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Young adult smokers' perceptions of cigarette pack inserts promoting cessation and dissuasive cigarettes: An online survey

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ABSTRACT

Objectives: To explore young adult smokers' perceptions of cigarette pack inserts promoting cessation and cigarettes designed to be dissuasive.

Design: Cross-sectional online survey.

Setting: United Kingdom.

Participants: Of the 1970 young adult smokers recruited, the final sample was 1766 (89.6%); 50.3% were male and 71.6% white British. To meet the inclusion criteria participants had to be 16-34 years old and smoke factory-made cigarettes.

Primary and secondary outcome measures: Salience of inserts, perceptions of inserts as information provision, perceptions of inserts on quitting, support for inserts, and perceived appeal, harm and trial of three cigarettes (a standard cigarette, a standard cigarette displaying the warning 'Smoking kills' on the cigarette paper, and a green cigarette).

Results: Half the sample indicated that they would read inserts with three-fifths indicating that they be a good way to provide information about quitting (61%). Just over half the sample indicated that inserts would make them think more about quitting (53%), help if they decided to quit (52%), are an effective way of encouraging smokers to quit (53%), and supported having them in all packs (55%). Participants who smoked factory-made cigarettes and other tobacco products (compared to exclusive factory-made cigarette smokers), had made a quit attempt within the last six months (compared to those that had never made a quit attempt), or were likely to make a successful quit attempt in the next six months (compared to those unlikely to make a quit attempt in the next six months), were more likely to indicate that inserts could assist with cessation. Multivariable logistic regression modelling suggested

that the two dissuasive cigarettes were considered much less desirable (less appealing, more harmful, less likely to be tried) than the standard cigarette.

Conclusions: Inserts and dissuasive cigarettes offer policy makers additional ways of using the pack to reduce smoking.

Strengths and limitations of this study

- The main strength of this study is that it allows an insight into how young adult smokers perceive two innovative tobacco control measures (pack inserts promoting cessation and dissuasive cigarettes).
- The main limitations are that the study does not provide any insight into actual smoking behaviour, the novelty of the stimuli and forced exposure to this, and the use of self-selection.

INTRODUCTION

While packaging remains a key marketing driver for tobacco companies, more than 100 countries now require pictorial health warnings on cigarette packs,[1] which can limit pack appeal.[2] Some countries have gone even further by implementing plain (or standardised) packaging, which severely reduces the promotional power of the pack. The United Kingdom (UK) became the third country to fully implement standardised packaging in May 2017, following Australia in December 2012 and France in January 2017. In the UK all cigarette packs must be drab brown with pictorial warnings on 65% of the front and back of packs and additional health messages on 50% of the sides of the pack. Although these changes have reduced the ability of tobacco companies to use the pack to create favourable perceptions of the brand and of smoking, there is clearly more scope for using the packaging to dissuade consumers. Regulators and academics have typically focused on the exterior of the cigarette pack, with little consideration of how the pack interior, for instance pack inserts or cigarettes, could potentially be used to encourage smokers to think about their smoking behaviour. This is the focus of our study.

Tobacco companies have used the inside of the cigarette pack to communicate with consumers since the late 19th century, via cigarette cards, coupons and promotional inserts. Only in Canada are they required, by law, to include pack inserts with health messaging. Sixteen text-only inserts were required in packs between 2000 and 2012, with nine encouraging cessation and seven providing health risk information.[3] These were replaced with eight new inserts, with coloured graphics and tips about quitting or the benefits of doing so, in 2012. Few studies have explored perceptions of pack inserts,[4-8] with only two assessing smokers' perceptions of, and responses to, the inserts used in Canada.[9-11] In focus group research in Scotland,[9] with smokers aged 16 and over who were shown seven of the inserts used in Canada, the general view was that they would capture attention and be read due to

their novelty and visibility when opening the pack. The positive messaging was liked and thought to increase message engagement. The inserts were often preferred to the on-pack warnings, although both were deemed necessary. Some participants suggested that inserts could encourage them to stop smoking, and they were generally considered to have the potential to alter the behaviour of younger people, would-be smokers and those wanting to quit.[9] In Canada, a longitudinal online survey with smokers aged 18 and over found that between 26% and 31% at each wave reported having read pack inserts at least once in the prior month; those intending to quit or having recently tried to do so were significantly more likely to have read them.[10] In addition, while reading warnings on the pack exterior decreased over time, reading pack inserts increased over time, with more frequent reading independently associated with self-efficacy to quit, quit attempts, and sustained quitting at follow-up.[11]

