment boxes. Participants also ranked from most to least effective, current packaging and each theme (presented in a random order) on their effectiveness in preventing non-smokers from smoking, and in encouraging current smokers to quit. Lastly, participants rated on a 5-point Likert scale their opinion (from 'Strongly Disagree' to 'Strongly Agree') on the inclusion of health warnings on cigarette sticks in Australia.

7.3.3 Analysis

A descriptive analysis was used to determine the demographic characteristics of the study population. Non-parametric tests (Kruskal-Wallis and Mann-Whitney U) in SPSS (v25; IBM Corp, Armonk, NY, USA) were used to investigate relationships between demographic variables and participant perceptions of the health warnings, with p-values set at 0.05. Friedman Test was used to measure change in participants' perceptions across the 5 categories (current warnings and the 4 interventional themes). Post-hoc tests and Bonferroni adjustments were used to determine statistically significant differences between the categories. Proportional odds logistic regression was performed using R (v33.2.4; R Core Team, Vienna, Austria) ordinal statistical package to evaluate between and within-theme effectiveness (in comparison to current packaging warnings) on non-smokers and smokers. Responses from open-text comments were analysed independently by two authors (AD and BMA) using content analysis to confirm emerging themes. To establish trustworthiness of the data, findings were compared and conflicting interpretations were resolved through dialogue. Illustrative quotes are reported verbatim to support the discussion.



Theme 1 – Immediate and Short-Term Consequences (ISC)

Theme 2 – Long-Term and Mortality Consequences (LMC)



Theme 3 – Social and Financial Consequences (SFC)

Theme 4 – Supportive Messages to Quit (SMQ)



Figure 7.1 The front and back of two cigarette packaging in circulation in Australia, and the twelve cigarette warnings divided in to the four themes. Each cigarette includes three lines of text and is rotated to read the entire message.

7.4 RESULTS

7.4.1 Demographic profile

Of the 3 908 eligible students emailed, 583 (14.9%) accessed the survey, and 479 (12.3%) both completed the survey and were eligible for inclusion. **Table 7.1** shows the demographic characteristics of participants, who were divided according to age group. Young adults (17-25 years) were the main target group of this research, constituting 389 (81.2%) of the participants. Current smokers included occasional (at least weekly) and daily smokers, with 58 participants in this group, all of whom only used cigarettes. Current smokers were mostly (67.2%) young adults, and ex-smokers were mostly (62.2%) older adults.

When asked to describe their perceptions of smoking, nearly two-thirds (62.2%) of non-smokers considered it a troubling addiction and that all smokers should aim to quit smoking, though nearly half (48.1%) agreed that smokers have the right to choose to smoke as long as it doesn't harm others around them. Current smokers knew that they should quit smoking, though only half (54.1%) planned to do so within the next 12 months, and most (55.2%) were either light or moderate smokers, smoking between one and twenty cigarettes per day. Over half (55.6%) of ex-smokers had quit more than 1 year prior to participating in the study.

7.4.2 Ratings of packaging and cigarette-stick warning effectiveness

Table 7.2 displays the results of the Friedman Test, and the p-values when comparing ranks between themes. The ranking task demonstrated similar outcomes to the Likert scale ratings, with theme 1 (ISC) ranked as the most effective theme in discouraging non-smokers from smoking, while themes 1 and 3 were equally the most effective in prompting smokers to quit. Chi-square test analysis depicted gender, age, ethnicity, and smoking status, as significantly affecting responses to the Likert-scale questions.

Table 7.1 Demographic characteristics and baseline perceptions of participating students.

	N	%
Gender		
Male	134	28.0
Female	345	72.0
Age Group (years)		
17-25	389	81.2
26 and older	90	18.8
Ethnicity		
Caucasian	375	78.3
Aboriginal or Pacific Islander	38	7.9
Asian	40	8.4
African	5	1.0
Middle Eastern	4	0.8
Not Stated	17	3.5
Degree Field		
Health	227	47.4
Education and Arts	59	12.3
Sciences	62	12.9
Business and Law	96	20.0
Engineering and IT	35	7.3
Smoking Status		
Non-smoker	376	78.5
Current Smoker	58	12.1
Ex-smoker	45	9.4
Baseline Perceptions of Harms of Smoking		
Not at all harmful	0	0
Minimally harmful	1	0.2
Some harm expected	28	5.8
Quite harmful	100	20.9
Very harmful	350	73.1

Table 7.2 Friedman test of interventions compared to current packaging warnings.

Category	Score	P values
Perceived Effectiveness on Non-Smokers		
Current Packaging Warnings	2.51 ^d	-
Theme 1 (Immediate and Short-Term Consequences)	3.64 ^a	<.001 ^{bcde}
Theme 2 (Long-Term and Mortality Consequences)	3.35 ^b	<.001 ^{de}
Theme 3 (Social and Financial Consequences)	3.23 ^{bc}	<.001 ^{de}
Theme 4 (Supportive Messages)	2.28 ^e	<.01 ^d
Perceived Effectiveness on Smokers		
Current Packaging Warnings	2.30 ^c	-
Theme 1 (Immediate and Short-Term Consequences)	3.39 ^a	<.001 ^{bcd}
Theme 2 (Long-Term and Mortality Consequences)	3.04 ^b	<.001 ^c
Theme 3 (Social and Financial Consequences)	3.27 ^a	<.05 ^{bd} , <.001 ^c
Theme 4 (Supportive Messages)	3.00 ^{bd}	<.001 ^c

Means with different superscripts are significantly different ($p < .05$) when adjusting for Bonferroni correction

Participants' perceived effectiveness ratings of the health warnings on current cigarette packaging in Australia showed that they considered these warnings as being minimally to moderately effective in reducing tobacco use. Age influenced ($\chi^2 = 7.503$, $p = .023$) participants' perceptions, with the older age group more likely to rate them as ineffective (71.1%) compared to the younger age group (56.6%) in encouraging current smokers to quit.

Theme 1 cigarettes describing the immediate and short-term consequences of smoking (ISC) were perceived as being the most effective in this study, both in preventing non-smokers from smoking, and in encouraging current smokers to quit. There were significant gender and age differences in participants' ratings, with female participants (34.5%) perceiving the warnings as being more effective compared to males (26.1%) in encouraging current smokers to quit ($\chi^2 = 6.533$, $p = .038$), as did younger participants (58.4%) compared to older participants (48.9%) in preventing non-smokers from smoking ($\chi^2 = 8.287$, $p = .016$).

Theme 2 cigarettes describing the long-term and mortality consequences of smoking (LMC) were overall perceived as being between moderately and quite effective (3 and 4 out of 5 respectively), and ranked second in perceived effectiveness in preventing non-smokers from smoking, and third in encouraging current smokers to quit. Both gender and age significantly affected perceptions of the effectiveness of these warnings in preventing non-smokers from smoking. Female participants (51.9%) considered these warnings as more effective compared to male participants (36.6%) ($\chi^2 = 9.365$, $p = .009$), as did younger (50.6%) compared to older (34.4%) participants ($\chi^2 = 12.283$, $p = .002$).

Theme 3 cigarettes describing the social and financial consequences of smoking (SFC) were overall perceived as similarly effective as the theme 2 warnings, though considered more effective in encouraging current smokers to quit. Gender, age, and ethnicity significantly affected participant perceptions, with female participants (46.7% vs. 35.8%, $\chi^2 = 4.311$, $p = .037$), younger participants (45.2% vs. 36.7%, $\chi^2 = 4.197$, $p = .040$), and Aboriginal and Torres Strait Islanders compared to Caucasians (39.5% vs. 20.0%, $\chi^2 = 22.837$, $p = .011$) rating these warnings more highly in their perceived effectiveness in preventing non-smokers from smoking.

Theme 4 cigarettes with messages supporting smokers to quit smoking (SMQ) were ranked the lowest in perceived effectiveness in preventing non-smokers from smoking, though they were considered more effective than current packaging warnings in encouraging current smokers to

Overall, participants perceived the warnings used on cigarette packaging and cigarette sticks as significantly ($p < .001$) more effective in preventing non-smokers from smoking, than encouraging current smokers to quit with an odds ratio (OR) of 3.32 (95% confidence interval [CI]: 2.52-4.37). Participants rated three message themes on cigarettes sticks (ISC, LMC, and SFC) as being overall more effective (all $p < .001$) than current cigarette packaging warnings (Odds Ratio [OR] and 95% Confidence Interval [CI] = 5.93 [4.51-7.80], 3.60 [2.79-4.64], and 2.86 [2.21-3.69] respectively). SM was more effective only in encouraging current smokers to quit (OR = 4.85 [95% CI = 3.35-7.05]).

7.4.3 Comments on packaging and cigarette-stick warning effectiveness

Over half (52%) of participants commented on current packaging warning effectiveness, with the majority (66%) of these participants indicating that the current packaging warnings have lost their shock value, and have no impact on smokers and their smoking habits, who have become desensitised to these warnings. *'So many people don't even look at the pictures, they just ask for the packet to purchase, take the plastic off and smoke the cigarettes one by one without taking time to read the outcomes'* (Female, 17, Non-Smoker), *'I don't think that health warnings make a difference to people who smoke, we're well aware of the health risks now'* (Female, 35, Ex-Smoker), *'We have become desensitised to the labelling on the packaging'* (Male, 20, Smoker). Many participants also believed that smokers would continue to smoke regardless of changes or improvements made to packaging warnings. *'If you smoke, a package won't stop you'* (Male, 19, Smoker), *'People who smoke will continue to smoke even if the packaging changes'* (Female, 17, Non-Smoker). However, over one-quarter (28%) of participants described the current warning as effective, particularly in their shock value and preventing tobacco use amongst non-smokers. *'For a non-smoker, seeing those images can be quite shocking and might help the person reconsider from starting to smoke'* (Female, 19, Non-Smoker), *'I think it is fairly effective at this stage, it certainly won't be attracting anyone in'*

(Male, 18, Non-Smoker), *'I'd imagine that it is effective in reinforcing individuals' conviction against smoking'* (Male, 24, Smoker).

One-third (31%) of participants described their exposure to memorable or effective anti-tobacco interventions employed within Australia, with interventions portraying graphic consequences of tobacco use (e.g. tar being scraped out of lungs) being the most frequently cited. *'There used to be ads on TV with a man coughing up blood, that used to scare me'* (Female, 19, Smoker), *'The advertisements with a surgeon showing a healthy lung, compared with tar seeping out of a smokers' lung'* (Female, 30, Non-Smoker), *'The TV advertisement from the government of the guy coughing up blood'* (Male, 17, Smoker). Depicting the effects of smoking on children (and other non-smokers), and isolation from others including family due to tobacco use were also commonly (15%) described as effective by participants. *'The advertisements on TV where people have to step outside into the cold away from their families or friends to have a smoke on their own'* (Female, 28, Non-Smoker), *'Advertisements on TV that involve fathers not seeing their children grow up, I believe playing on people's emotions can be effective'* (Female, 18, Non-Smoker). Television advertisements were described as being the most effective source of anti-tobacco interventions.

The theme 1 warnings (immediate and short-term consequences [ISC]) were the highest rated in the Likert-scales, with one-third (32%) of participants citing both the strong impact of the 'minutes of life lost' cigarette, and the cigarette describing the effects of smoking on others (including children, family members, and pets). *'I think these messages are quite confronting, in that they make the smoker think about the consequences as they are smoking, as they're unable to simply pocket and ignore the warnings on it'* (Male, 22, Non-Smoker), *'I believe the one that shows how much time is taken off your lifespan is pretty powerful'* (Female, 22, Ex-Smoker), *'The impact on others may have more effect, as it is no longer just about their wants and needs'* (Female, 37, Ex-Smoker), *'It's literally right in front of your face, and I was very concerned about how the smoke would impact my beloved pet, which I had not considered*

before' (Female, 27, Ex-Smoker). A smaller number of participants (10%) also considered the cigarette warning describing the appearance-related effects of smoking as potentially effective. However, one-third (31%) of participants considered this theme as being ineffective, or presenting information that smokers in particular would have seen or heard before. *'Some of these statements are facts of life for smokers, and you just adjust your habit to minimise the risks listed here'* (Female, 49, Smoker), *'Most smokers already know this and it wouldn't exactly give them drive to quit just by seeing it again'* (Male, 17, Non-Smoker),

The theme 2 warnings (long-term and mortality consequences [LMC]) were perceived as more effective in preventing non-smokers from smoking compared to prompting current smokers to quit. The open-text comments reflected that these warnings were considered either a repetition of current packaging warnings (over half [53%] of open-text respondents), or that they were not realistic or disconnected from individuals, who would not identify with the potential for ill health in the future due to smoking (40% of open-text respondents). *'As this is similar to the packaging and smokers will likely have heard this before, and the effects are generally thought to be several years off, it will probably not change their opinions on the subject'* (Male, 17, Non-Smoker), *'They are just old sayings every smoker has heard a thousand times'* (Female, 22, Smoker), *'If they are numb to the pictures on the box, how quick do you think they will ignore some writing?'* (Male, 38, Non-Smoker), *'These warnings have been on the packets for such a long time they have lost their weight'* (Female, 30, Ex-Smoker).

The theme 3 warnings (social and financial consequences [SFC]) were rated consistently in their perceived effectiveness on both non-smokers and smokers, with the financial cost of smoking warning leading the open-text responses (50 of the 73 responses [68%]). *'I quit smoking to save money and think this theme is the most effective'* (Female, 24, Ex-Smoker), *'Putting the cost of smoking per year would be the most effective, as people tend to care more about their finances than their health'* (Female, 30, Smoker), *'Smoking costs a lot of money and can be a big push to quit. Maybe seeing this amount might make some people think twice*

about continuing the habit (Female, 22, Ex-Smoker). However, one-third (30%) of respondents had comments either for or against the effectiveness of the overall theme. *‘These I feel would be very effective, as you are pointing out the financial and social burden that many people may not put together’* (Male, 31, Non-Smoker), *‘These messages wouldn’t be applicable to someone first trying a cigarette, so likely wouldn’t deter people from starting’* (Female, 20, Non-Smoker).

Lastly, the theme 4 messages (supportive messages to quit [SMQ]), were considered ineffective in preventing non-smokers from smoking, though most (76%) open-text respondents detailed supportive comments on this theme, relating to the importance of providing options for quitting and avoiding cravings for current smokers. *‘Everyone needs help in different ways and I think it’s a great idea to provide several options to find what will work for them’* (Female, 27, Ex-Smoker), *‘Supportive messages are much more effective than hateful/scare tactics’* (Male, 18, Non-Smoker), *‘Might have a compounding effect with the other warnings, which would allow smokers to broadly think about the immediate effects and how they might be able to succeed in quitting’* (Male, 24, Smoker).

7.5 DISCUSSION

In this study we investigated the perceptions of Australian university students towards themed health warnings on individual cigarette sticks, using current packaging warnings as a baseline comparison. Warnings describing the shorter-term effects of tobacco use were perceived as the most effective in this study, with the ‘minutes of life lost’ warnings being the most commonly referred to in the open-text comments. There was also a significant level of support for the inclusion of health warnings on individual cigarette sticks.

These findings align with previous research, with the two studies comparing multiple cigarette-stick warnings describing the ‘minutes of life lost’ warning as resulting in the lowest appeal ratings and highest increase in post-exposure quitting intentions.^{30,31} In this study, we found that both the novelty of the warning compared to current warnings utilised in Australia, and the

novelty of having the warning ‘directly in the smoker’s face’ were key factors leading to its greater perceived effectiveness. Message and medium novelty have also been key factors of recent research into anti-tobacco interventions, which have included not only cigarette-stick and packaging warnings, but also cigarette pack inserts, and smartphone applications.^{25,30-34,36,37} Public acceptance towards cigarette-stick health warnings (including from current smokers) has also been demonstrated elsewhere, including amongst tobacco packaging experts.^{33,38} Ensuring adequate public support towards anti-tobacco interventions has been a key factor in cigarette packaging interventions, as it informs on the best interventions to employ, their likely effectiveness, and potential for public backlash.³⁹⁻⁴¹

The other warning of note in this theme (immediate and short-term consequences) describing the effect of harming others (including children and pets) when smoking has also had success elsewhere,⁴²⁻⁴⁴ and as demonstrated in this study, smokers may exhibit less concern for their own health compared to the health of others. The use of this type of message has been used and achieved success on cigarette packaging and in mass media campaigns in Australia,⁴⁵ and could also be effective when applied to individual cigarettes. However, as noted in the open-text comments, certain viewers to whom the warnings have no meaning (such as not having a family or pets) will likely not be impacted by the warning, thus diminishing its effectiveness.

The novelty and personal relatability of the theme 3 (social and financial consequences) warnings (particularly the financial consequences) were also perceived as an effective means in reducing tobacco use. Unlike the other themes and previous research, where anti-tobacco techniques tend to have less of an effect on smokers compared to non-smokers,^{39,46-48} this theme was perceived to have an equivalent effect on both smokers and non-smokers. As stated by participants, smokers may care more about money and their financial stability as compared to their health. Also, there has been a perceived irrelevance of the ‘distal’ risks of smoking by younger persons, and an increased importance of the social risks of smoking, as detailed by responses to this theme, and in recent research.³⁷ Despite the generally high level of awareness

of the dangers of smoking,⁴⁹ there is self-exemption from the negative health and addictive consequences of smoking by younger persons.⁵⁰⁻⁵³ Denormalising smoking behaviours and placing emphasis on it being a negative rather than a positive social activity is theorised to have a greater effect on the younger generation.^{54,55}

In comparison to themes 1 and 3, the theme 2 warnings describing the long-term and mortality effects of smoking were seen to share some of the shortcomings of current cigarette packaging warnings, involving the use of established warnings, which have experienced a deterioration in effectiveness through a gradual loss of shock value.¹⁶ Though we did not use the long-established anti-smoking message ‘Smoking Kills’ used in previous cigarette-stick research,³²⁻³⁴ we believe that it might have had the same shortcomings when compared to the other warnings used. The use of novel, or regularly rotated warnings (as employed for Australian cigarette packaging with two rotating sets of seven warnings) alongside the established sets of warnings, may ensure a continual effect on viewer cognition and behaviours, and sustained reductions in tobacco use.

