

Reactions to standardised cigarette packs with varying structural designs, and the association with smoking susceptibility: A post-implementation cross-sectional survey with never-smoking adolescents in Scotland

Danielle Mitchell¹, Nathan Critchlow¹, Crawford Moodie¹, Linda Bauld^{2,3}

¹ Institute for Social Marketing and Health, Faculty of Health Sciences and Sport, University of Stirling, FK9 4LA, Scotland.

² Usher Institute, College of Medicine and Veterinary Medicine, University of Edinburgh, EH8 9AG, Scotland.

³SPECTRUM Consortium, University of Edinburgh.

Corresponding author: Danielle Mitchell, Institute for Social Marketing and Health, Faculty of Health Science and Sport, University of Stirling, Stirlingshire FK9 4LA. Email: danielle.mitchell1@stir.ac.uk
Tel: +44 (0)1786 467390

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ABSTRACT

Aim: From 20th May 2017, cigarettes in the United Kingdom must be sold in standardised (plain) packaging. We explore post-implementation reactions to standardised cigarette packaging among never-smokers in Scotland, whether reactions vary in relation to permitted variations in pack structure, and whether reactions are associated with susceptibility.

Methods: A cross-sectional survey with 12-17 year-old never-smokers ($n=507$) in Scotland, conducted November 2017-November 2018. Participants were shown one 'regular' standardised cigarette pack (flip-top lid and straight-edged pack, similar to designs in Australia) and three standardised packs with varied pack structures (bevelled-edges, slim pack, and shoulder box), which are permitted post-implementation in the UK. Participants rated each pack on eight five-point reaction measures (e.g. attractiveness). Participants also indicated which pack, if any, they would choose. Smoking susceptibility was the outcome.

Results: The mean reaction scores for all four packs were mostly negative, however the shoulder box was consistently rated less negatively than the regular, slim, or bevelled-edge packs. Most participants (87%) said they would not select any of the four packs, although susceptible participants were more likely to select one than non-susceptible participants (25% vs. 7%; $\chi^2=29.70$; $p=0.001$). For all four packs, not finding them off-putting was associated with susceptibility (*Adjusted Odds Ratio* range: 2.73-3.69), albeit only a minority of adolescents did not find each pack off-putting.

Conclusions: Adolescents have negative reactions to the standardised cigarette packs implemented in the United Kingdom, albeit permitted variations in structure can reduce the extent of negativity. Most reactions to standardised packaging had no association with susceptibility.

Keywords: Adolescent smoking, Standardised packaging, Tobacco control, Survey research

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IMPLICATIONS

We provide the first empirical evidence that adolescents find the standardised cigarette packs implemented in the United Kingdom unappealing and that most pack reactions have no association with susceptibility among never-smokers, with the exception of the minority who did not think that they would put them off smoking. This suggests that the legislation is achieving one of its primary aims, to reduce the appeal of packaging. That permitted variations in pack structure (e.g. shoulder boxes) somewhat reduce negative reactions suggests that the United Kingdom, and other countries introducing similar legislation, should ensure that all aspects of pack design are fully-standardised.

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INTRODUCTION

In May 2017, the United Kingdom (UK) became the third country to introduce mandatory standardised packaging for cigarettes, following Australia and France.¹ The Standardised Packaging of Tobacco Products Regulations 2015 and Tobacco and Related Products Regulations 2016 – which transposed the European Union Tobacco Products Directive into UK law – require cigarettes to be sold in drab brown packaging and with combined written and pictorial warnings covering 65% of the primary surfaces (i.e. front and back) and written warnings covering 50% of the secondary surfaces (i.e. the sides).^{1,2} The legislation also prohibits price marking on packaging (including on outer covers, e.g. cellophane) and sets a minimum pack size of 20 cigarettes. The legislation were introduced 20th May 2016, and became mandatory after a 12-month transition period on 20th May 2017.³

As of September 2019, six countries have fully implemented standardised (or plain) packaging. All the legislation are conceptually similar, although there are differences regarding what cigarette pack designs and structures are permitted post-implementation. The two Antipodean countries (Australia and New Zealand) require cigarettes to be sold in ‘regular’ straight-edged flip-top packs, whereas the four European countries (UK, France, Norway, and the Republic of Ireland) still permit slim packs, packs with bevelled or rounded-edges, and shoulder boxes (Figure 1).⁴ Research has demonstrated that how tobacco companies use pack structure to differentiate products does impact on consumer perceptions, with packs that diverge from the ‘regular’ straight-edged flip-top lid style considered appealing, stylish and classy.^{5,6,7} There is little to no research, however, which has explored how consumers react to standardised cigarette packs which vary in structure.

Research in Australia, the first country to implement standardised packaging, has reported positive behavioural and attitudinal changes among adult consumers. These include, but are not restricted to, reduced positive appraisal of packs, increased salience of health warnings, reduced display of cigarette packaging in public spaces, and increased weekly calls to a quit line.⁸⁻¹² There is some post-implementation evidence from European countries,¹³ albeit it is more limited in extent and scope than in Australia. One-year post-implementation in France, research found that smoking rates among adults had decreased, fear of the consequences of smoking had increased, and the warning messages on tobacco products were considered effective¹⁴. Research conducted during the 12-month transition period in the UK found that adult consumers were aware and supportive of the legislation, and exposure to the new standardised packs was associated with noticing health warnings on packs, thinking about the health risks of smoking, and motivation to quit.^{15,16,17} Increased noticeability of health warnings in the UK has also been demonstrated through eye-tracking research that compared the post-implementation standardised packs to pre-implementation fully-branded variants¹⁸.