The cigarette itself is also an important communications tool,[12,13] which has long been used by tobacco companies as a marketing device but has yet to be used by regulators to deter smoking. As cigarettes are primarily responsible for tobacco related mortality and morbidity and predicted to continue to dominate the global market for some time yet,[14] research exploring the potential impact of standardising the appearance of cigarettes to make them less desirable is long overdue. Some recent research has examined consumer perceptions of 'dissuasive' cigarettes, including unattractively coloured cigarettes,[15,16] cigarettes with the warning 'Smoking kills' on the cigarette paper,[17,18] and cigarettes displaying the 'minutes of life lost due to smoking' on the cigarette paper.[19] In each of these studies the dissuasive cigarettes were generally viewed more negatively than regular cigarettes. For instance, a qualitative study with young women smokers in New Zealand found that unattractively coloured cigarettes, particularly green or brown coloured cigarettes, were perceived as more harmful than other cigarettes, with it less likely that they or others their age would want to

use them.[15] An in-home survey in the UK with 11-16 year olds, who were shown an image of a cigarette stick displaying 'Smoking kills', found that 53% indicated that this would make people want to give up smoking, 71% indicated that it would put people off starting to smoke, and 85% supported having a warning on all cigarettes.[18]

In this study our objective was to explore, for the first time, young adult smokers' perceptions of pack inserts and dissuasive cigarettes (a cigarette displaying the warning 'Smoking kills' and a green coloured cigarette).

METHODS

Design and sample

An online survey was conducted in January-February 2016 with smokers aged 16-34 years old in the UK; an online survey is a suitable approach for this age group given that 99% of 16-34 year olds in the UK are recent internet users.[20] The sample was recruited by online market research company 'Research Now' (www.researchnow.com). The inclusion criteria were that participants were factory-made cigarette smokers and aged 16-34 years. After Research Now excluded those who had completed the survey in less than the minimum completion time, which they had set prior to data collection commencing (n=193), and those providing responses to open-ended questions that indicated that they had not taken the survey seriously (n=11), the final sample was 1766 (89.6%). The final sample was 50.3% male, with 53.9% aged 25-34 years and 71.6% white British. Most participants smoked 10 or less cigarettes per day, with 46.0% exclusive factory-made cigarette smokers (see Table 1 for sample and smoking-related characteristics).

Table 1 here

Procedure

An email invite was sent by Research Now to their online panel in the UK; Research Now is an established online market research company with their panel recruited from a range of internet sites, advertising and partnerships with other websites. Those eligible for inclusion were presented with an information page explaining the study aim (to explore what young adult smokers thought about cigarettes and pack inserts), and relevant ethical information (their right to withdraw at any time, assurances of confidentiality and anonymity, and contact details if they had any concerns). They were then presented with a consent page, with consent required for participation. Survey questions were presented in the same order for all participants, except the questions exploring perceptions of the three cigarettes (standard cigarette, warning cigarette, green cigarette), where the ordering was randomised; the ordering of the presentation of the three cigarettes (shown in Figure 1) was also randomised. There was no missing data as participants could only proceed to the next question if they had provided an answer to the previous question.

Figure 1 here

For each of the inserts questions participants were shown an image of one of four inserts, see Figure 2, chosen from the eight used in Canada as they were considered most relevant to our sample. The words 'Health Canada' were removed from the bottom of each insert to make them more relevant for participants in the UK. The median time for survey completion was 9 minutes 28 seconds. Participants received a nominal incentive for participation, as is common for online panels. The study received ethical approval from the School of Health Sciences Ethics Committee at the University of Stirling.

Figure 2 here

Measures

Inserts: Salience and information provision

Participants were asked 'If this type of insert was in your cigarette pack, do you think that you would read it?' and 'If this type of insert was in your cigarette pack, do you think that you would read it if you were interested in quitting?' They were also asked 'Do you think that inserts would be a good way to provide information to smokers about quitting?' Response options for each were 'Yes', 'No' and 'Not sure'.

Inserts: Cessation

Three questions assessed to what extent participants agreed or disagreed that inserts would make them think about quitting, and help them quit: 'Do you agree or disagree that having these types of inserts in every cigarette pack would make you think more about quitting?', 'Do you agree or disagree that having these types of inserts in every cigarette pack might help you if you decided to quit?', and 'Do you agree or disagree that having these types of inserts inside every cigarette pack would be an effective way of helping smokers who want to quit?' Response options for each were 'Strongly disagree', 'Disagree', 'Neither agree nor disagree', 'Agree', 'Strongly agree' and 'Don't know'.