Similarly, the use of supportive messages in theme 4 were partially dismissed as a repetition of current anti-tobacco interventions. However, the ratings and comments generally indicated support towards the use of positive and supportive messages which give options to smokers, and assist in not only initiating, but also succeeding in quit attempts. Less emphasis in current research has been placed on the use of supportive anti-tobacco messages, though some evidence amongst adult smokers suggest that they benefit more from this form of message and this requires further research to determine its effectiveness compared to the more dominant negative warnings on tobacco use.^{56,57}

Combining cigarette packaging with cigarette stick warnings is likely to increase the perceived susceptibility and severity of tobacco-related consequences, as well as providing cues to action (quitting), which are essential components of the Health Belief Model.²⁶ Shifting the balance of risks vs. benefits of smoking towards the ‘risk’ end is theorised to increase the likelihood of

'health promoting behaviours', including not experimenting with smoking (non-smokers), prompting to quit smoking (smokers), and preventing relapse (ex-smokers).^{58,59} Amongst the younger age groups, issues such as exposure to tobacco advertising, peer pressure, individual cigarette-sharing, and limited exposure to cigarette-packaging warnings can minimise the perceptions of the harm of cigarettes, which may be countered by the use of these cigarette stick warnings.

Further research into the feasibility and potential effectiveness of cigarette stick warnings is required to determine the optimal approach in utilising a novel anti-tobacco intervention such as this. Based on the ratings of the themes and comments made by participants, focusing on morbidity issues as a result of tobacco use (such as gradual but permanent reductions in breathing and exercise capacity) as opposed to 'end-game' mortality outcomes may have a greater effect amongst younger persons. The 'minutes of life lost' warning was considered particularly effective amongst participants, and should be the focus of future research into not only cigarette-stick warnings but also potentially cigarette packaging warnings, and in mass-media campaigns. Additionally, modifying the financial cost of smoking warning to be more relevant to a greater proportion of light and moderate smokers, such as the monthly cost of a pack-per-week smoker, may also have greater effects.

There are however limitations to consider when interpreting the results of this study. The brief exposure to each warning does not replicate real world situations of multiple exposures, as well as a lack of concomitant exposure to warnings on both cigarette packaging and cigarettes, reducing the applicability of these results to real-world situations. There was also a disproportionately high percentage of students studying a health-related degree, which may have influenced the overall perceptions of the study sample. Also, the use of an online survey and internet-based recruitment techniques do not necessarily draw a representative sample of the population. However, the use of online photographs as opposed to tactile materials, may have led to an understatement of responses and conservative results. As the themes were

presented in a standardised rather than a random order, it is also possible that participants gave an inflated response to the first set of warnings presented, where the novelty of warnings on cigarettes eclipsed their responses to the actual warning messages. It is also possible that participants adopted a response-pattern by the time they reached the fourth theme at the end of the survey. However, all warnings were presented on the same page, allowing participants to modify their responses at any time, as well as being followed by a ranking task in which each option was displayed in a random order. The higher than expected proportion of older adults in this study may have affected the findings, though it is likely that the results were understated compared to a full cohort of young adults, due to older adults giving less-positive responses to the cigarette-stick warnings being evaluated. Lastly, whilst a larger number of smoking participants were initially desired to increase the strength of the findings, the proportion of both current and ex-smoking participants were representative of the Australian population at the time of this study. Whilst the perceptions of non-smokers (particularly those aged 18-25) are important, further research should ideally aim to recruit a higher proportion of smokers.

7.6 CONCLUSION

Health warnings and messages on individual cigarette sticks may be an effective deterrent to tobacco use amongst smoking and non-smoking university students, particularly if used in combination with currently utilised anti-tobacco interventions. Novel warnings focussing on the more immediate or personable negative effects of tobacco use, such as the minutes of life lost, affecting those nearby, and the financial costs of smoking, may have greater effect than warnings discussing potential future health conditions that may arise due to smoking. Addressing tobacco use amongst this vulnerable population through expressing the negative consequences of tobacco use is essential in improving the health of future generations.

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Chapter EIGHT: Do Health Warnings on Cigarette Sticks Dissuade Smokers and Non-Smokers? A Focus Group Study of Australian University Students

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This chapter details the methodology and findings of a qualitative study involving focus groups and phone interviews, gathering more in-depth perceptions of university students towards current cigarette packaging warnings, and a refined set of cigarette stick warnings and messages. The findings from the online survey prompted the value in retrieving additional data relating to the perceptions of university students as a key target group for anti-tobacco interventions.

8.1 ABSTRACT

Introduction: Young adults are a vulnerable population for experimentation with tobacco, which can lead to lifelong addiction. In an effort to ensure reductions in tobacco use through improved health promotion materials, we explored young adults' perceptions of current Australian packaging warnings, and novel health warnings on individual cigarette sticks.

Methods: Focus groups and interviews were conducted with smoking and non-smoking first-year undergraduate university students at a regional Australian university. Participants discussed their perceptions on the effectiveness of current cigarette packaging warnings, and warnings printed on individual cigarette sticks, and effective future tobacco control interventions. Sixteen students participated across three focus groups, and eleven students participated in the phone interviews. Data was analysed using thematic analysis in NVivo.

Results: Six emergent themes were identified. Current cigarette packaging warnings were seen as ineffective, being disregarded by current smokers (theme 1), and seen as irrelevant by young adult smokers and non-smokers (theme 2). Several cigarette stick warnings were perceived as engaging and effective, due to the novelty of the cigarette stick as a medium (theme 3), and the proximal nature of the warnings used (theme 4). The warning depicting the financial consequences of smoking was considered the most effective, followed by the impact of smoking on personal appearance, and the 'minutes of life lost' warning. Social media (theme 5), and the use of more supportive messages to assist smokers (theme 6) were considered the best next steps as tobacco control interventions.

Conclusions: Supplementing packaging warnings, which were seen as minimally effective in this study, using cigarette stick warnings and social media may lead to further reductions in tobacco use. New and relatable warnings, such as the financial consequences of smoking and impact on personal appearance may be the most effective in dissuading young adults from smoking, particularly within the university environment.

8.2 INTRODUCTION

Tobacco control measures such as educational campaigns and tobacco packaging health warnings have led to significant declines in tobacco use, and its attributable morbidity and mortality.¹ Adolescents and young adults are a key target group for these interventions, as the majority of adult smokers start using tobacco products and developed nicotine addiction during these formative years.² High-school finishers who enrol in college are presented with a unique set of challenges, stressors, and experiences, including exposure to the use of alcohol, tobacco, and other drugs.³ Nearly 4 000 adolescents smoke their first cigarette each day in America, and 14% of 18-24 year olds smoke at least weekly in Australia. Therefore, ensuring that this vulnerable age group are dissuaded from tobacco products, and strengthening their health-promoting behaviours is essential in improving the health of future generations.⁴⁻⁶

Health-promoting behaviours are influenced by several factors, described within multiple theories, such as the Health Belief Model (HBM).⁷ The HBM describes health-related behaviours as being influenced by six major elements, encompassing an individual's perceptions of a behaviour and its relationship to good or poor health, modifying factors (including personal and social), and triggers for taking action.⁸ Within the context of smoking, the HBM describes that a person's perceived susceptibility (element 1) and severity (element 2) of known smoking-related consequences contributes to their belief of how smoking can harm their own health. This belief and their subsequent behaviours are also influenced by their perceived benefits (element 3) (both for smoking and not smoking) and perceived barriers (element 4) (both in quitting smoking and actively smoking). These factors may lead to changes in health behaviour through a combination of a person's cue to action (element 5) and perceived self-efficacy (element 6) in performing these actions.^{7,9-11} The HBM was selected as a theoretical framework for this research due to its multi-faceted construction (six major elements), all of which are addressed to some degree in current tobacco control interventions.

Health warnings therefore play an essential role in ensuring the accurate portrayal of comprehensible negative consequences of tobacco use, and actionable messages to support quitting. In Australia, text and pictorial warnings cover the majority of the packaging surface and are rotated to prevent image wear-out, and are supplemented by plain (standardised) packaging. These interventions have demonstrated effectiveness in reducing tobacco use, through minimising the appeal of tobacco packaging, increasing viewer awareness of the dangers associated with tobacco use, and increasing smoker quit attempts.¹²⁻¹⁵ However, recent research has identified these warnings are subject to diminished effectiveness over time, due to repetition of viewing and a loss of shock value.^{12,16} There are also issues with the vulnerable population of younger smokers not identifying with the fatal and debilitating diseases portrayed on cigarette packs in the same manner as older adults.¹⁷ This lack of a connection between smoking and smoking-attributable diseases amongst this age group results in perceived self-exemption from these consequences and allows rationalisation for continued smoking.^{18,19}

As a potential method for addressing these shortcomings, a novel method for communicating the risks of tobacco is the use of health warnings and messages on individual cigarette sticks. The small number of exploratory studies published in 2015 and 2016 primarily gathered the perceptions of adolescents and young adults.²⁰⁻²⁴ A systematic review of these studies identified that the evaluated health warnings such as ‘Smoking Kills’ and the ‘Minutes of Life Lost’ on cigarettes reduced cigarette appeal, affected viewer perceptions of the harm caused by cigarettes, increased quit intentions, and reduced the likelihood of smoking uptake.²⁵ An additional study that interviewed packaging and marketing experts also found that the cigarette-stick warnings were considered a powerful deterrent.²⁶ Two recent quantitative studies, one amongst school-aged students and one amongst university students, both found a trend of desensitisation towards current packaging warnings, and a high level of acceptance towards cigarette-stick warnings, particularly those depicting novel and shorter-term warnings.^{27,28}

In this study we aimed to build upon these recent findings, and identify health warnings perceived as the most effective by young adults. To achieve reductions in smoking prevalence amongst young adults, they must understand their personal susceptibility to a sufficient range of attributable consequences, whilst also being confident in their ability to avoid smoking (non-smokers), and overcome barriers that prevent them from quitting (smokers). Therefore, developing new health promotion materials that address the elements of the HBM may increase awareness amongst this population, leading to behavioural changes and better health outcomes. We therefore aimed to answer the following research questions (RQ) using a qualitative approach, and relating the findings to the HBM and its six elements:

1. How do university students perceive current cigarette packaging warnings, and their effectiveness as a tobacco control intervention?
2. How do university students perceive the inclusion of health warnings and messages on cigarette sticks, and their potential strengths and weaknesses as a tobacco control intervention?
3. What forms of tobacco control interventions do university students believe as being the most effective in promoting public health into the future?

8.3 METHODS

A combination of focus groups and one-on-one phone interviews were utilised to gather the perceptions of university students towards the effectiveness of current Australian health warnings on cigarette packaging, and experimental health warnings and messages on individual cigarette sticks. First-year undergraduate university students at the James Cook University Townsville campus were initially invited via email by the principal investigator in April 2018 to participate either in a focus group discussion (FGD) or phone interview, with the email containing an information and consent form detailing the purpose of the research and the rights of the participants. A combination of FGDs and one-on-one phone interviews was utilised to

accommodate student availabilities during the teaching semester. Students could respond to the principal investigator, indicating their willingness to participate, and propose suitable times and dates to participate. First year undergraduate students were chosen to primarily recruit recent school-leavers who were within the desired age bracket of 18 to 22 years old, though no potential participants were excluded based on their age. Participants received a \$20 Bunnings (Australian retail chain which does not sell tobacco products) e-gift voucher for participating.

This research was approved by the James Cook University Human Research Ethics Committee. Protocols were the same in both the FGDs and phone interviews, which both utilised the same semi-structured questions. Participants first viewed cigarette packaging (see **Figure 1**) and described their experiences and perceptions of the effectiveness of current packaging warnings. Participants were then prompted to open the cigarette packaging and take out the twelve cigarettes which included health warnings and messages (see **Figure 1**). Each cigarette stick had three lines of text down the shaft of the cigarette printed in red ink, with the entire content of the message read as the cigarette is rotated. The warnings used were evaluated throughout previous research on cigarette-stick warnings,^{20-24,27-29} and were designed to align with the elements of the HBM, and current tobacco control techniques utilised within Australia, such as the description of specific diseases, directions to quit services, and regular increases in taxation of tobacco products.³⁰ Participants were then asked to describe their perceptions of the cigarette-stick warnings and messages. Prior to the phone interviews, participants were emailed the interventional materials, and instructed to view the materials in a certain order in line with the relevant questions being asked. Finally, participants discussed their opinions of effective methods for tobacco control interventions which should be used in Australia to reduce tobacco use.

For the FGDs, students were grouped according to their smoking status, and each group involved between three (3) and seven (7) students. The FGDs were conducted by two of the researchers (AD and BMA) in classroom settings on campus, during working hours. They were audio recorded and ran for up to 60 minutes. The phone interviews were conducted by one researcher (AD), took between 10 and 15 minutes, and were audio recorded. After answering each phone interview question, primary themes identified during the FGDs were put forward to participants. They were prompted to discuss their viewpoint in comparison to what was described during the focus groups, with areas of consent and dissent of primary interest.

None of the participants had any prior relationship with the investigators. Following transcription, participant responses were analysed using thematic analysis (Braun & Clarke, 2006) using NVivo version 11 (QSR International Pty Ltd, Melbourne, Australia).³¹ Two researchers (AD and BMA) independently read the transcripts, identified and confirmed the recurring themes for each research question. A deductive approach was utilised to develop the emerging themes in relation to the six elements in the HBM. Individual and group-based perceptions (including points of participant consent and dissent) were both analysed, with the researchers comparing and reaching consensus on the identified themes by checking them against the research questions, the HBM and wider literature. Primary themes were compared with each element of the HBM, to build a framework to visualise the strengths and limitations of both current packaging warnings and cigarette stick warnings across the six HBM elements. Quotes illustrating the primary themes were identified and reported verbatim.



Theme 1 – Immediate and Short-Term Consequences (ISC)



Theme 2 – Long-Term and Mortality Consequences (LMC)



Theme 3 – Social and Financial Consequences (SFC)



Theme 4 – Supportive Messages to Quit (SMQ)



Figure 8.1 The front and back of two cigarette packaging in circulation in Australia, and the twelve cigarette warnings divided in to the four themes. Each cigarette includes three lines of text and is rotated to read the entire message.

8.4 RESULTS

Sixteen students participated in three focus groups, and an additional eleven participated in the phone interviews. Their characteristics and participation details are listed in **Table 8.1**. There was an overlap of participants' views in the FGDs and phone interviews, with participants having similar views, and many of the issues raised at the focus group discussions resonated in the interview sessions. Overall, six major themes and three sub-themes were identified as described below and presented with verbatim illustrative quotes. The themes identified and their relevance to the elements of the HBM and perceived outcomes on health-behaviours are depicted in **Figure 8.2**. Data saturation was achieved by the ninth phone interview participant (participant #20), where no new data relating to perceptions of cigarette packaging warnings, cigarette stick warnings, or ideas for future tobacco control interventions were identified. Quotations which illustrate these themes are annotated with a numerical indicator to identify the participant, whose details are described in **Table 8.1**.

8.4.1 RQ1: Perceptions of current cigarette packaging warnings

Health warnings currently implemented on cigarette packaging in Australia were generally perceived as minimally effective by all participants (males and females, smokers and non-smokers). Two underlying themes emerged describing the basis for these perceptions: the disregard of packaging warnings, and warning irrelevance to readers. These themes were primarily related to how packaging warnings influence readers' perceived susceptibility and severity of tobacco-attributable consequences.

Table 8.1 Participant characteristics for focus groups and phone interviews.

ID No.	Method of Participation	Pseudonym	Gender	Age	Smoking Status
1	Focus Group #1	Harriet	Female	18	Non-Smoker
2	Focus Group #1	Sylvia	Female	18	Non-Smoker
3	Focus Group #1	Candice	Female	18	Non-Smoker
4	Focus Group #1	Dylan	Male	18	Non-Smoker
5	Focus Group #1	Darren	Male	31	Non-Smoker
6	Focus Group #1	Natasha	Female	33	Non-Smoker
7	Focus Group #2	Dante	Male	21	Smoker
8	Focus Group #2	Jodie	Female	30	Smoker
9	Focus Group #2	Anna	Female	22	Smoker
10	Focus Group #3	Antonia	Female	47	Non-Smoker
11	Focus Group #3	Sally	Female	31	Ex-Smoker
12	Focus Group #3	Trisha	Female	18	Non-Smoker
13	Focus Group #3	Alex	Female	18	Non-Smoker
14	Focus Group #3	Kristina	Female	18	Non-Smoker
15	Focus Group #3	Nikki	Female	19	Non-Smoker
16	Focus Group #3	Krystal	Female	41	Non-Smoker
17	Phone Interview	Jenna	Female	45	Smoker
18	Phone Interview	Sara	Female	19	Smoker
19	Phone Interview	Lonnie	Female	30	Ex-Smoker
20	Phone Interview	Ronny	Male	19	Smoker
21	Phone Interview	Sam	Male	24	Smoker
22	Phone Interview	Lynne	Female	28	Smoker
23	Phone Interview	Belinda	Female	19	Smoker
24	Phone Interview	Tammy	Female	19	Smoker
25	Phone Interview	Carol	Female	30	Smoker
26	Phone Interview	Karl	Male	18	Smoker
27	Phone Interview	Rhiannon	Female	31	Smoker

Disregard of packaging warnings

There was general consensus amongst participants that health warnings on cigarette packaging were now not noticed or internalised by the majority of smokers. *‘I think the packaging gets ignored actively, like put it in their pocket to make sure they don’t see it and no-one else does’* (ID#4), *‘You see all the pictures on the packages and you sort of get used to it. I feel like they never really had an impact on me’* (ID#24). There was however belief that there may be some residual effect on non-smokers and young experimental smokers, due to their less frequent exposure to the warnings and retention of warning shock value. This also contributed to

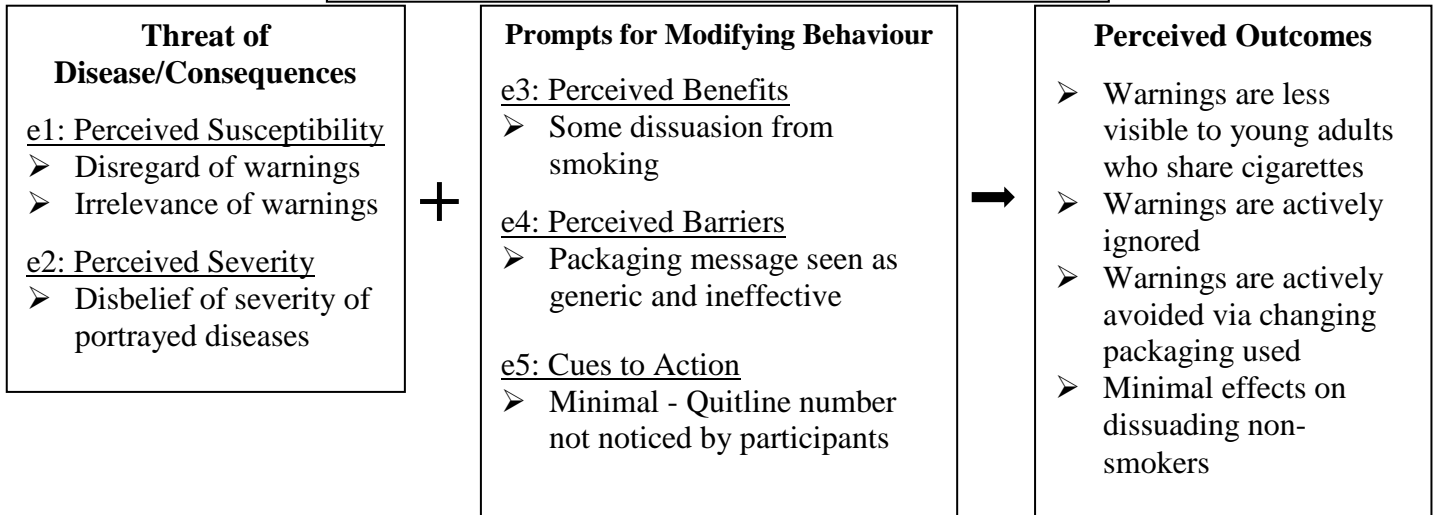
dissuading non-smokers from associating with smokers. *'My dislike towards tobacco products was already there but these packaging warnings have contributed more'* (ID#6), *'The pictures gross me out...it is a deterrent for me, and reinforces what I already know'* (ID#10).