Adolescents are an important population for evaluations of standardised packaging as smoking is often initiated in these age groups¹⁹, and reducing youth appeal is a key outcome for the legislation in both the UK and elsewhere²⁰. To date, however, there has been limited research examining the effects on adolescents following full implementation. Where research does exist, the results corroborate the trends observed among adult consumers. In Australia, longitudinal and cross-sectional research has found that standardised packaging reduced the appeal of smoking, increased perceptions of harm, and deterred young people that had tried smoking from doing so again.^{21,22,23} In France, standardised packaging was reported to have increased harm perceptions, reduced the acceptability of smoking, and decreased the likelihood of smoking experimentation among adolescents.²⁴ In the UK, focus group research with 16-17 year olds in Scotland found that

standardised packs were considered embarrassing, that they were off-putting and that the health warnings were salient, albeit reactions were less negative for standardised packs which had variations in structure.²⁵ For example, adolescents viewed the slim standardised packs to be discrete and potentially less harmful, and shoulder box packs to be cool and different.

In this study, we build on existing evaluation research in the UK^{13-17, 25} by exploring adolescents' post-implementation reactions to standardised cigarette packaging, whether permitted variations in structure influence reactions to the standardised packs (e.g. slim packs or bevelled-edges), and what association (if any) there is between pack reactions and susceptibility among never-smokers.

METHODS

Design and sample

A self-report cross-sectional survey was conducted with 12-17 year-olds never-smokers in Scotland ($n=507$). Participants were recruited from secondary schools in three locations in Scotland (Stirling, Edinburgh and South Lanarkshire). According to the Scottish Index of Multiple Deprivation 2016, a quantitative measure of deprivation that takes into account variety of indicators relevant to an area (e.g. income, employment, education), both schools in Edinburgh and Stirling were in the 10% of the least deprived areas in Scotland, whereas the school in South Lanarkshire was in the most deprived 10%.²⁶ Data were collected November 2017 (six months after standardised packaging became mandatory) to November 2018 (18 months after standardised packaging became mandatory).

Approval was sought from local educational authorities and, once granted, schools in their jurisdiction were contacted by letter or email, and followed up by phone. In the three schools that agreed to take part, participants were informed about the study aims by the researcher or a nominated teacher, and provided with participant and parental information sheets, parent opt-out forms (for parents to complete if they did not want their child involved), and data privacy notices. Participants completed the survey during designated class time and under exam-type conditions (i.e. individually, in silence, and without conferring with peers). The average completion time of the online survey was between 15 and 20 minutes; we do not know the completion time for the paper version of the surveys but have no reason to believe it would differ. Schools were given the option for students to complete either an online or physical version of the survey which were identical in content and question order. All participants were able to enter a ballot to win a computer tablet in return for participating.

Measures and stimuli

Demographics

Gender, age (coded: 12-13 years, 14-15 years, 16-17 years), and ethnicity (coded: White British vs. Other) were measured at the start of the survey. The Family Affluence Scale measured socioeconomic status (SES), as per previous school-based health surveys in Scotland.²⁷ In the scale, participants self-reported whether they have their own bedroom ($0=No$, $Yes=1$); how many vehicles their family own ($0=None-2=Two$ or more); how many computers their family own ($0=None-3=More$ than two); and how many times they have travelled on holiday with their family in the last 12 months ($0=Not$ all- $3=More$ than twice). Aggregate scores were divided into categories of low (0-2), medium (3-5), and high SES (6-9).²⁸

Smoking status

Smoking status was assessed through an established question from previous tobacco control research with adolescents in the UK.²⁹ Participants were provided with five statements about prior smoking experience and asked to select which best described them: (1) *'I have never smoked, not even a puff or two'*; (2) *'I have only ever smoked once or twice but not anymore'*; (3) *'I smoke at least once a month'*; (4) *'I usually smoke between one and six cigarettes a week'*; and (5) *'I smoke more than six cigarettes a week'*. Participants who selected anything other than the first option were categorised as *'ever-smokers'*. Those who selected the first option were classed as *'never-smokers'*. Consistent with previous research exploring young people's reactions to tobacco packaging in the UK, this study focused on never-smokers only.^{29, 30} Prior to reporting smoking status, participants were prompted with a statement which clarified that the survey was asking about traditional combustible cigarettes (either factory made or hand-rolling cigarettes lit with a flame), not electronic cigarettes or vaping devices.

Smoking susceptibility

Three items were used to identify whether never-smokers were susceptible to smoke: (1) *'If one of your friends offered you a cigarette would you smoke it?'*; (2) *'Do you think you will smoke a cigarette at any point in the next year?'*; and (3) *'Do you think you will be smoking by the time you are 18?'* (All three measures were scored on a four-point Likert scale (1=Definitely not to 4=Definitely yes). Participants who selected any option other than *'Definitely not'* for any of the three items were categorised as susceptible. All other participants were categorised as non-susceptible.²⁹

Cigarette pack stimuli

Participants were exposed to images of four standardised cigarette packs; a 'regular' straight-edged flip-top pack, a pack with bevelled-edges a slim pack, and a shoulder box (Figure 1). The regular straight-edged pack, bevelled-edge pack, and slim pack were purchased in the UK. The shoulder box, a design that is permitted in the UK legislation but was not knowingly sold at the time of the study, was sourced from France. All cigarette packs were displayed to participants in the same order (see Figure 1). For the 'regular', bevelled-edge, and slim pack, participants were shown both a front-facing image of the pack and a 'side angle' image that ensured the unique structural features (or lack of) were visible. For the shoulder box pack, participants were shown one image that emphasised the unique opening style.