Inserts: Support

A five-point semantic scale assessed support, with anchors 'All cigarette packs should have inserts like this in them-No cigarette packs should have inserts like this in them'.

Cigarette design: Appeal, harm and trial

Seven-point semantic scales assessed appeal, harm and likely trial. Appeal was assessed via four scales, with anchors 'Attractive-Unattractive', 'Stylish-Not stylish', 'Not nice to be seen with-Nice to be seen with' and 'Not appealing to people my age-Appealing to people my age'. Harm was assessed via two scales, with anchors 'Looks harmful to health-Does not look harmful to health' and 'Makes me think about the dangers of smoking-Does not make me think about the dangers of smoking'. Likely trial was assessed via two scales, 'If a friend offered you each of these cigarettes, how likely would you be to try them?' and 'If someone your age who had never smoked before was going to try a cigarette, how likely do you think they would be to try each of these cigarettes?' Both scales assessing trial ranged from 'Not at all likely' to 'Very likely'.

Sociodemographic characteristics

Age, gender, ethnicity, educational attainment and economic status (based on chief income earner) were obtained. A count procedure was used to create a variable for low socioeconomic status (SES): low education (General Certificate of Secondary Education: GCSE or below) and/or low economic status (routine or manual occupation, long-term unemployed or long-term sick or disabled).

Smoking behaviour

Smoking status was assessed with 'Which of these best describes you?' with response options: 'I have never smoked', 'I used to smoke, but don't now', 'I smoke, but not every day', and 'I smoke every day'. Type of products used was assessed with 'What type(s) of tobacco products do you smoke?' with response options: 'Only factory-made (packet)

cigarettes', 'Factory-made and roll-your-own cigarettes', 'Factory-made cigarettes and other tobacco products (e.g. cigars, shisha, etc)', 'Only roll-your-own cigarettes' and 'Only other tobacco products (e.g. cigars, shisha, etc)'. The Heaviness of Smoking Index (HSI)[21] was used as a measure of dependence, based on daily consumption and time to first cigarette.

Quitting and self-efficacy

Participants were asked 'Have you ever made an attempt to quit smoking that lasted at least 24 hours?' (Yes within the last six months, Yes more than six months ago, I have never tried to quit for more than 24 hours). They were also asked 'How likely are you to try to quit smoking within the next six months?' (Not at all, A little, Moderately, Very, Extremely, Don't know), with those responding 'Not at all', 'A little', 'Moderately' or 'Don't know' classified as 'Unlikely to make a quit attempt in the next six months'. To measure quitting self-efficacy, participants were asked 'If you decided to quit smoking in the next six months, how sure are you that you would succeed?' (Not at all, A little, Moderately, Very, Extremely, Don't know). Those who responded to the likelihood of quitting question with 'Very or 'Extremely' and to the quitting efficacy question with 'Not at all', 'A little', 'Moderately' or 'Don't know' were classified as 'unlikely to make a successful quit attempt in the next six months'. Those who responded 'Very' or 'Extremely' to both questions were classified as 'likely to make a successful quit attempt in the next six months'.

Analysis

Data was analysed using Microsoft office Excel 2013, SPSS v22 and v23 and MlWin v2.33.[22] The insert variables were dichotomised into yes/agreement and no/disagreement/neutral/not sure/don't know. The dichotomised insert variables were the outcomes of the logistic regression models. The independent variables were gender, age, education, ethnicity,

dependence (tertiles of HSI), tobacco product(s) smoked, previous quit attempt lasting 24 hours, and likely efficacy of a quit attempt in the next six months. Percentages in agreement were calculated. Age, gender and education (as a measure of SES) were entered into all models to account for any sampling inadequacies. Other variables were entered where $p<0.10$ in chi square tests.