Irrelevance of packaging warnings

There was also an underlying trend of disbelief, and perceptions that current packaging warnings are irrelevant, with younger participants in particular feeling disconnected from the threats of chronic diseases, which may develop after decades of tobacco use. *'Since I have started buying my own [cigarettes], I have ignored the health warnings because I keep telling myself that it would never happen because I am young and am not going to smoke for long'* (ID#26), *'When talking to people about smoking and advertisements, they say they don't really believe the smoke warnings'* (ID#23).

As depicted in **Figure 8.2**, these findings highlight the shortcomings of current packaging warnings relative to the HBM, particularly in depicting an appropriate level of perceived susceptibility to tobacco-attributable consequences. Both non-smoking and smoking participants were also dismissive of the packaging mentioning the benefits of quitting, and the inclusion of the 'Quitline' number on packaging, with the primary reason being a lack of addressing the barriers experienced when quitting. This indicates their minimal effectiveness in acting as a cue to take health-improving actions. The perceived severity of the health consequences portrayed was high however, with participants describing their beliefs of the severity of lung cancer and oral diseases on cigarette packaging.

Elements Influenced by Current Cigarette Packaging



Elements Influenced by Cigarette-Stick Warnings & Messages

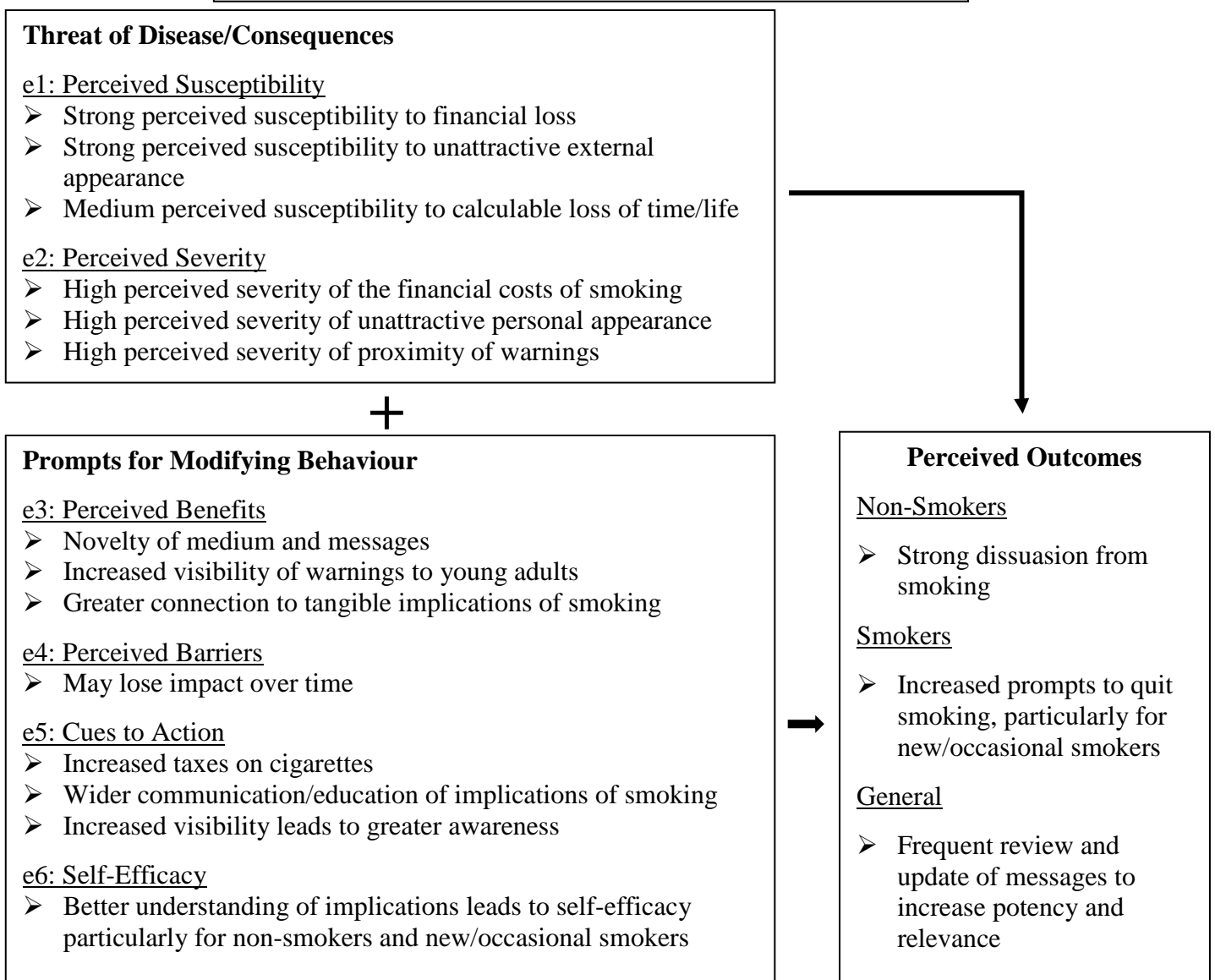


Figure 8.2 Elements (e1-6) of the Health Belief Model influenced by health warnings on current cigarette packaging, and individual cigarette sticks in this study, and perceived outcomes.

8.4.2 RQ2: Perceptions of Cigarette Stick Warnings and Messages

Two major themes emerged describing participants' perceptions of the cigarette warnings and messages: novelty of the cigarette stick warnings, and the proximity of tangible warnings. Proximity of tangible warnings had three sub-themes, namely financial consequences, personal appearance and calculable loss of time. These themes encompassed most of the elements of the HBM, most notably the increased susceptibility and severity of a wider range of consequences of smoking, including non-health consequences. As depicted in **Figure 8.2**, cigarette-stick warnings were also perceived as effective in better outlining the benefits of quitting, and acting as an additional cue for changes in smoking behaviour. The notable exception was the lack of addressing the perceived barriers of quitting, with neither the cigarette packaging nor cigarette stick warnings managing to address this element.

Novelty of the cigarette stick

Most participants showed interest in the cigarette-stick warnings and messages, with non-smokers in particular finding them a novel and potentially effective medium for tobacco warnings and messages. Smokers also held this belief, though to a lesser extent, suggesting that these warnings would likely suffer the same shortcomings as current packaging warnings. They did however support the introduction of cigarette stick warnings, perceived as being likely to lead to some reductions in tobacco use. Utilising the individual cigarette stick as a novel medium for communicating the consequences of smoking received positive comments from non-smokers, though mixed comments from smoking participants. Most could see the benefit of its use as a warning medium due to its visibility when smoking, and opposing the sought-after 'coolness factor'. *'Having warnings on the cigarettes will make them less attractive. Maybe the cool factor will be affected [others agreeing]' (ID#15), 'I remember in high school other people would sell [you individual] cigarettes, and you just got the cigarette and not any of the warnings or anything else (ID#11).*

However, some were also concerned that it might experience the same shortfalls as packaging warnings with repetitive exposure, and be less likely to have an influence on certain sub-groups, such as long-established smokers. *'In the beginning [they might be effective], but it might be the same thing as the pictures, and would just get to be part of the cigarette and you wouldn't really see it anymore'* (ID#9), *'I see this as probably a waste, the only time they might be effective is if they don't see the packaging warnings, because if those warnings don't get to you, then these won't'* (ID#16), *'For a continuing smoker it might work for them...if they want to change their life it might work, but not for other people and the addiction is too strong'* (ID#1).

Proximity of tangible warnings

Specific warnings and messages were also identified as particularly engaging over the others, with the warnings describing the more proximal (short-term) and tangible consequences of smoking perceived as the most likely to be influential on smoking behaviours, both amongst non-smokers and smokers. This included the cigarettes describing the financial cost of smoking, the impact of smoking on personal appearance, and the calculable loss of time, which were perceived as the most relevant and effective.

Financial consequences as the most effective dissuader

The cigarette depicting the financial burden of smoking was the most notably described message by participants as being both novel and universally relatable to the wider population of any age and smoking status. *'If you are a new smoker, you don't want to be spending that much per year. I could buy a car with that, or pay for this year's university fees'* (ID#4), *'A lot of adults in Australia worry about their finances, so saying that smoking a pack a day costs so much is a good prompter for people to start worrying about their wallet'* (ID#26), *'I think the cost of smoking message would hit smokers hard, because cigarettes are really expensive now,*

and for me with a young family, spending that money is better spent elsewhere' (ID#19). This message addresses many of the elements within the HBM. It clearly depicts an accurate susceptibility and severity of smoking from a financial standpoint, clearly outlines the benefits of both not starting to smoke, and the benefits of quitting, and serves as a cue to action for current smokers, who value their real-time financial stability over future health stability.

Importance of personal appearance for young adults

Personal appearance was similarly highly regarded, and considered as a strong motivating factor for young adults to avoid smoking, though believed to be less so for older, long-established smokers. *'A lot of people smoke to keep their weight down...so saying all of those consequences counters the idea that if you smoke, it can help you be beautiful'* (ID#4). The proximal threat of yellow teeth, bad breath, and stained fingers in particular for young women was seen as a strong deterrent, and directly opposed the 'coolness' often sought when smoking. *'The fingers and bad breath one especially for teenage girls, it is very important about how they look'* (ID#9). Conversely, the distal threats of chronic diseases were seen as disconnected from the act of smoking and unlikely to modify smoking behaviours in young smokers. *'I think the stats and cancers are just too far off into the future for younger people, you have a different timeline in perspective in how life is going to be lived'* (ID#21), *'People will think "that won't happen to me, I won't get mouth cancer or emphysema"'* (ID#13). Similar to the financial consequences of smoking, the novelty of this form of warning and its relevance to younger participants increased their perceived susceptibility and severity of smoking, and outlined further benefits of not smoking.

Calculable loss of time

Apart from the financial and appearance-related consequences, the proximal and calculable loss of time (minutes of life) per cigarette was also viewed as a shocking and thought-provoking

message with a strong potential to incite behavioural change. *‘The minutes of life lost I found interesting, because it is serious but not overly dramatic, which some of the pictures can be...I thought it just jumped out at me’* (ID#21). However, some participants believed that describing the loss of such short time-intervals to young people may have the opposite effect, as they feel like they expect to yet live for such a long time compared to older smokers. *‘Though teenagers might not care about their minutes of life lost, like “who cares I am young and I got years to worry about that”’* (ID#8).

8.4.3 RQ3: Future forms of anti-tobacco interventions

Two major themes emerged describing participants’ perceptions of effective ways in promoting further reductions in tobacco use in Australia: social media as a delivery medium for tobacco warning interventions, and an increased proportion of messages which are supportive in nature, to guide smokers in how to quit. These suggestions by participants support the RQ2 findings, where the elements of the HBM relating to self-efficacy and cues to change behaviour were minimally influenced by both the current cigarette packaging, and the cigarette stick warnings and messages utilised in this study.

Social media as a delivery medium

Whilst most participants agreed that the cigarette stick as a medium for warnings may lead to reductions in tobacco use, they also believed that an increased presence of tobacco warnings in social media would reach a greater proportion of young adults. The importance of dissuading young adults from tobacco products combined with their propensity for regular social media use led to its suggestion as a tobacco control platform. *‘Social media is a big platform that everybody is using...the younger generation is being exposed to smoking and it is important to limit that and [influence] the choices they make’* (ID#20). Some participants described the difficulty in making effective social media-based warnings and messages, and the likelihood for poorer message uptake amongst older persons. *‘A lot of middle aged and older people aren’t*

really interested in social media, they might check it once a week...but they don't use it several times a day to see what is going on' (ID#11), 'Social media messages might still come off as being negative, and will either be ignored or avoided' (ID#5).

Whilst not directly linked to any specific element of the HBM, social media platforms as a delivery tool would increase exposure to health warnings and messages, particularly amongst the younger generations, who use this technology frequently. The warnings and messages for implementation within these platforms would then themselves be designed to address specific elements of the HBM according to the needs of the community.

Supportive messages for smokers

Smoking participants in particular also believed that using more positive and supportive messages which guide smokers on how to quit would be more beneficial than the current tobacco warning climate, which is dominated by negative-framed messages. This identified that smokers desire more cues to action for quitting, and need greater self-efficacy in doing so, which they perceive as not being significantly supported by current tobacco packaging interventions. Both smokers and non-smokers believed that the current dominance of negative messages were having minimal (and sometimes the opposite) effect, and smokers were becoming more defensive towards this method of tobacco control intervention. *'You can't always shame smokers for smoking, because it is addictive...so you have to balance "this is really bad" but we also need to support them as well' (ID#3), 'I think using positive messages might be effective, because then it is not being harped on again, rather strategies and options so you feel supported' (ID#17).*

From these findings it is apparent that within the HBM, that participants desire an increase in the range of tobacco control interventions which act as cues to action, and improve smoker self-efficacy to quit. These elements within the HBM were perceived as being poorly addressed

by current packaging warnings, and also not sufficiently addressed by the proposed cigarette stick warnings and messages.

8.5 DISCUSSION

In this study, the Health Belief Model was utilised to gain insights into how health warnings and messages on tobacco products can instigate behavioural change amongst young adult smokers and non-smokers. We found that both smoking and non-smoking university students perceived current cigarette packaging warnings in Australia as having lost much of their effectiveness as tobacco control interventions. We also found that they consider health warnings and messages on cigarette sticks as a novel and potentially effective method for reducing tobacco use, especially when used to convey tangible and engaging messages, such as the financial and appearance-related consequences of smoking. They also identified social media as an additional potentially effective medium for communicating the dangers of tobacco use to young adults. Based on these findings, future health promotion materials could be developed to align with the HBM, with explicit messages that address each of the six key elements, to ensure persons of any smoking status are adequately targeted.

Despite being generally aware of the severity of smoking-related consequences portrayed on cigarette packaging,^{15,32,33} ensuring young adults accurately perceive their personal susceptibility to these consequences has historically been difficult.^{34,35} A perception of disease irrelevance to oneself, and personal invulnerability to becoming addicted to smoking are well documented amongst this population.^{17,36} This is further compounded with the relative lack of advertising of the wider range of smoking-related consequences.^{37,38} Young adults' perceptions may also be blurred as a result of the wide range of alternative tobacco products which have become recently more popular.³⁹ It is therefore essential that the perceived severity of the consequences of tobacco use remains high, alongside new measures which increase perceived personal susceptibility to the wider range of consequences of tobacco use.⁴⁰

Our findings highlight some of the shortcomings of current packaging warnings in depicting an appropriate level of perceived susceptibility to tobacco-attributable consequences. As found in this study and in recent literature, calling attention to the non-chronic and non-health-related but tangible and proximal consequences of tobacco use, may be more effective in dissuading younger adults from smoking.^{41,42} Such warnings include the financial consequences of smoking, impact of smoking on personal appearance and the calculable loss of time. The novelty of these messages within the current tobacco climate alongside their countering of the desired persona sought after by younger persons have been found as effective aspects of tobacco control interventions.^{41,43,44}

Key aspects of these desired personas, such as glamour, individuality, and rebelliousness can be directly opposed through inciting powerful reactions, such as disgust, and a reduced social acceptability of smoking, through illustrating the effects of smoking on personal appearance.^{41,45,46} Utilising novel or unavoidable media (such as social media and cigarette sticks) might be effective in portraying these novel messages, and may “undermine young adults’ perceived social and psychological benefits they hope to access by smoking”.⁴⁷ It is expected that these messages would cause increased perceptions of susceptibility and severity of smoking as well as the benefits of quitting amongst younger smokers, who would resonate more with these consequences as opposed to chronic health consequences portrayed on cigarette packaging.¹⁷ Our findings suggest that cigarette stick warnings may act as additional cue to take action alongside the current packaging warnings. However, additional messages that increase self-efficacy and adequately address the barriers associated with quitting need to be further explored and incorporated into future intervention strategies.

An effective and unique message within this study not currently utilised on cigarette packaging is the financial costs of smoking, particularly relevant within Australia due to regular increases

of taxation of tobacco products.³⁰ Emphasising ‘financial health’ as a component of the tobacco control repertoire is expected to act as a strong cue to action for current smokers, and reinforce the benefits of not smoking for non-smokers, given the effectiveness of using voucher-based incentives in smoking cessation.⁴⁸ Aligning the wording of this message to describe a shorter-term effect, such as the fortnightly or monthly cost of smoking, may elicit even stronger reactions amongst young adults, due to their familiarity with being paid and paying bills at these shorter intervals.

The ‘minutes of life lost’ warning has also been perceived as powerful and capable of eliciting strong emotional reactions both in this and other studies due in part to its perceived immediate impact on smoker, who can ‘*literally see their life ticking away*’.^{20,21} Whilst the HBM does not explicitly discuss proximity as an element influencing health behaviours, it is likely to be an influencing factor within most of the elements when making health-related decisions, particularly perceived susceptibility and severity. Similar to the development of nicotine addiction itself, the closer the link between an activity and its consequence (either positive or negative), the more quickly and strongly an association will form, influencing behaviour.⁴⁹ Other theories, such as Construal Level Theory (which is not strictly a health-related theory) describe the importance of ‘psychological distance’, and less abstract and more concrete thoughts being as a result of reduced temporal distance.⁵⁰ Given the perceived lack of relevance demonstrated by young adults towards current packaging warnings, and their converse perceptions towards short-term effects, challenging self-exemption strategies used by young adults to rationalise and support continued tobacco use may lead to reductions in experimentation amongst this population.^{18,19}

Limitations to consider when interpreting these results include the single exposure of participants to the interventional materials, and an inability to longitudinally track message

salience over multiple exposures, as it would occur in real-world settings. This may have led to responses which are exaggerated in this controlled setting as opposed to those that would occur within the community over time. We also only recruited participants from a single site of university students, making generalisation of the results to different age groups and students from other universities difficult. Therefore, further research is needed to corroborate and expand upon these findings, including evaluating the perceptions of a wider age range of participants, to cigarette stick warnings and messages.