All four packs carried the same warnings, and we ensured that these warnings were visible in all images of the packs displayed to the participants. The warning on the primary surfaces of the pack, about damage to teeth and gums, was selected because perceived loss of attractiveness is a message suggested as being resonant among the target sample.³¹ For the shoulder box pack sourced from France, translated warnings in English were digitally imposed on photographed images for consistency and to avoid participant confusion over language variation. Previous research in the UK has shown that the brand variant name on standardised packaging can also influence adolescent's reactions to the packs.²⁵ To reduce this confounding influence, we digitally removed brand variant names on each pack and replaced these with the dummy text *'Brand Name, Variant Name'*.

[Figure 1]

Reactions to the cigarette packs

Participant's reactions to the four standardised packs were measured using eight items. The items were divided into three sections and are based on previous research exploring adolescent never-smokers reactions to fully-branded cigarette packaging.²⁹ Participants were asked 'What do you think about each of these packs?' with scales for: (1) Unattractive/Attractive; (2) Cool/Uncool; (3) Cheap/Expensive. Participants were then asked 'What do you think the person that smokes each pack would be like?' with scales for: (1) Unfashionable/Fashionable; (2) Unpopular/Popular; and (3) Interesting/Boring. Finally, participants were asked 'How harmful to your health do you think that the cigarettes in each pack would be, if at all?' with scales for: (1) Harmful/Not harmful and then they were asked 'To what extent, if at all, does each pack put you off smoking' with scales for: (2) Puts me off smoking/Does not put me off smoking (referred to as 'off-putting' henceforth). Responses to all eight items were provided on five-point scales (e.g. 1=Unattractive to 5=Attractive), with a separate rating for each pack. Prior to analysis, the measures of coolness and interest were reverse coded to ensure that a higher score was indicative of a positive reaction.

Pack selection

Participants were asked 'If you were to pick one of the packs, which one would you pick' and given the option to select one of the four packs or 'none of these packs'. This mirrors choice tasks used in previous packaging research.³²

Family and peer smoking

Family and peer smoking, factors associated with smoking among adolescents,^{29,33} were measured as covariates to help contextualise any association between reactions to the cigarette packs and susceptibility. Participants were asked 'Does anyone in your household or peer group smoke? You can tick more than one box'. Options were provided for: (1) Mother; (2) Father; (3) Guardian(s); (4) Brother(s) or Sister(s); and (5) Friends. For each group, a dummy code was created (e.g. 0=Friends do not smoke; 1=Friends do smoke). For the analysis, mother, father, and guardian smoking were combined to a single parental/guardian variable (1=Yes, 0=No).

Ethics

Ethical approval was obtained from the University of Stirling's General University Ethics Panel (GUEP273). At the beginning of the survey, participants were informed about confidentiality and anonymity of their participation, and consent was obtained. Once completed, participants were debriefed about the harms of smoking and where to find further advice and information.

Analysis

We collected 686 responses. Of these, 73 cases were excluded for not completing the consent form or incomplete/invalid responses, 19 for being outside the age range (i.e. 11 or 18 years old), 12 for missing data on smoking status, and 75 participants categorised as ever-smokers. This resulted in a sample of 507 never-smokers for analysis.

Data were analysed using SPSS version 23 (Chicago, SPSS Inc). All analyses were conducted on never-smokers only. Descriptive statistics examined demographic variables, family and peer smoking, and susceptibility. Descriptive statistics examined mean scores for each cigarette pack on the eight reaction measures. As the Likert scale data were ordinal, Wilcoxon Signed Rank tests examined within-group differences in reactions to each of the cigarettes packs. Within-group tests were conducted across all reaction measures and for all pack combinations (e.g. attractiveness

reactions for the 'regular' straight-edge pack vs. bevelled-edge pack). A Bonferroni correction was applied to the critical value to account for the six multiple comparisons (i.e. $p=0.008$). Frequencies examined the proportion of participants who selected one of the four cigarette packs versus those who did not select any pack. Pearson Chi-square tests examined between-group differences for whether any of the four packs were selected (versus none of the packs) by age, gender, ethnicity, SES, and susceptibility. Given that only a small number of participants were categorised as low SES, the medium and low SES categories were combined.

Multivariate binary logistic regression models were conducted with susceptibility as the main outcome variable (*Non-susceptible/Susceptible*). Four separate regression models were conducted, with each focusing on one of the four cigarette pack designs. In each regression model, the key independent variables were the eight reaction measures for that pack (e.g. attractiveness for the bevelled-edge pack). Previous research has reduced the reaction items into subscales, such as pack receptivity and pack appraisal.²⁹ This approach was considered here, however factor analyses found that the eight reaction items did not reduce into subscales that had meaningful interpretation (i.e. no single thematic consistency across the four pack designs) and, of the subscales identified, there was limited internal consistency (Cronbach's Alpha <0.7). Consequently, in this study, each of the eight reactions measures are included individually in the regression models.

For each pack, a series of binary variables were created from the eight reaction scale measures to provide meaningful interpretation in the logistic regressions²⁹. As the majority of scores for the reaction items were towards the negative end of the scale (see Table 1), binary variables were computed based on whether a participant reported a negative reaction (i.e. scores 1-2) or not (scores 3-5). For example, in practice this meant that participants were categorised as those who considered a pack unattractive versus those who did not did (i.e. either neutral or positive reaction). This was preferred to coding whether a participant had a positive reaction versus not (i.e. neutral and negative) for two reasons. First, standardised packaging intends to elicit negative reactions among young people, and therefore this approach ensured that negative reactions were in an exclusive category (i.e. not grouped with neutral reactions). Second, as there was only a small number of participants who had indicated positive reactions on any reaction measure for any of the four packs (see Table 2), these were grouped with the neutral scores (i.e. the middle point of the scale) to ensure appropriate category sizes for analysis.