8.6 CONCLUSION

Despite having afforded significant improvements to public health since their introduction, current cigarette packaging warnings have shortcomings as identified by young adults in this study. The wear-out of warning effectiveness, particularly on current smokers highlights the need for an expansion of the current repertoire of tobacco control interventions, to ensure continued reductions in tobacco use. Based on the HBM, novel health promotion materials, such as cigarette-stick warnings describing the financial and personal-appearance consequences of tobacco use are potentially effective future methods for reducing tobacco use. Further research from a larger participant cohort into the perceptions of a wider range of novel and short-term health and non-health warnings is needed to facilitate the implementation of the most effective messages.

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Chapter NINE: Smoker Perceptions of Health Warnings on Cigarette Sticks: A Four-Country Study

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This chapter details the methodology and findings of a mixed-methods online survey gathering the perceptions of an international cohort of active smokers towards current cigarette packaging warnings respective to their countries, and a final refined set of cigarette stick warnings and messages. Active smokers are a key target group for anti-tobacco interventions, which must be effective in prompting and supporting quit attempts.

Smoker Perceptions of Health Warnings on Cigarette Packaging and Cigarette Sticks: A Four-Country Study

9.1 ABSTRACT

Introduction: Innovations in tobacco control interventions are required to ensure continued reductions in global tobacco use, and to minimise attributable morbidity and mortality. We therefore aimed to investigate the perceived effectiveness of current cigarette packaging warnings and the potential effectiveness of cigarette-stick warnings across four countries.

Methods: An online survey was distributed to adult smokers in Australia, Canada, the United Kingdom, and the United States. Participants rated (using 5-point Likert scales) and commented on the effectiveness of current cigarette packaging warnings, and eight cigarette sticks with text warnings in prompting smokers to quit smoking. Ratings were analysed using proportional odds logistic regression, and comments were analysed using content analysis.

Results: Participants (n=678, mean age=44.3 years) from all four countries perceived cigarette packaging warnings as being minimally effective in prompting smokers to quit, citing a desensitisation and irrelevance of the warnings, with American participants particularly critical of their text-only warnings. Compared to packaging warnings, the cigarette stick warnings describing the financial costs of smoking, and the effect of smoking on others were the highest rated in all four countries (Odds ratios and 95% confidence intervals = 3.42 [2.75; 4.25], $p < .001$ and 2.85 [2.29; 3.55], $p < .001$ respectively), and cited as strong messages to convey to reduce smoking. Half of the participants either 'agreed' or 'strongly agreed' to the use of cigarette-stick warnings.

Conclusions: The findings of this study suggest that cigarette packaging warnings may experience a loss of effectiveness over time, eventually resulting in minimal effects on smoker behaviour. Health and non-health focused warnings and messages on individual cigarette sticks represent a novel and potentially effective method for further reducing tobacco use. This would

complement tobacco control interventions currently employed, resulting in public health benefits.

9.2 INTRODUCTION

Tobacco use remains the largest cause of preventable morbidity and mortality,¹ despite the majority of smokers regretting smoking, and wanting to quit.^{2,3} Quit intentions are influenced by multiple factors, particularly the financial cost of smoking,^{1,4} and an awareness of the negative health consequences associated with tobacco use.^{4,5} Messages portraying these consequences are often prominently conveyed in developed countries through a combination of mass media campaigns and cigarette packaging warnings.^{6,7} The World Health Organization (WHO) Framework Convention on Tobacco Control (FCTC) details minimum recommendations for these public health interventions. ‘Article 11’ of the FCTC describes recommended packaging and labelling of tobacco products, including the use of text and pictorial warnings, plain packaging, and the removal of misleading branding elements.⁸

Within the Health Belief Model, health-related behaviours can be explained and predicted through a person’s values and expectations from performing these behaviours.⁹ Key elements within this model (as applicable to smoking) include a person’s perceived susceptibility to and severity of smoking-related consequences, perceived barriers to quitting, their perceived benefits of quitting, the cues to action in changing their smoking behaviours, and self-efficacy in doing so.¹⁰ Tobacco packaging interventions have been effective in addressing gaps in knowledge on the dangers of smoking and misconceptions of cigarette safety, and enhancing the perceived susceptibility and severity of smoking-related consequences.^{7,11-14} There are also few messages on cigarette packaging which enforce the benefits of quitting (especially non-health related benefits), or improve smoker self-efficacy in quitting smoking.¹⁵ Whilst these interventions have led to significant decreases in tobacco use, they may be subject to a ‘wearing-out’ effect due to repeated exposures, with regular smokers viewing these health warnings thousands of times per year.¹⁶⁻¹⁸ This suggests the need for frequent changes of tobacco packaging interventions to ensure a continued impact on smoking behaviour.

Recent research has identified the cigarette stick as a potentially effective medium for conveying the risks of smoking, and may complement warnings present on cigarette packaging.¹⁹⁻²⁴ As the primary packaging of tobacco, cigarette sticks represent a logical and visible medium for health warnings.²⁵ Initial cigarette-stick warnings evaluated amongst smokers and non-smokers were limited, and included ‘Smoking Kills’, the ‘Minutes of Life Lost’ per cigarette, and a list of toxic cigarette constituents.¹⁹⁻²⁵ These preliminary studies received positive responses from participants, and it was stated that further research is needed to better evaluate the potential effectiveness of this form of public health intervention.¹⁹⁻²⁶ Subsequent research investigating the potential effectiveness of a wider range of health and non-health warnings also reported positive findings, with high perceived effectiveness ratings among several warnings and agreeability towards cigarette-stick warnings.²⁷⁻²⁹ However, these studies largely involved non-smoking Australian participants.

Therefore, this study aimed to expand upon previous research on cigarette-stick warnings, utilising a smoker-only cohort. We first aimed to evaluate the perceptions of an international cohort of smokers on the effectiveness of cigarette packaging warnings, to identify their strengths and weaknesses as a tobacco control intervention. We also aimed to evaluate the perceptions of these smokers towards eight health warnings and messages on individual cigarette sticks, and identify those considered most effective in influencing smoker behaviours. We also aimed to gauge participants’ support towards the inclusion of health warnings on individual cigarettes as a public health intervention to reduce tobacco use.

9.3 METHODS

9.3.1 Study Design and Participant Recruitment

This study utilised a cross-sectional study design with an online survey, distributed to adult smokers in Australia, Canada, the United States, and the United Kingdom, in June 2018 using the ‘targeted audience’ function in SurveyMonkey. This function allows surveys to be

distributed to specific participants, which for this study were smokers over the age of 18 years, who use cigarettes, in these four countries. We used the targeting function to recruit 150 smokers from each country, who received no remuneration for participation. Due to previous research utilising the interventional materials in the current study having primarily recruited Australian non-smokers,²⁷⁻²⁹ we therefore intended to assess if these findings were relevant to smokers and had international applications as a tobacco control method.

9.3.2 Procedure and Data Items Collected

The first part of the survey requested demographic information which included: participant country of origin, gender, age, ethnicity, level of education, cigarettes smoked per day (CPD), intentions to quit smoking, and baseline perceptions of the level of harm caused by smoking. The survey had four country-specific versions to account for major ethnic backgrounds in each country, and for some of the interventional materials. Participants were then shown two country-specific cigarette packaging warning examples, representative of the main themes of tobacco control messages used in their country (see **Figure 1**), and rated on 5-point Likert scales (from 'Not at all effective' to 'Very effective') the effectiveness of these warnings in prompting them to quit. They were also prompted to detail in open-text comment boxes on specific strengths or shortcomings of cigarette packaging warnings used in their respective country.

Photos of eight cigarettes with messages printed in red down their shafts were then displayed. Each cigarette had three lines of text (with all sides shown per cigarette), which can be read as the cigarette is rotated, depicting a full message or warning relating to tobacco use (see **Figure 2**). Participants were informed that cigarette-stick warnings could be implemented using non-toxic vegetable inks. The eight cigarette-stick warnings were presented in a random order, and participants rated on 5-point Likert scales (from 'Not at all effective' to 'Very effective') their perceived effectiveness of each warning in prompting them to quit. They also had the option

of describing reasons behind each rating in open-text comment boxes. The cigarette-stick warnings were designed according to the elements of the Health Belief Model, and previous research conducted by the authors of this study, and earlier studies in the UK and New Zealand on cigarette-stick warnings.¹⁹⁻²⁹ Participants were then asked to rank each of the eight cigarette-stick warnings from most to least effective. Lastly, participants rated on a 5-point Likert scale (from ‘Strongly disagree’ to ‘Strongly agree’) their support for or against the implementation of health warnings on individual cigarette sticks in their respective country.

9.3.3 Analysis

Descriptive analysis was used to determine the demographic characteristics of the study population. Non-parametric tests (Kruskal-Wallis and Mann-Whitney U) in SPSS v25 (IBM Corp. Armonk, NY, USA) were used to investigate relationships between demographic variables and participant perceptions of the health warnings, with p-values set at 0.05. Friedman Test was used to measure change in participants’ perceptions across the 9 items (current warnings and the 8 interventional cigarette warnings). Post-hoc tests and Bonferroni adjustments were used to determine statistically 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 us to evaluate between and within-intervention effectiveness (in comparison to current packaging warnings), using the Likert-scale ratings for warning effectiveness as the dependent variable. Responses from open-text comments were analysed independently by two authors (AD and BMA) using content analysis to confirm emerging themes. To establish trustworthiness of the data, findings were compared and conflicting interpretations were resolved through dialogue. Illustrative quotes are reported verbatim to support the discussion.

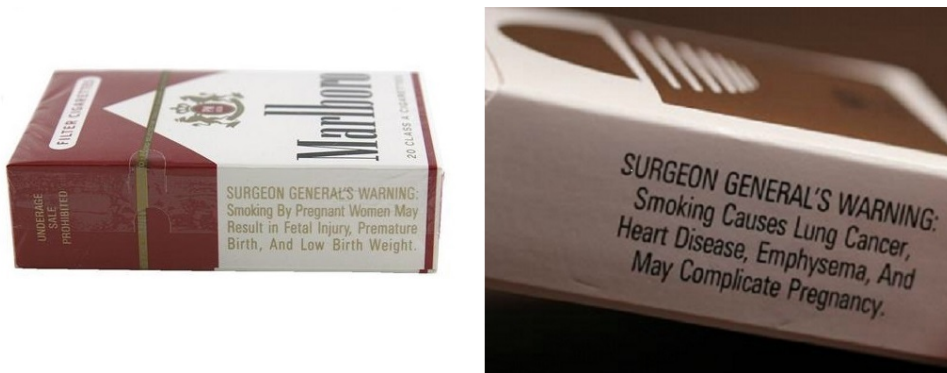


Figure 9.1 Cigarette packaging warnings displayed to participants from each country; Australia (top), Canada (second), United Kingdom (third), United States (bottom).



Figure 9.2 Eight cigarette-stick warnings and messages displayed to participants (in random order). Note: Cigarettes 5 and 8 were different in each of the four versions of the survey to account for country-specific differences in the financial cost of smoking (Australia: \$11 000, Canada: \$5 000, UK: £4 000, USA: \$2 500) and phone numbers for help lines.

9.4 RESULTS

9.4.1 Demographic Profile

Of the 717 participants who accessed the survey, 687 (96%) were eligible for inclusion and their characteristics are shown in **Table 9.1**. There were slightly more females than males (53.4% vs. 46.6%), with a relatively even spread across age groups (33.9% 18-35 years, 40.6% 36-55 years, 25.5% 56 years and older). Most participants had completed high school (98.8%), were of Caucasian descent (82.2%), and smoked between one and twenty CPD (70.3%), though only half (50.4%) had plans to quit smoking. The majority (80.2%) also recognised that smoking was ‘quite’ or ‘very’ harmful to a person’s health (4 and 5 on the Likert-scale respectively).

9.4.2 Perceived Effectiveness of Current Cigarette Packaging Warnings

There were significant differences between most countries for participant ratings of current packaging warning effectiveness. Americans had significantly lower ratings for their packaging warnings compared to other countries ($p < .05$), with nearly three quarters (72.3%) of participants considering them ‘not at all’ or ‘minimally’ effective (1 and 2 on the Likert scale respectively) in prompting current smokers to quit (mean rating 2.07). This is in comparison to half (51%) of Australians (mean rating 2.54), and one-third (36.1% and 35.1%) of UK (mean rating 2.98) and Canadian (mean rating 2.87) participants respectively ($\chi^2 83.177$, $p < .001$). Other factors significantly affecting current packaging warning ratings included participant age, and the number of CPD smoked. The youngest age group were more likely to consider them as ‘quite’ or ‘very’ effective (4 and 5 out of 5 on the Likert scale respectively) compared to the oldest participants (27.9% vs. 14.3%, $\chi^2 18.904$, $p = .015$). Similarly, lighter smokers were more likely to consider them as ‘quite’ or ‘very’ effective (38% for occasional smokers, and 26.8% for those smoking 1 to 10 CPD), compared to heavier smokers (18.3% for those smoking 21-29 CPD, and 15.7% for those smoking 30 or more CPD) ($\chi^2 38.887$, $p < .001$).

The open-text comments reflected the Likert-scale ratings, with nearly two-thirds (63.4%) of participants describing their opinions of current packaging warnings. Whilst some participants from each country (from 10.2% of Americans up to 23.7% of Australians) described the warnings as retaining some of their efficacy (particularly on youth), the majority of comments (from 48.0% of participants) were negative. The most common reasons for negative comments on the effectiveness of current packaging warnings was a perceived loss of efficacy, warning irrelevance to smokers (especially younger participants), or desensitisation towards the warnings. These comments were made by many participants, ranging from 33.3% of Canadians up to 41.6% of Australians. *‘Because they’re everywhere, people become desensitised to them.*

Table 9.1 Participant demographics for each country (total n = 687).

		Australia	Canada	United Kingdom	United States	Total
Country of Origin		190	165	155	177	687
Gender	Male	77	89	67	87	320
	Female	113	76	88	90	367
Age (years)	Mean	41.4	39.1	42.5	53.8	44.3
	Range	19 – 73	18 – 78	19 – 74	19 – 84	18 – 84
	Std. Dev.	12.8	14.0	13.4	14.8	14.9
Ethnicity	Caucasian	159	120	139	147	565
	Indigenous*	11	11	9	8	39
	Hispanic	0	0	0	11	11
	Asian	10	27	3	7	47
	African	1	2	1	0	4
	Middle-Eastern	6	2	2	3	13
	No response	3	3	1	1	8
Education	No schooling	0	1	0	2	3
	Primary school	2	2	0	1	5
	High School	54	55	57	44	210
	Trade/Vocational	66	36	34	47	183
	Undergraduate	51	47	37	52	187
	Postgraduate	17	24	27	31	99
Cigarettes per day	Less than daily	24	19	14	22	79
	1 – 10	57	60	58	56	231
	11 – 20	63	57	57	75	252
	21 – 30	35	22	20	16	93
	31 +	11	7	6	8	32
Intention to Quit	No plans/intentions	24	21	20	30	95
	Intends to but no plan	67	60	55	67	249
	Within 12 months	80	65	59	30	237
	Within 3 months	19	19	21	50	109
Perceptions of Harm from Smoking	Not at all harmful	1	2	1	0	4
	Minimally harmful	4	8	4	3	19
	Moderately harmful	34	26	19	34	113
	Quite harmful	51	57	45	66	219
	Very harmful	100	72	86	74	332

* Australia; Aboriginal or Torres Strait Islander, Canada; Native Canadian or African American, United Kingdom; Black British or Afro-Caribbean, United States; African American.

I know they don't bother me anymore' (Female, 30, Australia). *'Worst case scenario portrayed on packs, minimal effect on quitting'* (Male, 63, UK). *'If someone is willing to smoke, they will smoke no matter what the message or image on the packet is'* (Male, 36, Canada). *'I think that when originally implemented, the impact was very much higher than today. I also suspect that even today the warnings will have some effect on youth'* (Male, 70, America).

9.4.3 Perceived Effectiveness of Health Warnings on Cigarette Sticks

Cigarette stick warnings were rated in the same country-specific order as for the cigarette packaging warnings, with UK smokers rating each cigarette stick the highest, followed by the Canadians then Australians, and Americans giving the lowest ratings (see **Appendix 9.1**). Compared to the overall mean rank for packaging warnings (2.60 out of 5), cigarette stick ratings 1 to 8 were 2.91, 3.06, 2.93, 2.61, 3.11, 2.49, 2.53, and 2.72 respectively. **Table 9.2** shows the results of the proportional odds logistic regression analysis, including reference levels and points of significance. The cigarette warning describing the financial costs associated with smoking (cigarette #5) was consistently rated the most effective in all four countries (odds ratio [OR] and 95% confidence interval [95%CI] = 3.24; 2.75-4.25, $p < .001$ compared to current packaging warnings) followed by the cigarette warnings describing the effect of smoking on others (cigarette #2) (OR = 2.85; 95%CI 2.29-3.55, $p < .001$). The lowest rated cigarette warning overall (cigarette #6) describing social issues associated with smoking, was rated lowest in all countries except for the UK (where it was the second lowest) (OR = 0.70; 95%CI 0.57-0.88, $p = .002$). Other factors affecting cigarette stick ratings included: age, CPD, and quit intentions. The oldest age group were less likely to rate cigarettes 1, 2, 5, and 7 as 'quite' or 'very' effective compared to the youngest age group (all $p < .01$). Heavier smokers similarly were significantly less likely to rate cigarettes 1-6 as effective compared to occasional smokers (all $p < .01$), as were those with no quitting intentions compared to those who had plans to quit within the next 12 months for all 8 cigarette warnings (all $p < .01$).

Table 9.2 Proportional odds logistic regression model, with bolded p-values showing points of significance within the data.

Variable	Est.	SE	Z value	Odds Ratio	95% Confidence Intervals		P value	
					Lower	Upper		
Participant Characteristics								
Gender (Female = 0, Male = 1)	0.487	0.219	2.219	1.63	1.06	2.50	.026*	
Age Group ¹	36-55 years	-0.274	0.255	-1.075	0.76	0.46	1.25	.283 ^{NS}
	56 years+	-0.428	0.310	-1.380	0.65	0.36	1.20	.168 ^{NS}
Ethnicity ²	Indigenous	1.307	0.465	2.812	3.70	1.49	9.19	.005**
	Asian	0.426	0.444	0.961	1.53	0.64	3.66	.337 ^{NS}
	Other	0.249	0.484	0.515	1.28	0.50	3.31	.607 ^{NS}
Education ³	Trade/Tech/Voca	-0.075	0.281	-0.268	0.93	0.53	1.61	.789 ^{NS}
	Undergraduate	-0.256	0.282	-0.909	0.77	0.45	1.35	.363 ^{NS}
	Postgraduate	-0.364	0.345	-1.054	0.69	0.35	1.37	.292 ^{NS}
Country ⁴	Canada	0.469	0.301	1.560	1.60	0.89	2.88	.119 ^{NS}
	UK	0.853	0.304	2.811	2.35	1.29	4.26	.005**
	USA	-0.388	0.321	-1.208	0.68	0.36	1.27	.227 ^{NS}
Quit Intentions ⁵	No plans to quit	-0.082	0.346	-0.237	0.92	0.47	1.82	.813 ^{NS}
	<12 months	0.865	0.358	2.417	2.38	1.18	4.79	.016*
	<3 months	0.645	0.415	1.556	1.91	0.85	4.30	.120 ^{NS}
CPD ⁶	1-10 CPD	-0.549	0.365	-1.506	0.58	0.28	1.18	.132 ^{NS}
	11-20 CPD	-0.482	0.363	-1.327	0.62	0.30	1.26	.185 ^{NS}
	21+ CPD	-1.636	0.412	-3.975	0.19	0.09	0.44	<.001***
Perceptions of harm caused by smoking ⁷	Quite Harmful	0.769	0.313	2.458	2.16	1.17	3.98	.014*
	Very Harmful	1.270	0.303	4.195	3.56	1.97	6.45	<.001***
Cigarette Stick Effectiveness⁸								
1: Minutes of Life Lost	0.725	0.110	6.572	2.06	1.66	2.56	<.001***	
2: Effect of Smoking on Others	1.048	0.111	9.484	2.85	2.29	3.55	<.001***	
3: Risk of Mortality from Smoking	0.764	0.110	6.978	2.15	1.73	2.66	<.001***	
4: Risk of Addiction from Smoking	-0.055	0.110	-0.505	0.95	0.76	1.17	.614 ^{NS}	
5: Financial Cost of Smoking	1.230	0.111	11.091	3.42	2.75	4.25	<.001***	
6: Social Issues with Smoking	-0.351	0.111	-3.166	0.70	0.57	0.88	.002**	
7: Dealing with Cravings	-0.227	0.111	-2.043	0.80	0.64	0.99	.041*	
8: Planning to Quit	0.222	0.110	2.016	1.25	1.01	1.55	.044*	

*** <.001 ** <.01 * <.05 NS = Not significant

¹ Reference level was the 18-35 year old age group

² Reference level was Caucasian heritage

³ Reference level was High School education

⁴ Reference level was Australia

⁵ Reference level was no interest or intentions to quit

⁶ Reference level was occasional smoking

⁷ Reference level was 'Some Harm' (3 on Likert Scale)

⁸ Reference level was current packaging warnings

There were fewer open-text comments provided for cigarette-stick warnings (between 12% and 15% of participants per cigarette), though these comments provided insight as to why certain warnings and messages were perceived as more effective than others. Comments for the cigarette describing the financial costs of smoking were evenly split between those that were supportive/positive, and those that were dismissive/negative. Positive comments described the importance of money as a motivator for quit attempts, with the large annual cost associated

with smoking as being a powerful message. *‘When you bring the financial aspect into it, it really opens people’s eyes and they might cut down or even quit’* (Male, 30, Canada). *‘This is the most effective argument of all. People play fast and loose with health issues, but a reminder about the drain on the wallet will probably be a lot more effective with many people in our current times’* (Female, 47, America). Negative comments related to warning irrelevance (e.g. to smokers who smoked less than one pack per day) or already being aware of the financial cost of smoking. *‘There are a lot of smokers who do not smoke that much, that this wouldn’t persuade’* (Female, 22, Canada). *‘People are aware of the cost of cigarettes when they go buy them, and this doesn’t change their view’* (Female, 22, UK). Comments for the cigarette describing the effect of smoking on others were slightly more positive (58% vs. 42%), with participants usually acknowledging the importance of not harming others as a result of their habit, though many cited the irrelevance of the warnings to their personal situation, or that they know about the effects of smoking on others and have already taken steps to prevent this issue. *‘If you care about your family and pets, especially young children, how can you ignore this one?’* (Female, 60, America). *‘I smoke outside to avoid this, so it doesn’t affect me’* (Female, 22, UK). *‘Family is probably the biggest concern for me, and that they may have to deal with the consequences of my habit’* (Male, 26, Australia). *‘I have no children or pets, and I only smoke around family that smoke’* (Male, 48, Canada).

9.4.4 Support for Health Warnings on Cigarette Sticks

The same country-specific order as seen previously was seen for including health warnings on individual cigarette sticks, with UK smokers being the most supportive, followed by Canada, Australia, and the United States. Participant acceptance towards the implementation of cigarette-stick warnings was high for each country, with about half (50.7%) of all participants either ‘agreeing’ or ‘strongly agreeing’. Country-specific averages were 3.31, 3.43, 3.75, and 3.91 out of 5 for Australia, Canada, the UK, and United States respectively, with a total average

of 3.42 out of 5. Only 12% of participants left open-text comments (likely due to being the end of the survey), though this included strong and emotive responses equally for and against warnings on cigarette sticks. *‘I think this would have teenagers thinking twice, I know it would have impacted me greatly as a teen. Even now as an adult we all need constant reminders in our lives to do better, and I think these statements do it way better than the old ads’* (Female, 35, America). *‘Printed comments on the actual cigarette seems like a joke. If they have a cigarette in their hand they are going to smoke it no matter what is printed on it, just like on the box’* (Female, 42, America). *‘Everyone is used to seeing the warnings on the packages and most often those packages are thrown away. It could be different if the warnings were on individual cigarettes’* (Female, 24, Canada). *‘Smokers are immune to pictures and words. I couldn’t even tell you what is on the packet I’m smoking now’* (Female, 54, Australia).

Other factors significantly affecting support for cigarette-stick warnings included intentions to quit smoking, and baseline perceptions of the harms of smoking. Those who intended to quit smoking, and those acknowledging the dangers of smoking were more likely to ‘agree’ or ‘strongly agree’ to the inclusion of health warnings on cigarette sticks compared to those with no intentions to quit, and those who only considered smoking ‘somewhat harmful’ ($p < .001$).

9.5 DISCUSSION

In this study, health warnings on cigarette packaging currently implemented across Australia, Canada, the United Kingdom, and the United States were generally perceived as minimally effective in prompting current smokers to quit, with irrelevance and desensitisation to the warnings being commonly cited. In comparison, four of the eight cigarette-stick warnings were rated as more effective than current packaging warnings in all countries (cigarettes 1, 2, 3, and 5), with Americans rating all eight cigarettes warnings higher than their current packaging warnings. Within the HBM, these four cigarette stick warnings all aimed to increase readers’ perceived susceptibility and severity of smoking. There was also significant support for the

inclusion of health warnings on individual cigarette sticks, with half of participants ‘agreeing’ or ‘strongly agreeing’ with the premise. Amongst this cohort, younger and lighter smokers demonstrated higher perceived effectiveness ratings towards both cigarette packaging and cigarette stick warnings, likely due to their less extensive dependence on tobacco products and exposure to packaging warnings, alongside recent trends of improved public health initiatives as per the WHO FCTC guidelines.

Of the four participating countries in this study, America is the only one without pictorial warnings on their packaging, including only small text warnings,¹⁵ likely responsible for their lower ratings of packaging warning effectiveness compared to the other countries. These findings reinforce the need for more effective tobacco packaging interventions in America, such as those initially planned for release in 2012, though were prevented through an injunction initiated by several tobacco companies.³⁰ Also, despite having pictorial warnings present, Australian ratings of their packaging warnings were lower than Canada and the UK. This could be potentially due to differences in the variety of warning themes and specific pictures used compared to Canada, and the recent implementation of plain packaging in the UK, which increase the visibility and recall of warnings.¹⁵ Two common themes expressed by participants in all four countries was perceived irrelevance and desensitisation to the warnings, demonstrating the need for warnings that are both novel and more generalisable to the wider population. Less emphasis on the ‘worst-case’ or ‘end-game’ diseases which might occur due to smoking (such as those currently dominating cigarette packaging warnings), and a greater emphasis on negative outcomes (and not those restricted to personal health) which affect a wider proportion of smokers earlier in their smoking career may therefore have greater effects.

In this study, we identified the financial consequences of smoking as being consistently the most effective message in prompting current smokers to quit, a message which is not currently portrayed on cigarette packaging in any of the four participating countries, despite research

identifying it as a key motivator for quit attempts.^{1,4,31-34} Within the HBM, and as identified through the open-text comments, perceived susceptibility and severity of the financial strains of smoking appears to be much more generalizable and relatable than health-related consequences of smoking. Similar to the shortcomings of current packaging warnings, perceived irrelevance may have limited the ratings of this message, as nearly half of participants smoked half a pack per day or less, reducing the impact of the annual cost estimate of smoking one pack per day. Increased message relatability (and effectiveness) could be achieved through depicting the fortnightly or monthly costs of light or moderate smoking, which are shorter-term and may be more relatable in terms of general living costs. Implementing such a message would be particularly beneficial if used in conjunction with tax increases on tobacco products, such as those being annually applied within Australia.³⁵

Unlike the financial costs of smoking, the second highest rated warning in this study describing the effects on others has been implemented on cigarette packaging (except America), indicating the need for this theme of message to continue as an a tobacco control intervention. Many participants considered this warning irrelevant to them, particularly if they were already taking steps to minimise the exposure of those around them to their smoking, though previous research has indicated that not all smokers acknowledge that smoking can cause significant harm to close-contact non-smokers.^{11,13,36} Improving public awareness of the effects of both second- and third-hand smoke may lead to improved efficacy for this theme of warning.^{36,37} Previous research has also identified a gap in knowledge on the specific health consequences of tobacco use.^{11,13} Whilst not explicitly examined in this study, some lesser-acknowledged consequences of tobacco use, such as male impotence, an earlier onset of menopause, osteoporosis, and several dental diseases, may benefit from greater exposure on both cigarette packaging and cigarette sticks, potentially made more effective through causing embarrassment or guilt when visible to onlookers.^{11,13,38,39} A similar effect occurs with dissuasively coloured cigarettes, with

darker coloured cigarette paper opposing the desired persona of smokers, increases their perceptions of the cigarette in causing harm, and may stimulate quit attempts.^{21,26} An investigation into combining of dissuasively coloured cigarettes and cigarette-stick warnings would be an important next step in evaluating the full potential of the cigarette stick as a tool for controlling tobacco use.

Increasing smokers' perceived susceptibility to both health- and non-health-related smoking-attributable consequences, through a combination of cigarette packaging and cigarette-stick warnings and messages, is likely to prompt quit attempts amongst smokers. An additional advantage of cigarette stick warnings is their visibility during smoking, and inability to be easily concealed or avoided entirely, as can occur for packaging warnings, particularly amongst adolescents.^{40,41} The severity of the consequences portrayed should also be perceived as applicable to the majority of smokers, which was identified as a limitation with current packaging warnings, and some of the cigarette stick warnings in this study. Apart from these two components, which are commonly addressed through current packaging warnings, the Health Belief Model also indicates the significance of a smokers' cue to action and self-efficacy in quitting.⁹ Cigarettes 7 and 8 which gave advice on how to quit and deal with cravings were rated similarly to packaging warnings, though previous research has indicated that some adult smokers prefer this approach and encourage the availability of supportive messages.^{42,43}

Further research into a larger international population of smokers and non-smokers using tailored and generalizable health warnings and messages is needed to better determine the potential efficacy of this novel form of intervention. Regular updates and message rotation would also require investigation, to ensure that cigarette stick warnings do not suffer from the same loss of impact over time as packaging warnings.^{12,44} Identifying specific reactions to individual warnings, such as their ability to attract attention, comprehension, credibility,

emotional appeal, and personal applicability, would provide more detail as to why certain warnings are perceived as effective and how ineffective warnings may be improved.

Limitations to consider when interpreting the results include the participants solely being from developed countries, where tobacco packaging warnings and policies differ from developing countries. This includes differences in smoking prevalence, social acceptability, and the rates of use of non-cigarette tobacco products. Comparing cigarette stick and cigarette packaging warnings is also made difficult when taking into account the medium of warning delivery, with the novelty of cigarette-stick warnings likely influencing to some extent the Likert-scale ratings of warning effectiveness. The presentation of different packaging warnings per country prior to the stick warnings may have also conditioned participants and influenced their ratings of the cigarette stick warnings. We also did not compare the demographics of the samples against the norm for each country, with sample bias potentially affecting the generalisability of the findings to each country and also to countries not involved in this study. The brief exposure to each warning also did not replicate real-world situations, or examine the diminishing effectiveness of warnings over repeated exposures. The use of online photographs compared to tactile materials may have also affected participant responses.

9.6 CONCLUSION

This study identified current health warnings on tobacco packaging in four countries as having lost their impact as deterrents to smoking, highlighting the need for an update in current tobacco packaging interventions. We also found that health warnings and messages on cigarette sticks were generally well-received, and perceived as an effective additional source of information for smokers, particularly those which relate to the financial burdens of tobacco use, and the effect that smoking has on others apart from the active smoker. Providing novel and effective messages for smokers to prompt quit attempts could result in significant public health benefits through the reduction of tobacco-attributable morbidity and mortality.

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Appendix 9.1 – Country-specific Likert scale ratings of cigarette packaging and cigarette stick health warnings

Table F.1 Country-Specific Likert-Scale Ratings of Cigarette-Packaging and Cigarette-Stick Health Warnings.

Country	Current	Cig 1	Cig 2	Cig 3	Cig 4	Cig 5	Cig 6	Cig 7	Cig 8	Cig AVG	OpinHW
AUS	2.54	2.79	3.04	2.85	2.46	3.11	2.34	2.51	2.63	2.72	3.31
CAN	2.87	3.08	3.18	3.02	2.75	3.27	2.56	2.63	2.85	2.91	3.43
UK	<u>2.98</u>	<u>3.17</u>	<u>3.28</u>	<u>3.25</u>	<u>2.89</u>	<u>3.30</u>	<u>2.82</u>	<u>2.74</u>	<u>2.92</u>	<u>3.05</u>	<u>3.75</u>
USA	2.07	2.65	2.77	2.66	2.38	2.78	2.29	2.29	2.53	2.55	3.19
AVG*	2.60	2.91	3.06	2.93	2.61	3.11	2.49	2.53	2.72	2.79	3.42

*AVGs may be slightly different due to rounding done in excel rather than with 2 decimal points.

Bold and green = Highest scoring cigarette per country (financial costs) Bold and red = lowest scoring cigarette per country

Underlined = highest score per item across countries Likert-Scale Ratings: 5-point; Not at all effective (1) to Very effective (5)

Current = Current Packaging Warnings

Cig 1 = Minutes of Life Lost

Cig 2 = Effect of Smoking on Others 2nd overall

Cig 3 = Risk of Mortality from Smoking

Cig 4 = Risk of Addiction from Smoking

Cig 5 = Financial Cost of Smoking 1st overall

Cig 6 = Social Issues with Smoking Last in 3 of 4 countries

Cig 7 = Dealing with Cravings

Cig 8 = Planning to Quit

OpinHW = Opinion (from Strongly Disagree to Strongly Agree) of health warnings and messages being included on all cigarette sticks

Chapter TEN: General Discussion

10.1 DISCUSSION

Since their introduction in 1973, health warnings on cigarette packaging have significantly contributed to Australia's consistent reductions in tobacco use.^{1,2} These reductions are achieved through a combination of increasing the public's awareness of their susceptibility to smoking-related consequences, and the severity of these consequences, as well as prompting changes in smoker behaviour.³ These effects were greatest in the period immediately following the implementation (and strengthening) of these health warnings, but subsequently their effectiveness has gradually diminished.⁴⁻⁷ Given that Australian cigarette packaging has been unchanged since the implementation of plain packaging in 2012, and has displayed the same graphic images since 2006, it is likely that the current warnings are now exhibiting a diminished effect on smoking behaviours.^{1,4}

This thesis aspired to achieve four aims (as stated in Section 1.3.1); to assess (1) the overall Australian perceptions of current packaging warnings, (2) non-smokers' perceptions (focusing on adolescents and young adults) of cigarette-stick warnings, (3) smokers' perceptions of cigarette-stick warnings, and (4) overall support for the implementation of cigarette-stick warnings. From these aims, research questions were developed to: (1) create an initial understanding of how health warnings on tobacco products are perceived, (2) understand how prevention of smoking amongst young people can be improved through tobacco warnings, and (3) understand how smoking cessation can be stimulated through the use of tobacco warnings.

Table 10.1 outlines the primary findings from Chapters 2 to 9, and how the findings of these chapters relate to the overall thesis including the aims, hypotheses, research questions, and the HBM theoretical framework utilised. Sections 10.1.1 to 10.1.3 in this discussion aim to address these research questions through triangulating the data from Chapters 2 to 9.

Table 10.1 Primary findings of each chapter and their contributions to the thesis, including the aims and hypotheses, and alignment with the HBM.