In earlier stages of each regression model, we first added demographic information (e.g. age, gender, ethnicity, and SES) and information on parental/guardian, peer, and sibling smoking. For all variables with two categories, simple contrast comparisons were used (e.g. $0=Peers\ do\ not\ smoke\ vs.\ 1=Peers\ do\ smoke$); reference categories are reported in the results. For age, the difference contrast function enabled comparison of each increasing category relative to the combined previous categories (e.g. 14-15 years old vs 12-13 years and then 16-17 year olds vs. combined 12-15 year old categories).

RESULTS

Sample characteristics and smoking susceptibility

Accounting for missing data on gender ($n=1$), ethnicity ($n=5$), SES ($n=11$), and susceptibility ($n=2$), 39% ($n=195$) of the never-smokers were aged 12-13 year olds, 36% aged 14-15 year olds ($n=180$), and 26% aged 16-17 year olds ($n=132$). There was almost an even distribution of females (53%, $n=268$) and males (47%, $n=238$), and most were White British (82%, $n=411$) compared to other ethnicities (18%, $n=91$). Concerning SES, over half of respondents were categorised as high (76%, $n=378$), over medium or low SES (24%, $n=118$). Almost a third of participants (30%, $n=152$) were categorised as susceptible to smoking and the remainder (70%, $n=353$) categorised as non-susceptible.

Reactions to the four cigarette packs

Reactions for the four packs were consistently towards the negative end of each scale for all eight items (response items 1 or 2 on the scale) (Table 1). Although most reactions were negative, Wilcoxon Signed Rank tests found that reactions to the shoulder box were significantly less negative compared to the regular pack on perceived attractiveness ($p=0.001$), cost ($p=0.001$), fashion ($p=0.001$), and popularity ($p=0.006$). After accounting for the Bonferroni correction, there were no differences in reactions between the standard pack versus either the bevelled-edge and slim pack.

Within-group reactions to cigarette packs with structural variations

Compared to the slim pack, Wilcoxon Signed-Rank tests found that reactions to the shoulder box were significantly less negative on perceived attractiveness ($p=0.001$), cost ($p=0.001$), fashion ($p=0.001$), interest ($p=0.004$), and popularity ($p=0.001$) (Table 1). Compared to the pack with bevelled-edges, reactions for the shoulder box were significantly less negative for perceived attractiveness, cost, and fashion (all $p=0.001$). Finally, the slim pack was perceived to be significantly cheaper than the pack with bevelled-edges ($p=0.001$).

[Table 1]

Selecting a cigarette pack

When asked to indicate which of the four packs they would select, after accounting for missing data on this item ($n=19$), only 13% of participants said they would select one of the four packs, and the remaining 87% ($n=426$) said they would not select any (Table 2). Pearson Chi-square tests found no significant differences in whether participants selected one of the four packs versus not by gender ($p=0.151$), SES ($p=0.407$), age ($p=0.081$), and ethnicity ($p=0.733$); however, those categorised as susceptible were significantly more likely to select a pack (25%) compared to those who were non-susceptible (7%), $\chi^2(1)=29.70$, $p=0.001$. Of those who did select a pack ($n=62$), most selected the shoulder box (55%), followed by the bevelled-edge pack (19%), slim pack (15%), and the regular pack (11%).

[Table 2]

Association between reactions to the four cigarette packs and smoking susceptibility

Multivariate regression models examined what association, if any, there was between reactions to each cigarette pack and susceptibility (Table 3a and Table 3b). After controlling for demographics and family and peer smoking, participants who did not think each of the four packs were off-putting were significantly more likely to be susceptible than those who did find them off-putting (regular pack [Adjusted Odds Ratio [AOR]=3.22, $p=0.006$], bevelled-edge pack [AOR=3.22, $p=0.006$], slim pack [AOR=3.70, $p=0.002$], shoulder box pack [AOR=2.73, $p=0.015$]); albeit the number of participants who did not think the packs were off-putting was small (range: $n=33-55$). There was no association for the other packs on the other reaction measures. In all models, parental or guardian smoking was a predictor of susceptibility (regular pack [AOR=1.92, $p=0.037$], bevelled-edge pack [AOR=1.92, $p=0.036$], slim pack [AOR=2.12, $p=0.016$], shoulder box [AOR=2.15, $p=0.016$]). There was no association for other covariates.

[Table 3a]

[Table 3b]

DISCUSSION

This study explored adolescent never-smoker's reactions to four standardised cigarette packs, three of which varied in structure permitted under the UK legislation (e.g. bevelled-edged pack, slim pack and shoulder box). Adolescents' mostly reported negative reactions to all four packs and the majority said that they would not select any of the pack designs. Permitted variations in structure somewhat reduced negative reactions, particularly for the shoulder box design. Pack reactions mostly had no association with smoking susceptibility. Although not considering the four pack designs to be off-putting was associated with increased susceptibility, the proportion of adolescents reporting such reactions were low.