Chapter	Major Findings [#]	Contribution to the thesis* and alignment with the HBM [^]
2	<p>This systematic review found that adolescents perceive graphic health warnings as more credible, noticeable, personable, and effective than text-only warnings. Adolescents can also self-exempt themselves from the portrayed consequences of smoking. In terms of effective graphic images, lung and oral diseases were perceived as the most effective, as were those that were depicted in colour rather than black and white, and those that portrayed real people and their stories. Plain packaging was found to cause perceptions of lower appeal, inferior taste, and increased harm, though there was a minor trend of having the opposite effect on adolescent perceptions. Plain packaging also affected the aesthetics and social acceptability of smoking.</p>	<p><u>Contribution:</u> The findings of this review gave an understanding as to the consequences of smoking that adolescents relate to most strongly. This contributed to the design of the first set of cigarette-stick warnings utilised in adolescents in Chapter 5, as well as the actual questions used in the online surveys. These findings contribute to Aim 2 and Hypotheses 2 and 3 of the thesis.</p> <p><u>HBM:</u> Elements 1 and 2 were most frequently employed within the studies included in this review, with warnings designed to cause shock, fear and anxiety. Few warnings or messages utilised any of the other elements or modifying variables, indicating a potential gap in public health interventions aimed at preventing adolescent non-smokers from smoking.</p>
3	<p>This systematic review found that cigarette stick design can significantly affect viewers' perceptions. Sticks with varied dimensions, embellishments and bright colours affected perceptions of quality, harm, and 'coolness'. Dark coloured cigarettes were seen as boring, cheap and more harmful. The 'minutes of life lost' cigarette-stick warning was perceived as the most effective, with warnings also affecting social standing and acting as a constant reminder to quit. Placement of warnings down the length of the cigarette was the most effective.</p>	<p><u>Contribution:</u> The findings of this review contributed to the development of the first set of cigarette stick warnings utilised in Chapters 4 to 6, and the positioning of the warnings, as well as the actual questions used in the online surveys. These findings contribute to Aims 2 and 3, and Hypotheses 2 and 3 of the thesis.</p> <p><u>HBM:</u> Similar to the findings of chapter 2, Elements 1 and 2 were exclusively employed within the studies, which may not adequately impact upon the behaviour of current smokers, and indicates the need for a wider range of warnings and messages.</p>
4	<p>These online surveys of the Australian community found that current cigarette packaging warnings have lost much of their effectiveness as a tobacco control intervention since their initial implementation. Non-smokers had significantly higher perceived effectiveness of cigarette packaging warnings. Of the cigarette-stick warnings, the mortality statistics and financial consequences of smoking were perceived as the most effective, with non-smokers and younger participants giving higher effectiveness ratings across most themes.</p>	<p><u>Contribution:</u> This first original-research component of the thesis established the groundwork for cigarette-stick warning refining in Chapters 7 and 8 alongside the findings from Chapters 5 and 6. All Aims and Hypotheses were addressed in this chapter relating to cigarette packaging and cigarette stick warning effectiveness.</p> <p><u>HBM:</u> As opposed to the previous chapters, Elements 1, 2, 3, and 5 (and the HBM modifying variable economy) were utilised in this study, though it was identified that there was a failure to address Element 4 and 6 (addiction and overcoming addiction).</p>

5	<p>The online survey and interviews with Australian pharmacists found that cigarette packaging warnings were considered as having retained some of their effectiveness, more so than the community in Chapter 4. Similar to Chapter 4, the mortality statistics and financial consequences of smoking were perceived as the most effective. Unlike Chapter 4, there were few differences in perceptions of effectiveness across different age brackets and genders. Major reasons for quitting identified included pressure by family members, experience with a smoking-related illness, and financial strain. Additional themes of effective warning identified in the interviews included appearance-related effects of smoking and harming others.</p>	<p><u>Contribution:</u> The findings of this study largely supported the data from Chapter 4, and contributed to the refining of cigarette-stick warnings utilised in Chapters 7 and 8. In particular the development of warnings describing the short-term and appearance-related consequences of smoking. They also contribute to moving forward in having health professionals assist smokers in quitting. All Aims and Hypotheses were addressed in this chapter. <u>HBM:</u> As for Chapter 4, Elements 1, 2, 3, and 5 (and the HBM modifying variable economy) were utilised in this study, with Element 5 in particular being viewed as an under-utilised technique for prompting smokers to quit, especially through reinforcing a smokers' primary reason(s) for quitting.</p>
6	<p>This online survey of Australian school-aged students found that similar to pharmacists in Chapter 5, adolescents perceive cigarette packaging warnings as having retained some efficacy, finding them 'graphic', 'gross', and off-putting. However, similar to Chapter 4, desensitisation to the warnings was also a concern, as well as poor relatability. Only the mortality statistics of smoking were perceived as significantly more effective as packaging warnings, with the minutes of life lost in particular cited as effective. Similar to Chapters 4 and 5, supportive messages were highlighted as lacking in current interventions.</p>	<p><u>Contribution:</u> This final study utilising the first set of cigarette-stick warnings was key in the development of the refined set of warnings in Chapters 7 and 8 due to the intended similarity in ages between the school and university students. This study focused on addressing Aim 2 and Hypothesis 2 in this thesis. <u>HBM:</u> As for Chapters 4 and 5, Elements 1, 2, 3, and 5 (and the HBM modifying variable economy) were utilised in this study. Modifications to the warnings in Elements 1 and 2 relating to depicting shorter-term and relatable consequences of smoking were key findings of this study in relation to the HBM elements.</p>
7	<p>This online survey of Australian university students utilising the refined cigarette-stick interventions found that current packaging warnings perceived to a similar level as the Australian community in Chapter 4; minimally effective, with older participants being more negative regarding their efficacy. The short-term consequences, and modified social and financial consequences themes were perceived as the most effective, with younger and female participants having significantly higher ratings across the themes. The refined theme long-term and mortality consequences were also perceived as effective.</p>	<p><u>Contribution:</u> The findings of this study highlighted the improvements sought after from Chapters 4-6, with the onset of the consequences a key finding compared to the previous studies. All Aims and Hypotheses were addressed in this study. <u>HBM:</u> Unlike the previous chapters, the refined cigarette-stick warnings better addressed Elements 4-6 whilst retaining an emphasis on Elements 1 and 2. The use of supportive messages to overcome barriers in quitting (especially addiction), and improve self-efficacy amongst smokers were well supported in this study compared to Chapters 4-6.</p>

8	<p>Focus groups and interviews with Australian university students found that, like the previous Chapters, current cigarette packaging warnings are minimally effective as tobacco control interventions, with warning irrelevance (as seen in Chapters 2 and 6) and disregarding of warnings (as seen in Chapter 5). Discussions on the cigarette-stick warnings found that warning novelty and the proximity of tangible warnings were key in their perceived effectiveness. As for most previous studies (Chapters 4 to 7), the minutes of life lost, and financial consequences of smoking were perceived as the most effective, with the addition of the effect of smoking on personal appearance. Social media and the use of more supportive messages were identified as key ways in moving forward in tobacco control interventions.</p>	<p><u>Contribution:</u> The findings of this study supported the findings from Chapter 7, by giving insight into why specific warnings have been consistently perceived as effective. At this stage of the thesis, more information on how to best move forward in tobacco control is also needed, which was supplied by the participants in this study. Aims 1 to 3, and Hypotheses 1 and 2 were addressed in this study. <u>HBM:</u> As for Chapter 7, the refined cigarette-stick warnings were more able to address the elements of the HBM compared to Chapters 4 to 6, particularly Elements 4 to 6. Element 3 was also strongly addressed, whilst retaining the impact of Elements 1 and 2 similar to the previous studies and the current tobacco packaging climate. However, Element 4 was still considered to be under-addressed in comparison to the other elements.</p>
9	<p>These online surveys of Australian, American, British, and Canadian smokers found that generally across all four countries, cigarette packaging warnings are perceived as minimally to moderately effective, with text only warnings in America considered particularly ineffective. Younger participants and lighter smokers gave higher perceived effectiveness ratings. Similar to previous studies, the financial cost of smoking was the highest rated, however the effect of smoking on others was also a standout in this chapter, and was perceived as more effective than the minutes of life lost warning. An additional notable finding was the poorly rated social issues of smoking.</p>	<p><u>Contribution:</u> The congruence within the results from Chapters 4 to 8 indicated the need to assess the potential international applications of the final set of cigarette-stick warnings that were tailored to smokers. The findings of this study demonstrated that cigarette stick warnings may indeed positively influence tobacco use in countries other than Australia. This study expanded upon of Aims 1 and 4 (international perspectives), and addressed Aim 3, and Hypotheses 1 and 3. <u>HBM:</u> As for Chapters 7 and 8, these refined smoker-targeted cigarette stick warnings more comprehensively addressed more Elements of the HBM, particularly Elements 5 and 6 for smokers.</p>

Green text refers to convergence with data in other chapters, and red text indicates divergence with data in other chapters.

* Aim 1: assessing the overall perceptions of Australians towards current cigarette packaging warnings, Aim 2: assessing the perceptions of non-smokers (particularly adolescents) on cigarette-stick warnings, Aim 3: assessing the perceptions of smokers on cigarette-stick warnings, Aim 4: assessing overall amenability of the Australian population towards the implementation of cigarette-stick warnings.

* Hypothesis 1: current cigarette packaging warnings would receive poor perceived effectiveness ratings, Hypothesis 2: certain cigarette-stick warnings would elicit strong reactions leading to perceived changes in smoking behaviour, Hypothesis 3: a high proportion of participants would agree with the implementation of cigarette-stick warnings.

^ Health Belief Model (HBM) elements: Element 1 (e1): perceived susceptibility, Element 2 (e2): perceived severity, Element 3 (e3): perceived benefits, Element 4 (e4): perceived barriers, Element 5(e5): cues to action, Element 6 (e6): self-efficacy.

10.1.1 Initial Understanding of Perceptions of Packaging Warnings

This research first aimed to assess public perceptions towards current cigarette packaging warnings, where it was hypothesised that according to recent research, there would be an overall perception of a diminished effectiveness of these warnings. The systematic reviews in Chapters 2 and 3 gave insight into how tobacco interventions are perceived, leading into Chapters 4 to 9 of this thesis testing this hypothesis amongst several participant populations. It was found that generally non-smokers and smokers both in Australia and overseas generally perceive current packaging warnings as being ineffective as an anti-tobacco intervention.

Participants from the wider community, non-smoking university students, and the international cohort of smokers felt that there was an overall desensitisation towards the graphic images, and a loss of warning shock value due to repeated exposures, particularly amongst current smokers. Pharmacists however believed this perceived ineffectiveness was more as a result of warnings being actively ignored, or are seen as irrelevant by viewers. This trend was also strongly conveyed by adolescents and smoking university participants, particularly regarding warning irrelevance and the use of ‘worst case scenario’ health consequences of smoking rather than those that are more relatable and occurred in the short-term.

Both the Australian community and university students also believed that some smokers will continue to smoke regardless of packaging changes, which was also identified in the systematic review of cigarette-stick attributes. However, for the majority of smokers who want to quit, it was identified that packaging warnings need to instead direct smokers on how to quit (as identified by the Australian community participants) and also build on the major reasons given as prompts for quitting (as identified by pharmacists). Additionally, the Australian community and university students also believed that non-smokers still benefit from current packaging warnings due to their less frequent exposure and retention of shock value, positively affecting their health behaviours.

To incite emotional responses and behavioural change, these current packaging warnings have traditionally aimed at evoking guilt, fear, shock, and anxiety, dissuading non-smokers from smoking, and increasing quit intentions amongst smokers.^{4,8,9} This relates to elements 1 and 2 (susceptibility and severity) of the HBM, which are the only two elements notably utilised within current packaging interventions. However, it does appear that the capabilities of these current packaging warnings in representing the smoking-related consequences is lacking, due to the issues previously mentioned relating to desensitisation, loss of shock value, and irrelevance.¹⁰ These shortcomings are compounded by current warnings' relative lack in addressing the other elements within the HBM, such as sufficiently outlining the benefits of quitting, addressing the barriers to quitting, and improving smoker self-efficacy to quit.¹⁰ This was identified by the Australian community participants who suggested that these interventions need to give directions on how to go about quitting. Some smokers in this research and in recent literature perceived supportive messages which address the issue of addiction itself as being more effective.^{11,12} Despite this trend, supportive messages generally received lower perceived effectiveness ratings compared to warnings which evoke fear and shock.¹³

This reflects the needs of a specific sub-population of smokers, who may be in the contemplative stage of addressing their smoking habits, who desire prompts for action which can support their quit attempts and prevent relapse. Smokers also incorrectly believe that they are completely aware of the dangers associated with tobacco use, with a wide array of known health consequences not utilised in tobacco control interventions.^{14,15} Other sub-populations who require attention when designing packaging interventions are older persons and males, who frequently demonstrated poorer ratings, more negative comments, and lower levels of disgust and perceived harm. This was seen not only from participants in this research (including the Australian community, university students, and the international cohort of smokers), but also from the systematic review of packaging warnings.

10.1.2 Understanding of Smoking Prevention and Cessation with Cigarette-Stick Warnings

This research also aimed to investigate the potential efficacy of cigarette-stick warnings, by evaluating perceptions of this method of public health intervention. It was hypothesised that certain warnings and messages on cigarette sticks would elicit positive cognitive and behavioural reactions, and be perceived as effective in reducing tobacco use. This includes both preventing non-smokers (particularly adolescents and young adults) from smoking, and prompting active smokers to quit. Chapters 4 to 9 of this thesis tested this hypothesis amongst several populations, where it was found that specific health warnings consistently received higher perceived effectiveness ratings and positive open-text comments. In accordance with the findings from the second systematic review, cigarette stick warnings and messages were placed down the length of the cigarette in red coloured ink to promote visibility both to the smoker and to onlookers. Refining of the warnings and messages utilised throughout this thesis involved the discarding of poorly rated interventional materials, retention of higher rated materials, and a more comprehensive utilisation of the six elements of the HBM. Themes were also refined within this research to reflect the themes raised in the open-text comments.

The ‘minutes of life lost’ and ‘financial consequences of smoking’ warnings were consistently rated as two of the most effective throughout this research, with smokers in particular appearing to be driven by their financial stability over their health. Smokers also valued the health and safety of those around them more than their own, and perceived the effects of smoking on others as an engaging and effective warning. This trend was identified within the smoking Australian community, smoking university students, and the international cohort of smokers. The novelty aspect was often described by participants as a strength of these warnings, as they are not currently utilised on packaging in any country, bolstered by the novelty of warnings being included on cigarette sticks. The more calculable and shorter-term nature of these warnings were also perceived as reasons for their higher ratings compared to other warnings.

The potential effectiveness of the ‘minutes of life lost warning’ was investigated in studies included in the second systematic review and throughout this research. The novelty of this warning was seen as a contributing factor to its perceived effectiveness. It also has many other facets leading to its perceived effectiveness, as it both relates to long-term mortality, but describes this impact through shorter-term effects, and also describes consequences that apply to persons of any demographic variable. The warning depicting the monetary costs associated with smoking is thus far unique to this research, but appears to have similar facets to the minutes of life lost warning, having both short and long-term implications, and also a more direct calculable impact on persons of any demographic variable. Given the consistency throughout this research on the perceived effectiveness of both of these warnings, their continued evaluation and eventual implementation (either on tobacco products or in another form of public health intervention) would likely be beneficial for public health outcomes.

The warnings describing the combination of short-term and external (appearance-related) effects of smoking, were also highly rated from the refined sets of interventional materials, particularly amongst the younger (school and university student) participants, and was suggested by pharmacists during the initial set of surveys. This finding addresses a key issue identified in the systematic reviews and from the cigarette packaging interventional materials; self-exemption from the consequences of smoking. The focus groups and interviews with university students assisted in ascertaining why this approach was perceived as more effective than longer-term consequences. It was found that younger persons tend to associate their behaviours with the immediate and short-term effects, as opposed to adults who were thought to plan ahead more and would experience more effect from long-term consequences. The ‘coolness factor’ was also affected by warnings on cigarette sticks, as they reduce the aesthetic and social acceptability of smoking, which was identified in the adolescent systematic review

and by adolescents in this research. Adolescents and young adults were also found to be more susceptible to warnings that were novel, but are also easily desensitised to repetitive exposures.

Conversely, the health condition consequences theme evaluated within the community, and by pharmacists and school students received poorer ratings due to feelings of them being overused, too basic, and common knowledge. This combined with perceived repetition with current packaging warnings (particularly amongst adolescents and university students) led to beliefs of the warnings within this theme as not being engaging nor capable of prompting changes in smoking behaviour. This was also identified in the second systematic review when the warning ‘Smoking Kills’ was utilised. Pharmacists were particularly critical to this theme of warnings, and referred to a potential lack of health literacy as a limiting factor. Pharmacists also identified the importance of conveying how smoking harms others, so the combination of novel health conditions being portrayed on packaging, and how smoking can cause these consequences for both smokers and their close contacts may have significant effects on smoking behaviours.

Warnings describing the social consequences of smoking and how smoking affects others received mixed responses, usually determined by age and smoking status. Younger participants and non-smokers engaged more with the social consequences of smoking warning, compared to older and smoking participants, who were more dismissive of this warning but highly rated the warning describing how smoking affects others. These findings likely reflect the changes in priorities that occur over the lifetime of an individual, where adolescents highly value their social standing, whereas adults value the health and financial stability of their families. Smoking status and other demographic variables generally had some impact on the Likert-scale ratings, with smokers in these studies and in the second systematic review being less likely to perceive cigarette stick warnings as effective. Female participants (including adolescents) also perceived cigarette sticks as more effective than males, as did younger participants, which were also identified in the second systematic review.

Lastly, supportive messages were often perceived within most participant groups as potentially more effective than negative ones, who cited that smokers need positive messages and support when undertaking quit attempts. However, it was also identified that these supportive messages would likely not sway a minority of smokers (heavy smokers) who will smoke regardless of changes to cigarette sticks, as seen for the cigarette packaging warnings. Pharmacists in particular gave higher ratings of supportive messages in prompting smokers to quit, citing the likely efficacy of utilising common reasons to quit as messages on cigarette sticks.

Overall, the cigarette stick warnings and messages evaluated in this research more adequately address the six elements of the HBM (perceived susceptibility, severity, barriers, benefits, cues to action, and self-efficacy), and achieve a more complete representation of all of the risks of tobacco use, not just those limited to personal health. **Figure 8.2** in Chapter 8 illustrates how the refined cigarette stick warnings achieve this in comparison to current cigarette packaging warnings. This aligns with the statement made by Chapman and Liberman (2005), and endorsed by the World Health Organisation; '*consumers of tobacco products have a fundamental right to accurate information about the risks of smoking*'.^{16,17} As the risks of smoking are not limited to health risks, which dominate current packaging warnings, delivering accurate information about the wider range of risks on individual cigarette sticks would be expected to better inform consumers.

According to previous research in social psychology by Strahan *et al* (2002), warnings on tobacco products need to give consumers enough information relating to all the health risks of smoking, so they can fully understand the magnitude of these risks. This includes the impact on the day to day life of a person suffering from tobacco-related diseases.¹⁸ The current research found that both health and non-health warnings were able to elicit these effects, and were more apt in addressing more elements within the HBM compared to current packaging warnings.¹⁰ Participants in this research strongly associated cigarette stick warnings and messages with a

wider range of consequences from smoking, and had a high perceived severity of these consequences. The cigarette stick warning and messages utilised were also perceived as effective in outlining the benefits of not smoking, which could serve as an additional source of quitting information for smokers, and improve smoker self-efficacy in quitting. However, a shortcoming of these warnings was that as with packaging warnings, they did not adequately address the barriers experienced when quitting, such as overcoming the addiction itself. This could be addressed by the development of warnings which describe useful techniques for overcoming the commonly-experienced issues when quitting, such as cravings and withdrawal symptoms.

The few studies which have also evaluated warnings on individual cigarette sticks similarly concluded that dissuasive cigarette sticks could supplement cigarette packaging interventions, disrupt the desired persona of smokers, reduce uptake amongst non-smokers, and lead to an increase in quit intentions.¹⁹⁻²³ Packaging and marketing experts also consider the concept of cigarette-stick warnings as being a potentially powerful deterrent to tobacco use, supplementing cigarette packaging as a health communication device to consumers, and evoking emotional responses leading to changes in behaviour.²⁴

10.1.3 Support for Cigarette Stick Warnings as a Public Health Intervention

The final aim of this research was to assess the level of public support towards health warnings and messages on cigarette sticks, where it was hypothesised that participants would be amenable to the inclusion of cigarette-stick warnings as an additional public health intervention. Chapters 4 to 9 of this thesis tested this hypothesis amongst several participant populations, where it was found that over half (54%) of the active smokers, and over three-quarters (87%) of non-smokers in this research either 'agreed' or 'strongly agreed' to the implementation of health warnings on cigarette sticks. The only other study which has assessed public perceptions towards cigarette stick warnings also found that most participants including

half of current smokers supported warnings on individual cigarette sticks.²⁴ There was little divergence of these findings within the chapters of this thesis, with non-smokers being the most accepting of cigarette stick warnings, followed by ex-smokers, and then current smokers. Pharmacists and university students were the most amenable to cigarette-stick warnings.

Aspects of this form of public health intervention deemed effective included the increased visibility of cigarette-stick warnings, not only for the smoker, but for onlookers as well. This was considered as potentially causing feelings of guilt and shame, and reductions in tobacco use, particularly in public settings and amongst adolescents, who aim to achieve higher social standing and sophistication through smoking.²⁰ The wider Australian community in this research believed that adding more health warnings to tobacco products would cause no harm and could only be beneficial. However, they also identified that by the time a non-smoker is holding a cigarette, it may be too late to change their minds, whilst others stated that a final warning may turn them away. It was also found that smokers who intended to quit or had a higher awareness of the dangers of smoking were more receptive to cigarette stick warnings, reflecting their potential effects on the majority of smokers who wish to quit.

Cigarette-stick warnings were also considered to have prolonged visibility compared to packaging warnings, and would reduce the aesthetics and appeal of cigarettes, and serve as an additional prompt for quit attempts, which aligns with previous research.¹⁹⁻²³ High levels of public support towards tobacco product interventions has been demonstrated in previous research on a global scale, with both non-smokers and smokers requesting the implementation of accurate and informative materials related to tobacco use.^{15,25,26} However, if implemented, cigarette-stick warnings would ideally align with an expanded array of consequences on cigarette packaging, and would also require frequent rotation and updating to avoid loss of efficacy as has been demonstrated for current packaging warnings.¹⁸

10.1.4 Summary of Findings

The first aim of this thesis was to assess the perceptions of Australians towards current cigarette packaging warnings and to identify their strengths and weaknesses, where it was hypothesised that in accordance with the current literature, they would be perceived as poorly effective in controlling tobacco use in Australia. It was found that current packaging warnings not only in Australia but also in other developed countries are perceived as minimally to moderately effective in preventing non-smokers from smoking and prompting current smokers to quit. Desensitisation, loss of shock value, and avoidance by smokers, and warning irrelevance amongst adolescents were the primary reasons for this perceived irrelevance.

The second and third aims of this thesis was to assess the perceptions of both non-smokers and smokers on cigarette-stick warnings and messages, and to what extent they believe these interventions will positively affect health behaviours related to the uptake of smoking, and smoking cessation respectively. It was hypothesised that specific warnings and messages would elicit reactions leading to changes in smoking behaviours, with several of the warnings utilised achieving this goal. Warning novelty, relatability, and the short-term consequences of smoking were consistently identified reasons for perceived warning effectiveness, with the minutes of life lost and financial consequences of smoking warnings possessing these attributes and being consistently perceived as being effective in modifying smoking behaviours.

The fourth and final aim of this research was to assess the level of public support towards health warnings and messages on cigarette sticks. It was found that there was a high level of support amongst all participant groups, with few negative comments received, demonstrating the potential effectiveness of this additional form of public health intervention aimed at reducing tobacco use.

10.1.5 Implications of Findings

This research has identified that cigarette-stick health warnings and messages are generally perceived as (or more) effective than current cigarette packaging warnings, and would be an acceptable form of supplementary public health intervention. The findings of this research have implications for several stakeholder groups. This includes not only the wider community who would benefit from this public health intervention, but also health professionals and quitting services such as ‘Quit-line’ who would incorporate the messages they depict into counselling advice, and schools when addressing tobacco use amongst students. Finally, policymakers are a key stakeholder group who would utilise the results of this research as a driver for the processes necessary for further research and the implementation of cigarette-stick warnings.

Relative to the wider community, the findings of this research generally indicates that current cigarette packaging warnings require a significant overhaul to counteract the desensitisation and loss of efficacy identified throughout the studies. This desensitisation was largely attributed to repetition, indicating that the current method within Australia of rotating two sets of health warnings is inadequate in combating desensitisation. Therefore, the utilisation of additional health-related consequences of packaging, such as those employed overseas,¹³ and non-health-related consequences on cigarette packaging would be prudent. ‘Novel’ health conditions on cigarette packaging which may elicit the desired cognitive and behavioural responses include: erectile dysfunction, osteoporosis, early menopause, macular degeneration, and hair loss.^{13,27} However, desensitisation to new warnings would need monitoring to ensure public perceptions of smoking remain negative, and continue to inhibit tobacco uptake and stimulate cessation.

As identified in the first systematic review, graphic health warnings were perceived as more useful, credible, personable and effective than text-only warnings, which may be a limitation of cigarette-stick warnings if implemented. This could be managed however through the linking of graphic health warnings on packaging to the cigarette-stick warnings contained

within, similar to the intentions of packaging inserts in Canada which aim to deliver supplementary health information.²⁸ Also as identified in both systematic reviews, the use of colour as opposed to grayscale warnings were considered the most effective, and would likely be the case if implemented on cigarette sticks. An additional consideration as identified by several participant groups is the prevention of warning ‘wear-out’ as seen for current packaging warnings, demonstrating the need for both the rotation of implemented warnings and continued development of new warnings. Therefore, based on the findings in this research, moving forward in tobacco control interventions requires multiple considerations. Both the medium and content aspects of new and existing interventions are of importance, with several participant groups acknowledging the perceived effectiveness of graphic television advertisements, and university students identifying the under-utilised social media pathway. Given that smokers in the first systematic review and in the international cohort both requested more information be made available on the consequences of smoking (including on packaging), these avenues could be a way of achieving a greater dispersal of health-related information.

Changes to governmental policy which ultimately influence tobacco regulations are driven by independent research such as this, and the associated recommendations of large health bodies such as the WHO’s FCTC and the US Food and Drug Administration (FDA). Within Australia, both the ‘National Tobacco Strategy’ and ‘National Preventative Health Strategy’ aim to improve the health of all Australians through improving access to tobacco-focused health-related information, and quitting information, services, and medications.^{29,30} The findings of this research are expected to contribute to these aims, and improve upon the recommendations made within the WHO FCTC regarding tobacco packaging.³¹ Canada is currently (between October 2018 and January 2019) sourcing for consultation on further improvements to their tobacco packaging regulations, including the addition of warnings on individual cigarettes, indicating the relevance and international applications of this research within the current

tobacco control climate.³² It is expected that the tobacco industry would oppose such changes to legislation and implementation of cigarette-stick warnings as has been repeatedly demonstrated for changes in tobacco packaging legislation. However, it is also expected that like earlier attempts, governmental bodies of developed countries would make headway.^{33,34}

Health professionals such as pharmacists and general practitioners also rely upon changes in policy which contribute to updated clinical guidelines, and guide their interventions with smokers. These include consistently querying changes in smoking status, intentions to quit, and the provision of smoking cessation medications and relapse prevention.²⁷ Understanding what main driver(s) are often behind quit attempts (such as financial strains) can assist in stimulating quit attempts by discussing these driver(s) as they relate to each individual smoker, ensuring the best outcomes and reductions in smoking within their respective communities.³⁵ In this research, pharmacists' perceptions of health warnings on tobacco products informed on effective and ineffective messages and the development of modified cigarette-stick warnings that were generally more positively received in Chapters 8 to 10. One of the most notable contributions of the pharmacists was for an increase in the use of supportive messages for active smokers, which was also raised by active smokers, who requested guidance and support for quit attempts.

Additionally, apart from the perceived effectiveness and high level of support for cigarette-stick warnings and messages in this research, social media was also identified as an important but currently underutilised avenue for public health education. Social media has become a key tool for communication, particularly amongst the younger age groups (adolescents and young adults) for marketing products as well as for health promotion messages.³⁶⁻³⁸ Several participant groups also believed that heavy (and older) smokers might never be influenced by public health interventions aimed at tobacco use, making it even more essential to reduce tobacco use amongst the younger age groups through multiple methods. Therefore, the

incorporation of health warnings and messages akin to those evaluated in this research, and targeted at adolescents and young adults may impact upon the social acceptability and ‘coolness’ of smoking. Supportive messages via these media outlets would also serve as a prompt to quit amongst current smokers, as suggested by several participant groups in this research. These techniques would likely assist in combating the use of social media and the marketing of tobacco products by tobacco manufacturers to adolescents.³⁹

Finally, this research found the HBM to be an effective framework for the development and evaluation of tobacco-related health warnings and messages. Smoking status in particular appeared to influence which elements were perceived as the most influential, with smokers preferring elements 4 to 6, and preferred messages which support them to quit over those that described the harms of smoking on their bodies (elements 1 and 2). Non-smokers in comparison responded more positively to these elements 1 to 3 and in what ways smoking is detrimental.

10.1.6 Strengths and Limitations of the Research

The strengths of this research include the use of a theoretical framework such as the HBM and its component elements to design and refine the interventional materials improves the validity of the findings. An additional strength was the use of a mixed-methods approach, allowing two forms of data collection to gain insight into and strengthen the findings, reducing the likelihood that data is obtained through chance. In this thesis, the quantitative data collection through Likert-scales was generally supported by qualitative data gathered from multiple sources and methods. Lastly, diverse groups of participants (including an international cohort of smokers) were involved throughout this research, with a general consensus being apparent between these groups, improving the generalisability of these findings to the wider population.

However, there were also limitations within this research, which should be taken into account when interpreting and applying the findings to the wider literature. Firstly, the underlying

theoretical framework does not take into account multiple factors which influence health behaviours, which may have influenced participant perceptions. Most notably this includes habitual behaviours which subconsciously affect health-related decisions,¹⁰ as well as the lack of the model explaining how elements within the model interact with each other.⁴⁰ Additional limitations relate to the design of this research, including the use of themes which involved several warnings or messages, making interpretation of the quantitative data difficult to perform accurately. For example, the ‘social and financial consequences’ theme often received high perceived effectiveness rankings, though the majority of comments given supporting this perceived effectiveness were directed only at the ‘financial consequences’ cigarette.

There was also a lack of randomisation of theme orders within most of the surveys, meaning that an order effect may have been present for the Likert scale ratings, however the subsequent randomisations indicated no significant effect on perceptions. It was also noted that open-text comments became less frequent towards the end of the survey, limiting the volume of qualitative data received for Theme 4 in particular. There was also an inaccurate grouping of a cigarette-stick warning in Chapters 4-6, with one of the warnings presented in Theme 3 ‘Smoking one pack per day reduces your life expectancy by one day per week’ not matching the theme (social and financial consequences). This likely negatively impacted the ratings of this theme as this message is akin to Themes 1 and 2 which were generally negatively rated by participants. Lastly, the single exposure to the interventional materials within the surveys does not reflect the multiple exposures that would occur in real-life, likely leading to an exaggerated response for the cigarette stick warnings which might naturally lose their effectiveness after repetitive exposures as has been demonstrated for the cigarette packaging warnings.

The elements of the HBM were also not addressed equally, with elements 1 and 2 (susceptibility and severity) being more heavily relied upon both in current research on health warnings, and in Chapters 4 to 6 of this thesis. This was identified during these initial studies

and amended in Chapters 7 to 9. Element 4 of the HBM (perceived barriers) was not sufficiently utilised as a tobacco-control method in this research, and identified by participants as a form of message not addressed either in this research or by current packaging warnings. Many participants requested that the issue of addiction itself and how to overcome addiction be better portrayed in public health interventions relating to tobacco use. Finally, the element ‘cues to action’ and is relatively unexplored compared to the other elements and is particularly difficult to assess due to the interplay between both conscious and subconscious mediators.¹⁰

10.1.7 Reflections on Research

Whilst much knowledge and experience has been gained from undertaking this thesis, there are aspects of the research which would have been performed differently given the opportunity, time, and sufficient financial resources. Most importantly would be the recruitment of greater participant numbers, particularly health professionals (not limited to pharmacists), and school students. The input from both of these participant groups were key in gaining a basic understanding of how cigarette packaging and cigarette stick warnings are perceived and in refining the interventional materials. Therefore, a greater participation rate from both groups would have been ideal in improving these early stages of the research. The recruitment of doctors and nurses as other ‘front-line’ health professionals would have also strengthened these initial studies. A higher level of recruitment of both smokers and ex-smokers, including those who have suffered smoking-related diseases and what might have made them adjust their smoking habits earlier on in life, would also have been beneficial. Additionally, though the percentage of Australian smoking participants was reflective of the smoking rate in Australia, the earlier studies would have benefited from a higher proportion of smokers in developing and refining the interventional materials.

Furthermore, whilst the preparation and publication of eight journal articles from this thesis was an attractive idea, there was a significant amount of repetition between the articles. It may

have been more prudent to consolidate similar studies into larger, higher-powered articles. Lastly, the qualitative component of this research is smaller compared to the quantitative component, and ideally a greater involvement of more participant groups from a qualitative research angle, would have strengthened the triangulation of the data. However, a PhD is a learning process, and despite this hindsight into how the research might have been better undertaken, this thesis achieved its goal in contributing to knowledge within the area of tobacco control, and has provided valuable research experience to the researcher.

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Chapter ELEVEN: Conclusions & Recommendations

11.1 CONCLUSIONS

Based on the diminishing effectiveness of current packaging warnings identified in this research, and the positive reactions of the study participants to many of the cigarette-stick warnings evaluated, the following conclusions have been drawn and recommendations made. The recommendations pertain to promoting improvements in public health through a reduction in tobacco use, and its attributable morbidity and mortality, by curtailing tobacco experimentation amongst non-smokers, and stimulating quitting intentions amongst smokers.

11.1.1 Updating of Cigarette Packaging Warnings

This thesis first aimed to assess current public perceptions towards cigarette packaging warnings, where it was found that desensitisation and a loss of shock value have significantly reduced their perceived effectiveness. The diminished effectiveness of current cigarette packaging warnings identified in this research represents a need for a comprehensive update of this anti-tobacco intervention, as the current packaging warnings in Australia have not changed in content for several years. The introduction of new graphic images depicting both the currently utilised and unadvertised health conditions (such as erectile dysfunction and osteoporosis), and other consequences linked to tobacco use, is theorised to renew their effectiveness in stimulating emotional responses by viewers. This is expected to lead to reduced experimentation amongst non-smokers, and increased thoughts of quitting amongst current smokers, as was demonstrated when the graphic health warnings were first implemented in Australia. These new graphic images would also be required to have complementary text information, describing the link between tobacco use and the relevant consequence, and contain information relating to how smokers can quit. These improvements in cigarette packaging interventions require the input of practitioners, the public, and policymakers alike to ensure that newly developed materials appropriately target vulnerable groups within the community.

11.1.2 Implementation of Cigarette Stick Warnings

This thesis also aimed to assess the perceptions of several populations of non-smokers and smokers on cigarette-stick warnings and messages, where it was found that key interventional materials were perceived as effective in modifying smoking behaviours. In addition to improvements to cigarette packaging warnings previously suggested, the introduction of warnings and messages on individual cigarette sticks may further reduce tobacco use, by acting as an additional source of information related to the consequences of smoking, and a source of information for quitting. Placement of warnings down the length of the cigarette was conducted due to the findings of the cigarette-stick systematic review, and was not objected to within this research, suggesting that this placement of warnings on cigarette sticks is appropriate.

As found within this research, the implementation of warnings and messages which are novel, perceived as tangible, and depicting the short-term consequences of smoking will likely be the most effective in both dissuading non-smokers (particularly adolescents) from smoking, and prompting current smokers to quit. Despite the propensity for using only health-related consequences on cigarette packaging, this research found that novel non-health consequences such as the financial and social costs of smoking, and information related to quitting may also be effective. A final consideration regarding cigarette stick warnings is the need for continued warning development, and warning rotation as needed for cigarette packaging warnings to prevent 'wear-out' and desensitisation, and ensure continued cognitive and behavioural responses. In regards to the active smoker key participant group, the use of more supportive messages on cigarette sticks (and packaging) which address issues associated with addiction and provide options for quitting were also believed to improve cessation rates. Lastly, the use of social media interventions which supplement the information presented on current and new cigarette packaging and stick warnings may contribute to reduced smoking uptake amongst the younger age groups and protect future generations from smoking related consequences.

11.2 RECOMMENDATIONS

This research was exploratory in nature, and though these initial results are promising, further research is needed to corroborate these findings and translate them into real-world outcomes. The recommendations proffered below reflect the major findings of this research as they relate to the aims, hypotheses, and research questions addressed.

11.2.1 Policymakers

Firstly, improvements to cigarette packaging warnings are recommended to combat their diminishing effectiveness, occurring as a result of repeated viewing and loss of shock value. Secondly, the continued development, implementation, and evaluation of cigarette stick warnings and messages as a tobacco control intervention are recommended, both in preventing non-smokers from smoking, and stimulating cessation amongst smokers. These changes in tobacco-related public health interventions should include the development, implementation, and rotation of warnings and messages that utilise all six elements and the modifying variables of the HBM, not only warnings which utilise elements 1 and 2 (susceptibility and severity) and aim to cause shock and disgust.