The findings are consistent with evaluation research from other countries where standardised packaging has been fully implemented, such as Australia and France, particularly studies which have reported decreased appeal and reduced susceptibility.^{21,22,23,24} The findings are also consistent with early evaluation research from the UK, such as focus groups which found that adolescents in Scotland considered the standardised pack designs unappealing and off-putting²⁶. The current findings provide empirical support to this, by demonstrating negative reactions across measures of appeal (e.g. attractiveness), user-perceptions (e.g. cool and fashionable), and perceived negative effects (e.g. off-putting and harmful). Adolescents' exhibited a variety of negative reactions, the majority suggested that they would not select any of the four packs (including the majority of those susceptible to smoke), and there was no association between most pack reactions and susceptibility. Collectively, these findings suggest that standardised packaging is achieving one of its core aims by reducing appeal among adolescents,²⁰ and will supplement the effect of other tobacco control policies that aim to reduce the visibility and attractiveness of tobacco marketing, such as the point-of-sale display ban.^{34, 35}

The data suggest that the variations in pack structure that are still permitted in the UK do somewhat reduce negative reactions to standardised packs. In particular, adolescents rated the shoulder box pack less negatively than the 'regular' pack across half of the reaction measures, and this design was also rated less negatively than the other two packs varying in structure (slim and bevelled-edge). These findings are consistent with research which suggests that cigarette packs that vary in structure and opening method are considered cool, novel, attractive, and expensive by both

young and adult consumers.^{5,6,7,25,29} The findings are also consistent with post-implementation focus group research in Scotland, where adolescents viewed the shoulder box to be cool and different. The 'regular' pack was rated most negatively by adolescents on all eight reaction measures.²⁹ This is the only design permitted in some other countries where standardised packaging has been introduced, such as Australia and New Zealand. This suggests that further reductions in appeal may have been possible had the UK adopted the same structural restrictions, and this as an important consideration for other countries considering similar legislation. Further research is required to monitor the use of structural variation, including whether shoulder box designs are introduced to the UK market, and to monitor the impact of such variation in other populations (e.g. adult smokers).

There are limitations. Concerning study design, we cannot establish a causal association between pack reactions and susceptibility due to the cross-sectional nature of the data. Longitudinal research, similar to that conducted in Australia, is needed to evaluate the longer term impact of standardised packaging.²¹ We also only focused on never-smoking adolescents in Scotland, and the sample was skewed towards those from more affluent SES due to the location of two of the schools recruited; indeed there were so few participants from the low SES category it was necessary to combine this with medium SES for analysis. Exploring to what extent, if at all, these findings generalise across the UK, to adult consumers, to those of lower SES status and among ever-smokers are important questions for future research. Concerning survey delivery, teachers were present, which may have resulted in socially desirable answers. The survey was also completed using two modes (electronic vs. paper), and we did not explore whether mode of completion had any impact on responses. Participants were only exposed to images of the packs, and were not exposed to the tactile qualities of the packs (e.g. bevelled-edges). It is possible that other modes of study, such as an in-person discrete choice experiment, may have elicited different responses albeit formative qualitative research suggests that reactions are negative even when being able to handle the packs.²⁵

There are also contextual limitations to consider. First, the study was conducted across a one-year period post-implementation of standardised packaging, and it is possible that reactions may have varied by point of data collection. For instance, tobacco companies delayed full implementation of standardised packaging until compliance was almost mandatory in May 2017,³ and it is therefore plausible that participants in the months closer to implementation may have had a greater reaction when the unattractive designs felt comparatively new, versus those recruited a year later when they may have become more or familiar with, or desensitised to, standardised packs. Furthermore, participants were only exposed to packs at one-time point when completing the survey, and perceptions may change in a real-world setting after repeated-exposure, or when seeing others (e.g. peers) with these packs. Moreover, we used purposively selected graphic warnings, and also removed brand variant names. In the real-world, adolescents may react differently to other health warnings and previous research has shown that brand name does create appeal, even on standardised cigarette packs.²⁵ As such, future research should consider how these other elements of packaging may impact on reactions to standardised packs. Finally, data were not available to understand how widely available the packs with varied structures are in the UK or what proportion of sales volume they represent.

In conclusion, never-smoking adolescents in Scotland reacted negatively to standardised packs, with most indicating that they would not select any of these packs, and most reactions having no association with susceptibility. This provides early evidence that standardised packaging is achieving its intended goal among a key target population. Nevertheless, that the different pack structures permitted in the UK somewhat reduced negative reactions, particularly the shoulder box, suggests that the legislation should be updated to ensure that pack structure is standardised, as it is in Australia and New Zealand. Countries considering introducing standardised packaging should do likewise.

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REFERENCES

1. UK Government. Standardised Packaging of Tobacco Products Regulations 2015. Available: www.legislation.gov.uk/uksi/2015/829/pdfs/uksi_20150829_en.pdf Accessed August 15, 2017.
2. UK Government. Tobacco and Related Products Regulations 2016. Available: www.legislation.gov.uk/uksi/2016/507/pdfs/uksi_20160507_en.pdf Accessed 9 March 2019)
3. Critchlow N, Stead M, Moodie C, Eadie D, MacKintosh AM. Introduction of standardized tobacco packaging during a 12-month transition period: findings from small Retailers in the United Kingdom. *Nicotine Tob Res.* 2018; 21(7): 871-878. doi.org/10.1093/ntr/nty006
4. Moodie C, Hoek J, Scheffels J, Gallopel-Morvan K, Lindorff K. Plain packaging: Legislative differences in Australia, France, the United Kingdom, New Zealand and Norway, and options for strengthening regulations. *Tob Control.* 2018; 28(5): 485-492. doi.org/10.1136/tobaccocontrol-2018-054483.
5. Moodie C, Ford A. Young adult smokers' perceptions of cigarette pack innovation, pack colour and plain packaging. *Australasian Marketing Journal (AMJ).* 2011; 19(3): 174-180. doi.org/10.1016/j.ausmj.2011.05.003
6. Borland R, Savvas S, Sharkie F, Moore K. The impact of structural packaging design on young adult smokers' perceptions of tobacco products. *Tob Control.* 2013; 22(2): 97-102. doi.org/10.1136/tobaccocontrol-2011-050078.
7. Kotnowski K, Hammond D. The impact of cigarette pack shape, size and opening: evidence from tobacco company documents. *Addiction.* 2013;108(9):1658–68. doi.org/10.1111/add.12183.
8. Wakefield M, Coomber K, Zacher M, Durkin S, Brennan E, Scollo M. Australian adult smokers' responses to plain packaging with larger graphic health warnings 1