Policymakers responsible for the legislation of new materials for all tobacco products including cigarette packaging and cigarette sticks must ensure that any implemented materials contain novel images and information, which cater to all ages and smoking statuses. This includes health conditions of smoking not currently portrayed, such as erectile dysfunction, early menopause, and osteoporosis, as current packaging warnings as seen as ‘too basic’ and are ‘common-knowledge’. These consequences may cause a resurgence of the desired responses amongst non-smokers and smokers leading to positive behavioural change. This research has also identified that non-health consequences of smoking, such as social or financial consequences, could also invoke emotional responses and reactions leading to a reduction in tobacco use. These methods for eliciting behavioural change should also be incorporated into

current packaging interventions to better reflect the variety of needs and priorities in non-smokers and smokers across all age groups. Researchers and policymakers together would need to evaluate the potential effectiveness of these messages to identify the best wording and combination of messages for implementation on cigarette packaging.

Also, whilst not an intended finding within this thesis, an identified theme within this research was the potential for social media to act as a powerful tobacco control tool. Due to the repeated identification of social media as a potentially effective communication medium by participants throughout this research, it is also recommended that social media as a delivery platform for anti-tobacco warnings and messages be considered by policymakers. As for the recommendations for cigarette packaging and cigarette stick warnings, social media advertisements relating to the dangers of tobacco use would need to depict novel information that is relatable to a wide proportion of the target population. Adolescents and young adults should be considered a key target population due to their propensity for social media use.

11.2.2 Researchers

Applying a theoretical model such as the HBM to cigarette stick warning development will be essential in developing effective warnings. Similar to the recommendations for policymakers, the novelty of intervention materials undergoing further research is essential in eliciting emotional responses and avoiding viewer desensitisation. For example, the novelty, widespread applicability, and consistently high perceived effectiveness of the ‘minutes of life lost’ warning evaluated both here and in earlier research demonstrates the need to consider this warning for implementation on tobacco products. The financial consequences of smoking was similarly perceived as novel and highly rated, though was considered not applicable to smokers who smoke less than one pack per day. Therefore, this form of message should be evaluated across different levels of tobacco addiction, ranging from light smokers who smoke less than ten cigarettes per day, up to heavier smokers who smoke more than one pack per day.

Future research into cigarette-stick warnings should also focus on warning placement and novel features that stimulate viewer interest and internalisation of the warning's intended message. This could include different placement sites of warnings, 'flagging' of the warning so it protrudes outwards from the cigarette, or varied colours as to draw in viewer attention as the tobacco industry has done in the past with novel pack styles and embellishments. Additionally, it is necessary to evaluate the potential long term impact of cigarette stick warnings on the smoking behaviours of a large population. This could be achieved through eye-tracking studies and longitudinal analyses which assess smoker and non-smoker perceptions after repeated exposures in everyday environments, and how these perceptions change over time as would happen after implementation. Also, as identified in the systematic review of adolescent perceptions of cigarette packaging warnings, identifying how cigarette-stick warnings and messages can elicit specific reactions, such as guilt, fear, and anxiety, would be beneficial in linking developed warnings to the HBM, and fine-tuning warnings to elicit the desired responses. Lastly, lobbying for the mandatory inclusion of health warnings on cigarette sticks by tobacco manufacturers would be required, and would likely follow the same processes as carried out for changes in cigarette packaging policies.

11.2.3 Health Professionals

Health professionals also benefit from changes in policy, and the public health interventions utilised relating to tobacco use, as they may incorporate the messages portrayed into their counselling process with patients. Doctors and pharmacists should keep informed on the packaging changes relating to tobacco use, as new warnings and messages may serve as an effective drive to quit for patients, which can be reinforced upon during consultations with health professionals. Policymakers and researchers should also both consult with health professionals such as was done in this research, to gather data relating to real-world experiences involving smokers, and the primary drivers for quit attempts.

APPENDICES

The following appendices were not included as part of the article-based chapters in this thesis, and are included here to promote the transparency of the research conducted.

Appendix A – Report to Key Stakeholders

The report starting on the following page has been developed and submitted as a professional courtesy to the following organisations and researchers:

- Australian Government Department of Health
- Cancer Council Victoria
- Lung Foundation Australia
- Rob Cunningham at the Canadian Cancer Society (by request)
- Professor Billie Bonevski (Head of the Oceania chapter of the Society for Research on Nicotine and Tobacco) at the University of Newcastle (by request)

Dear Reader,

This document briefly details the methodology and results of a series of studies aimed at *investigating the perceptions of smokers and non-smokers on health warnings on cigarette packaging and individual cigarette sticks*. These studies were conducted as the major component of a PhD (Health) at James Cook University. This document is being distributed to major stakeholders for tobacco control in Australia, as a professional courtesy by the principal investigator, and to serve as a prompt for future research into cigarette-stick warnings as an anti-tobacco intervention.

This research involved online surveys, focus groups, and face to face and phone interviews. Both current Australian cigarette packaging, and investigational warnings and messages on cigarette sticks were utilised. The investigational materials were developed using a sequential exploratory method, with results from initial studies allowing refining of the materials for subsequent studies. The 'Health Belief Model' was also utilised in developing the materials, which were designed with the intention to increase participants' perceived susceptibility and severity of tobacco-related consequences, and outline the benefits of quitting, whilst also serving as an additional prompt for quit attempts. Participants used Likert-scale ratings and open-text comments in the online surveys to detail their perceptions of the interventional materials. Semi-structured questions were used in the focus groups and interviews to gather more in-depth data regarding these perceptions.

A total of 2 054 participants were recruited, of which 76% were Australian, 60% were female, 37% were smokers, and 80% were of Caucasian descent. Participant groups included: the wider Australian community (637), school students (150), university students (501), pharmacists (79), and an international cohort of smokers (687 total: Australia [190], Canada [165], United Kingdom [155], United States [177]).

Perceptions on current cigarette packaging warnings were generally consistent amongst all participant groups, including across countries. These warnings were overall perceived as ‘minimally to moderately effective’ (between 2 and 3 on the 5-point Likert scales) in prompting current smokers to quit, and preventing non-smokers from experimenting with tobacco. Several notable limitations were identified throughout the qualitative components of the research relating to current packaging warnings. These included a loss of shock value due to repeated exposures over several years, active avoidance of packaging warnings, and feelings of irrelevance of the warnings (particularly amongst younger participants).

In comparison, several of the novel warnings and messages utilised on individual cigarette sticks were rated as significantly more effective than current packaging warnings in preventing non-smokers from smoking, and prompting current smokers to quit. Examples of the cigarette packaging and cigarette stick warnings investigated are attached to the end of this document. Many of the cigarette-stick warnings and messages utilised were considered effective in increasing participants’ perceived susceptibility and severity to a wider range of consequences of smoking, and outlining the benefits of quitting.

The financial costs of smoking message was consistently amongst the highest rated (particularly amongst current smokers), and considered novel, engaging, and applicable to the broader population. Compared to ratings for current packaging warnings, this message was significantly higher rated in perceived effectiveness in prompting current smokers to quit, with an odds ratio (OR) of 3.42, 95% confidence interval (CI) 2.75-4.25, $p < .001$. Other warnings perceived as effective throughout this research include the ‘minutes of life lost’ per cigarette (OR = 3.60, 95% CI 2.79-4.64, $p < .001$ amongst university students), and the negative effects of smoking on family members (OR = 2.85, 95% CI 2.29-3.55, $p < .001$ amongst current smokers). These warnings were considered novel, relatable, and engaging, making them

capable in eliciting strong emotional responses likely to motivate changes in smoking behaviour amongst smokers, and prevent experimentation amongst non-smokers.

Participants throughout this research were also in favour of the inclusion of warnings and messages on cigarette sticks, with over half (54%) of smokers and over three-quarters (87%) of non-smokers either 'agreeing' or 'strongly agreeing'. They believed that this anti-tobacco intervention would be more difficult to avoid, and would reduce the aesthetic appeal of smoking, particularly amongst adolescents.

Overall, this research identified shortcomings of current cigarette packaging warnings, outlining the need for improvements in anti-tobacco interventions. The inclusion of novel and engaging warnings and messages on individual cigarette sticks was found to be a potentially effective next step in addressing tobacco use. Future warning and message development for both cigarette packaging and cigarette sticks should therefore include short-term health, and non-health related consequences of tobacco use, since in this research they were found to be the most engaging, and likely to elicit positive public health changes in the community.

The list of publications below relate to the research presented above, and are all either currently published or under review.

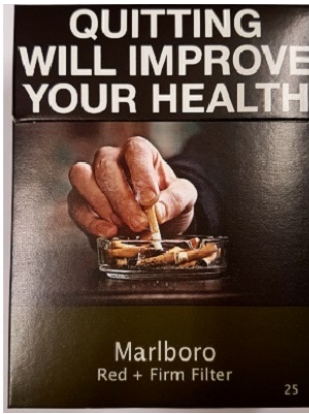
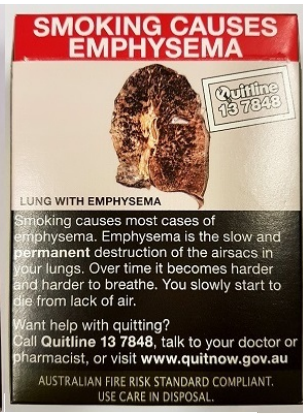
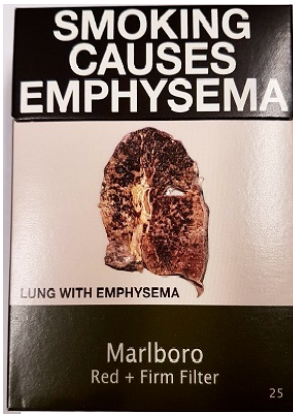
1. Drovandi A, Teague PA, Glass B, Malau-Aduli B. Australian perceptions of health messages and warnings on cigarette sticks. Submitted to *BMC Public Health*.
2. Drovandi A, Teague PA, Glass B, Malau-Aduli B. Australian community pharmacist experiences with smoking cessation and opinions of health warnings on individual cigarette sticks. *International Journal of Pharmacy Practice*. Published online 18th July 2018. <https://doi.org/10.1111/ijpp.12470>
3. Drovandi A, Teague PA, Glass B, Malau-Aduli B. Effectiveness of health warnings on cigarette sticks: perceptions of school students in Queensland, Australia. *Frontiers in Public Health*. 2018;6:297. <https://dx.doi.org/10.3389%2Ffpubh.2018.00297>

4. Drovandi A, Teague PA, Glass B, Malau-Aduli B. Australian university student perceptions of health messages on cigarette sticks. Accepted in *Health Communication* [In Press].
5. Drovandi A, Teague PA, Glass B, Malau-Aduli B. Do health warnings on cigarette sticks affect perceptions towards smoking? A focus group study of Australian university students. Submitted to *Psychology Research and Behavior Management*.
6. Drovandi A, Teague PA, Glass B, Malau-Aduli B. A four-country study on smoker perceptions of health warnings on cigarette sticks. Submitted to *Tobacco Induced Diseases*.

For further information regarding this research, feel free to contact the principal investigator Mr. Aaron Drovandi using the contact details below.

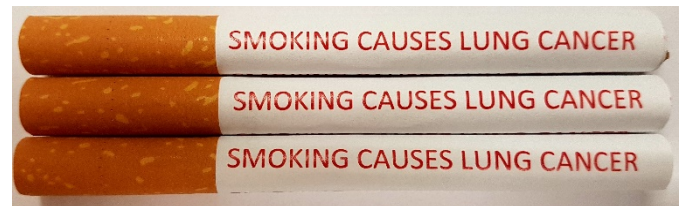
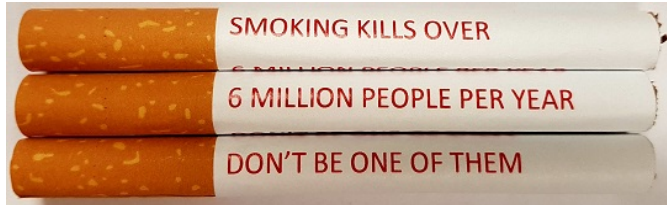
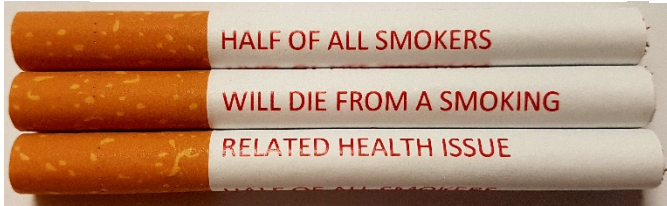
Kind Regards,

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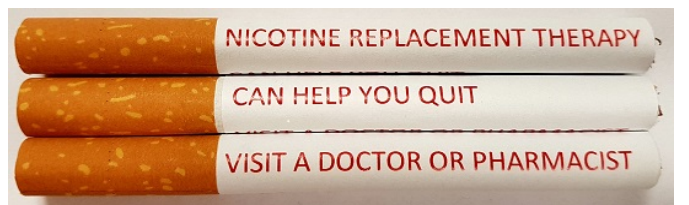
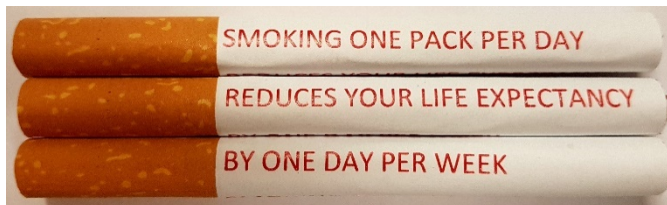
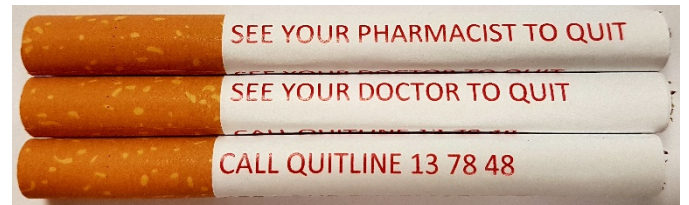
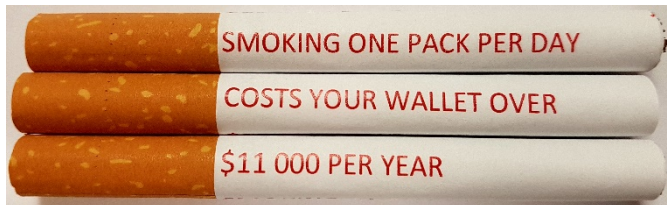
Theme 1 – Mortality Statistics (MS)

Theme 2 – Health Condition Consequences (HCC)



Theme 3 – Social and Financial Consequences (SFC)

Theme 4 – Supportive Messages (SM)



Top image: The packaging warnings utilised in Australian online surveys, focus groups, and interviews.

Other images: The cigarette stick warnings utilised in the initial online surveys amongst: the wider Australian community, pharmacists, and school students.

Theme 1 – Immediate and Short-Term Consequences (ISC)



Theme 2 – Long-Term and Mortality Consequences (LMC)



Theme 3 – Social and Financial Consequences (SFC)



Theme 4 – Supportive Messages to Quit (SMQ)



The second (refined) set of cigarette stick warnings utilised in the online surveys, focus groups, and interviews amongst university students (at James Cook University Townsville campus).

SMOKING CAUSES EMPHYSEMA

LUNG WITH EMPHYSEMA

Marlboro
Red + Firm Filter

25

SMOKING CAUSES EMPHYSEMA

Quitline 13 7848

LUNG WITH EMPHYSEMA

Smoking causes most cases of emphysema. Emphysema is the slow and permanent destruction of the air sacs in your lungs. Over time it becomes harder and harder to breathe. You slowly start to die from lack of air.

Want help with quitting?
Call Quitline 13 7848, talk to your doctor or pharmacist, or visit www.quitnow.gov.au

AUSTRALIAN FIRE RISK STANDARD COMPLIANT. USE CARE IN DISPOSAL.

QUITTING WILL IMPROVE YOUR HEALTH

Marlboro
Red + Firm Filter

25

QUITTING WILL IMPROVE YOUR HEALTH

Quitline 13 7848

Long term smokers can and do quit. Quitting smoking at any age has immediate and long term health benefits. Compared with a smoker, quitting today will **halve your risk of**:

- heart disease (after one year);
- mouth and throat cancer (after five years); and
- lung cancer (after ten years).

Thinking of quitting? Call Quitline 13 7848, talk to your doctor or pharmacist, or visit www.quitnow.gov.au

AUSTRALIAN FIRE RISK STANDARD COMPLIANT. USE CARE IN DISPOSAL.

WARNING

Cigarettes are a major cause of heart disease.

Smokers are up to 4 times more likely to develop heart disease than non-smokers.

You can quit. We can help.
1-866-366-3667
gosmokefree.gc.ca/quit

Health Canada

WARNING

Another premature death...

Smoking is the leading preventable cause of premature death in Canada. About 100 people die from tobacco use each day.

You can quit. We can help.
1-866-366-3667
gosmokefree.gc.ca/quit

Health Canada

Smoking clogs your arteries

Get help to stop smoking at www.nhs.uk/quit

Tobacco smoke contains over 70 substances known to cause cancer

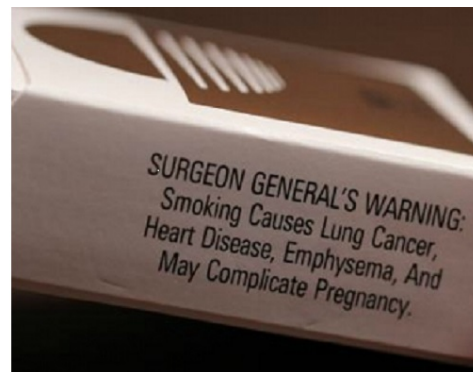
Brand Variant

20
50

Quit smoking – stay alive for those close to you

Get help to stop smoking at www.nhs.uk/quit

UK DUTY PAID



The cigarette packaging warnings utilised in the four-country online survey for: Australian, Canadian, UK, and USA participants (top to bottom respectively).



The final refined set of eight cigarette stick warnings utilised in the four-country online survey (no themes used; each cigarette stick presented and rated separately).

Appendices B-C – Online Surveys Administered through SurveyMonkey

The following two appendices are copies of two of the online surveys conducted throughout this thesis through the use of the SurveyMonkey platform.

- Appendix B is the survey administered to the school students in Chapter 6. This survey is similar to the online surveys conducted in Chapters 4, 5, and 8, where the cigarette stick warnings were presented in themes for ranking and comments.
- Appendix C is the Australian version of the survey administered to the international cohort of smokers in Chapter 9. This survey differed from the others, and involved the presentation of individual cigarette stick warnings for ratings and comments (as opposed to themes), and also involved ranking and comparison tasks.