- implementation in Great Britain. *Int J Environ Res Public Health*. 2017;14(8):858. doi.org/10.3390/ijerph14080858.
16. Poundall T, Bogdanovica I, Langley T. A cross-sectional study of the impact of standardized tobacco packaging legislation on university students. *J Child Adolesc Subst Abuse*. 2018;27(3):165-173. doi.org/10.1080/1067828X.2018.1431992.
17. Moodie C, Brose LS, Lee HS, Power E, Bauld L. How did smokers respond to standardised cigarette packaging with new, larger health warnings in the United Kingdom during the transition period? A cross-sectional online survey. *Addict Res Theory*. 2019;1-9. doi: 10.1080/16066359.2019.1579803
18. Retzler C, Shiraj N, Retzler J. Eye movement data reveal increased attention to combined health warnings on cigarette packs. *Drug Alcohol Depend*. 2019; 194:336-340. doi.org/10.1016/j.drugalcdep.2018.11.004.
19. Ng Fat L. Health survey for england 2015: adult cigarette smoking. nhs digital. 2016. Available: www.content.digital.nhs.uk/catalogue/PUB22610/HSE2015-Adult-smo.pdf Accessed 21 August, 2017.
20. McNeill A, Cravely S, Hitchman SC, Bauld L, Hammond D, Hartmann-boyle J. Tobacco Packaging design for reducing tobacco use. *Cochrane Database Syst Rev*. 2017; 4(CD011244).
21. Dunlop S, Perez D, Dessaix A, Currow D. Australias plain tobacco packs: anticipated and actual responses among adolescents and young adults 2010–2013. *Tob Control*. 2016;26(6):617-626. doi.org/10.1136/tobaccocontrol-2016-053166.
22. White V, Williams T, Wakefield M. Has the introduction of plain packaging with larger graphic health warnings changed adolescents' perceptions of cigarette packs and brands? *Tob Control*. 2015;24(Suppl 2):42-49. doi.org/10.1136/tobaccocontrol-2014-052084.

23. White VM, Guerin N, Williams T, Wakefield M. Long-term impact of plain packaging of cigarettes with larger graphic health warnings: findings from cross-sectional surveys of Australian adolescents between 2011 and 2017. *Tob control*. 2019;28(e1):77-84. doi.org/10.1136/tobaccocontrol-2019-054988.
24. El-Khoury F, Bolze C, Gomajee R, White V, Melchior M. "Plain tobacco packaging, increased graphic health warnings and adolescents' perceptions and initiation of smoking: DePICT, a French nationwide study." *Tob Control*. 2019;28(e1):31-36. doi.org/10.1136/tobaccocontrol-2018-054573.
25. Mitchell D, Moodie C, Critchlow N, Bauld L. Adolescents' perceptions of standardised cigarette packaging design and brand variant name post-implementation: a focus group study in Scotland. *BMC Public Health*. 2019;19(1):1-9. doi.org/10.1186/s12889-019-7552-0.
26. Scottish Index for Multiple Deprivation 2020. Available: <https://simd.scot/#/simd2020/BTTTTFTT/9/-4.0000/55.9000/> Accessed January 28, 2020.
27. Currie C, Molcho M, Boyce W, Holstein B, Torsheim T, Richter M. Researching health inequalities in adolescents: the development of the Health Behaviour in School-Aged Children (HBSC) family affluence scale. *Soc Sci Med*. 2008;66(6):1429-1436. doi.org/10.1016/j.socscimed.2007.11.024.
28. Boyce W, Torsheim T, Currie C, Zambon A. The family affluence scale as a measure of national wealth: validation of an adolescent self-report measure. *Soc Indic Res*. 2006;78(3):473-487. doi.org/10.1007/s11205-005-1607-6.
29. Ford A, MacKintosh AM, Moodie C, Richardson S, Hastings G. Cigarette pack design and adolescent smoking susceptibility: a cross-sectional survey. *BMJ open*. 2012;3(9):e003282. doi.org/10.1136/bmjopen-2013-003282

30. MacKintosh AM, Moodie C, Hastings G. The association between point-of-sale displays and youth smoking susceptibility. *Nicotine Tob Res.* 2012;14:616-620. doi.org/10.1093/ntr/ntr185.
31. Hammond D. Health warning messages on tobacco products: a review. *Tob Control.* 2011; 20(5): 327-337. doi.org/10.1136/tc.2010.037630.
32. Hammond D, Doxey J, Daniel S, Bansal-Travers M. Impact of female-oriented cigarette packaging in the United States. *Nicotine Tob Res.* 2013;13(7):579-588. doi.org/10.1093/ntr/ntr045.
33. Moodie C, Ford A, Mackintosh AM, Hastings G. Young people's perceptions of cigarette packaging and plain packaging: an online survey. *Nicotine Tob Res.* 2011;14(1): 98-105. doi:10.1093/ntr/ntr136.
34. Kuipers MA, Best C, Wilson M, Currie D, Ozakinci G, MacKintosh AM, Stead M, Eadie D, MacGregor A, Pearce J, Amos A. Adolescents' perceptions of tobacco accessibility and smoking norms and attitudes in response to the tobacco point-of-sale display ban in Scotland: results from the DISPLAY Study. *Tob control.* 2019;0:1-9
35. Ford, A., MacKintosh, A. M., Moodie, C., Kuipers, M. A., Hastings, G. B., & Bauld, L. Impact of a ban on the open display of tobacco products in retail outlets on never smoking youth in the UK: findings from a repeat cross-sectional survey before, during and after implementation. *Tob control.* 2019;0:1-7. doi: 10.1136/tobaccocontrol-2018-

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Table 1: Reactions towards a ‘regular’ pack with no different structural features and three packs with different structural features, among never-smokers

Reactions	Regular vs. Bevelled ¹			Regular vs. Slim ²			Regular vs. Shoulder ³			Bevelled vs. Slim ⁴			Bevelled vs. Shoulder ⁵			Slim vs. Shoulder ⁶		
	M (S D)	M (S D)	p	M (S D)	M (S D)	p	M (S D)	M (S D)	p	M (S D)	M (S D)	p	M (S D)	M (S D)	p	M (S D)	M (S D)	p
Unattractive(1)	1.2 3 (0.	1.2 5 (0.	0. 24	1.2 3 (0.	1.2 3 (0.	0. 92	1.2 3 (0.	1.3 3 (0.	0. 00	1.2 5 (0.	1.2 3 (0.	0. 23	1.2 5 (0.	1.3 3 (0.	0. 00	1.2 3 (0.	1.3 3 (0.	0. 00
Attractive(5)	75)	76)	8	75)	74)	2	75)	91)	1	76)	74)	3	76)	91)	1	74)	91)	1
Uncool(1)	1.4 6 (1.	1.4 6 (1.	0. 85	1.4 6 (1.	1.4 4 (1.	0. 22	1.4 6 (1.	1.4 9 (1.	0. 18	1.4 6 (1.	1.4 4 (1.	0. 37	1.4 6 (1.	1.4 9 (1.	0. 08	1.4 4 (1.	1.4 9 (1.	0. 01
Cool(5)	13)	11)	7	13)	08)	7	13)	13)	7	11)	08)	4	11)	13)	5	08)	13)	2
Cheap(1)	3.1 9 (1.	3.2 3 (1.	0. 08	3.1 9 (1.	3.1 2 (1.	0. 04	3.1 9 (1.	3.4 5 (1.	0. 00	3.2 3 (1.	3.1 2 (1.	0. 00	3.2 3 (1.	3.4 5 (1.	0. 00	3.1 2 (1.	3.4 5 (1.	0. 00
Expensive(5)	39)	32)	2	39)	37)	2	39)	31)	1	32)	37)	1	32)	31)	1	37)	31)	1
Unfashionable(1)	1.6 7 (1.	1.7 0 (1.	0. 04	1.6 7 (1.	1.7 2 (1.	0. 07	1.6 7 (1.	1.8 6 (1.	0. 00	1.7 0 (1.	1.7 2 (1.	0. 42	1.7 0 (1.	1.8 6 (1.	0. 00	1.7 2 (1.	1.8 6 (1.	0. 00
Fashionable(5)	05)	04)	7	05)	06)	1	05)	18)	1	04)	06)	6	04)	18)	1	06)	18)	1
Boring(1)	2.3 5 (1.	2.3 8 (1.	0. 24	2.3 5 (1.	2.3 7 (1.	0. 28	2.3 5 (1.	2.4 3 (1.	0. 01	2.3 8 (1.	2.3 7 (1.	0. 89	2.3 8 (1.	2.4 3 (1.	0. 06	2.3 7 (1.	2.4 3 (1.	0. 00
Interesting(5)	29)	28)	5	29)	26)	8	29)	30)	7	28)	26)	8	28)	30)	3	26)	30)	4
Unpopular(1)	2.4 2 (1.	2.4 6 (1.	0. 15	2.4 2 (1.	2.4 4 (1.	0. 42	2.4 2 (1.	2.5 3 (1.	0. 00	2.4 6 (1.	2.4 4 (1.	0. 54	2.4 6 (1.	2.5 3 (1.	0. 03	2.4 4 (1.	2.5 3 (1.	0. 00
Popular(5)	29)	28)	6	29)	26)	7	29)	31)	6	28)	26)	7	28)	31)	3	26)	31)	1
Harmful(1)	1.1 9 (0.	1.2 0 (0.	0. 13	1.1 9 (0.	1.2 1 (0.	0. 08	1.1 9 (0.	1.2 2 (0.	0. 04	1.2 0 (0.	1.2 1 (0.	0. 10	1.2 0 (0.	1.2 2 (0.	0. 15	1.2 1 (0.	1.2 2 (0.	1. 00
Not harmful(5)	62)	62)	2	62)	63)	8	62)	64)	6	62)	63)	8	62)	64)	2	63)	64)	0
Off-putting(1)	1.2 7 (0.	1.2 7 (0.	0. 43	1.2 7 (0.	1.2 8 (0.	0. 65	1.2 7 (0.	1.3 0 (0.	0. 03	1.2 7 (0.	1.2 8 (0.	0. 29	1.2 7 (0.	1.3 0 (0.	0. 01	1.2 8 (0.	1.3 0 (0.	0. 02
Not off-putting(5)	72)	71)	9	72)	73)	5	72)	76)	4	71)	73)	1	71)	76)	2	73)	76)	1

Notes: As data were ordinal, pairwise comparisons based on Wilcoxon Signed Rank Test; Means are shown for illustration of scoring on scale

Bonferroni correction applied to account for six pairwise comparisons, so critical value $p = 0.008$.

Range of missing data across comparisons: ¹ 1-16; ² 4-17; ³ 3-17; ⁴ 4-19; ⁵ 3-18; ⁶ 5-19

Table 2: Proportion of participants (%) who selected one of the four packs (vs. did not any pack)

Variable	Selected one of the four packs		χ^2	<i>p</i>
	%	<i>n</i>		
Overall	13	62	-	-
Age¹			5.04	0.081
12-13 years old	9	16		
14-15 years old	13	23		
16-17 years old	17	23		
Gender²			2.06	0.151
Female	15	39		
Male	10	23		
Socioeconomic status³			0.69	0.407
Low or Medium SES	15	17		
High	12	43		
Ethnicity⁴			0.12	0.733
Other or Prefer not to say	14	12		
White British	13	50		
Susceptibility⁵			29.7	0.001
Non-susceptible	7	25		
Susceptible	25	37		

Notes:

Cases with missing data on pack selection (*n*=19). Accounting for missing data on demography total cases excluded in each test:

¹Age (*n*=19)

²Gender (*n*=20)

³SES (*n*=29)

⁴Ethnicity (*n*=24)

⁵Susceptibility (*n*=19).

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Neutral or positive	22	0.98	0.34-2.83	0.973	22	1.06	0.38-2.98	0.913
Pack off-putting								
Negative reaction	434	REF			432	REF		
Neutral or positive	33	3.22	1.39-7.45	0.006	33	3.22	1.40-7.40	0.006

Notes:

Base = All never smokers; *AOR* = Adj. Odds Ratio; 95% CI = 95% Confidence Interval

Case excluded due to missing data on one or more items ¹ (*n*=40); ² (*n*=42)

DV = Susceptibility to smoke (0 = Non-susceptible never-smoker, 1 = Susceptible never smoker)

Model summaries for final block:

² Test of coefficients, $\chi^2(16)=36.75, p<0.002$; Hosmer & Lemeshow, $\chi^2(8)=2.53, p = 0.960$, Nagelkerke $R^2=0.107$

⁴ Test of coefficients, $\chi^2(16)=34.37, p<0.005$; Hosmer & Lemeshow, $\chi^2(8)=11.04, p = 0.199$, Nagelkerke $R^2=0.101$

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Table 3b. Logistic regression exploring association between reactions to slim and shoulder box pack and smoking susceptibility

Variables and ref categories	Slim pack ³				Shoulder Box ^{2,4}			
	<i>n</i>	AOR	95% CI	<i>p</i>	<i>n</i>	AOR	95% CI	<i>p</i>
Gender								
Male	210	REF			211	REF		
Female	249	1.13	0.74-1.73	0.572	246	1.09	0.72-1.66	0.688
Age								
12-13 years old	157	REF		0.387	157	REF		0.529
14-15 years old (vs younger)	171	1.41	0.84-2.35	0.190	170	1.34	0.80-2.23	0.262
16-17 years old (vs younger)	131	1.14	0.71-1.82	0.387	130	1.06	0.66-1.70	0.805
SES status								
High	347	REF			345	REF		
Low or medium	112	0.80	0.47-1.34	0.392	112	0.80	0.48-1.34	0.391
Ethnicity								
Other or prefer not to say	80	REF			80	REF		
White British	379	1.47	0.82-2.64	0.191	377	1.50	0.84-2.68	0.174
Parent or guardian smoking								
No	401	REF			400	REF		
Yes	58	2.12	1.15-3.90	0.016	57	2.15	1.15-4.00	0.016
Friend smoking								
No	390	REF			389	REF		
Yes	69	0.99	0.55-1.79	0.976	68	1.07	0.59-1.95	0.813
Sibling smoking								
No	443	REF			411	REF		
Yes	16	0.70	0.22-2.17	0.531	16	0.73	0.23-2.28	0.581
Pack attractiveness								
Negative reaction	431	REF			417	REF		
Neutral or positive	28	1.14	0.46-2.86	0.775	40	1.20	0.55-2.60	0.649
Pack coolness								
Negative reaction	408	REF			396	REF		
Neutral or positive	51	1.80	0.91-3.55	0.089	61	1.68	0.89-3.18	0.108
Pack cost								
Negative reaction	146	REF			101	REF		
Neutral or positive	313	1.16	0.72-1.86	0.539	356	1.03	0.61-1.74	0.920
Pack fashionable								
Negative reaction	352	REF			326	REF		
Neutral or positive	107	1.20	0.69-2.07	0.517	131	1.07	0.63-1.82	0.800
Pack popularity								
Negative reaction	225	REF			216	REF		
Neutral or positive	234	1.14	0.70-1.85	0.608	241	1.05	0.65-1.71	0.836
Pack Interest								
Negative reaction	235	REF			230	REF		
Neutral or positive	224	1.45	0.92-2.29	0.114	227	1.46	0.92-2.30	0.106
Pack harm								
Negative reaction	437	REF			435	REF		

Neutral or positive	22	0.83	0.28-2.41	0.725	22	1.26	0.46-3.50	0.652
Pack off-putting								
Negative reaction	426	REF			422	REF		
Neutral or positive	33	3.70	1.61-8.47	0.002	35	2.73	1.22-6.15	0.015

Notes:

Base = All never smokers; *AOR* = Adj. Odds Ratio; 95% CI = 95% Confidence Interval

Case excluded due to missing data on one or more items ¹ (*n*=48); ² (*n*=50)

DV = Susceptibility to smoke (0 = Non-susceptible never-smoker, 1 = Susceptible never-smoker)

Model summaries for final block:

² Test of coefficients, $\chi^2(16)=38.83, p<0.001$; Hosmer & Lemeshow, $\chi^2(8)=9.47, p = 0.304$, Nagelkerke $R^2=0.114$

⁴ Test of coefficients, $\chi^2(16)=33.00, p<0.007$; Hosmer & Lemeshow, $\chi^2(8)=8.96, p = 0.346$, Nagelkerke $R^2=0.098$

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Figure 1: Standardised cigarette packs varying in structure (Pack 1: ‘regular’ straight-edge pack, Pack 2: Bevelled-edged pack, Pack 3: Slim pack, Pack 4: Shoulder box)



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