The cigarette variables were assessed using seven-point semantic scales, with percentages calculated for those indicating one of the three points nearest the undesirable anchor (e.g. unattractive, not nice to be seen with, looks harmful to health). Differences between the three cigarettes were tested using Cochran's Q and pairwise comparisons. A factor analysis of the eight perception variables, collated for all three cigarettes, was undertaken, with checks indicating that the data was suitable for factor analysis (Kaiser Meyer Olkin=0.845, Bartlett's test of sphericity (approx. chi-square 18062.842, df=276, $p<0.001$), with no correlations between the variables >0.9). The extraction method used was Principal Axis Factoring and the criteria for extraction was eigenvalues>1. All eight variables loaded on a single factor >0.5. High factor scores indicated that a cigarette was desirable and low scores that it was undesirable. Visual inspection and the Kolmogorov-Smirnov test indicated that the factor was non-normal (because responses for the dissuasive cigarettes indicated they were undesirable generally) and attempts to normalise it using normit rankit methods failed. Thus the factor was divided into tertiles and the tertile indicating undesirable factor scores was compared with the other two tertiles. This was the outcome variable in regression analysis.

Multilevel logistic regression modelling, with second order PQL linearization, was undertaken with cigarette type (at level one) clustered with individual participants (at level two). All models included cigarette type as a fixed effect where the standard cigarette was compared with the warning cigarette and green cigarette. Other fixed effects at the individual

(participant) level were sociodemographic and smoking-related characteristics. This main effects model tested which characteristics were associated with perceiving cigarettes as desirable. In order to understand which characteristics differentiated the desirability of the three types of cigarettes, interactions between cigarette type and each significant characteristic were tested. One interaction was found. Interacting variables were substituted by a cross classified variable (derived from cigarette type and the variable with which cigarette type significantly interacted). The reference category of the cross classified variable was varied in order to understand the interaction.

RESULTS

Perceptions of inserts

Half the sample indicated that they would read inserts, with approximately three-fifths indicating that they would read them if interested in quitting (60%), and that they would be a good way to provide information about quitting (61%). Just over half strongly agreed/agreed that inserts may make them think more about quitting (53%), help them if they decided to quit (52%), that they are an effective way of encouraging smokers to quit (53%), and that all cigarette packs should have inserts (55%), see Table 2.

Table 2 here

Sociodemographic differences in perceptions of inserts

Women were more likely than men to indicate that they would read inserts (aOR=1.24; 95%CI 1.02-1.50), and 25-34 year olds less likely than 16-19 year olds to think that they were a good way of providing information about quitting (aOR=0.76; 95%CI 0.60-0.98).

Compared with white British participants, white non-British (aOR=0.70; 95%CI 0.50-0.98) and Asian (aOR=0.67; 95%CI 0.49-0.92) participants were less likely to suggest that they would read inserts if trying to quit, white non-British (aOR=0.58; 95%CI 0.41-0.81) and Black (aOR=0.61; 95%CI 0.38-0.98) participants were less likely to indicate that inserts would make them think about quitting, and white non-British (aOR=0.62; 95%CI 0.44-0.87) and Asian (aOR=0.70; 95%CI 0.51-0.96) participants were less likely to support having inserts in all packs, see Table 3a.

Smoking-related differences

Compared to exclusive factory-made cigarette smokers, those who also smoked roll-your-own cigarettes were more likely to indicate they would read inserts (aOR=1.35; 95%CI 1.09-1.66), read them if trying to quit (aOR=1.61; 95%CI 1.30-2.00), that they would make them think about quitting (aOR=1.31; 95%CI 1.06-1.62), help them if they decided to quit (aOR=1.31; 95%CI 1.06-1.61), and that they would be an effective way of encouraging smokers to quit (aOR=1.27; 95%CI 1.03-1.56). Compared to exclusive factory-made cigarette smokers, those who also smoked other tobacco products (e.g. cigars, shisha) were more likely to indicate they would read inserts if trying to quit (aOR=1.39; 95%CI 1.04-1.86) and that inserts might help them if they decided to quit (aOR=1.34; 95%CI 1.01-1.78).

Participants who had made a quit attempt more than six months ago (aOR=1.30; 95%CI 1.00-1.69), or within the last six months (aOR=1.67; 95%CI 1.29-2.15), were more likely to indicate that they would read inserts than those who had never made a quit attempt. Those who had made a quit attempt in the last six months were also more likely than those who had never made a quit attempt to indicate that inserts were a good way to provide information about quitting (aOR=1.54; 95%CI 1.20-1.98), that they would read them if trying to quit (aOR=1.51; 95%CI 1.17-1.94), make them think about quitting (aOR=1.46; 95%CI

1.14-1.88), help them if they decided to quit (aOR=1.35; 95%CI 1.05-1.73), and that they would be an effective way of encouraging smokers to quit (aOR=1.33; 95%CI 1.04-1.71).

Compared to those likely to make a successful quit attempt in the next six months, those unlikely to make a quit attempt in the next six months were less likely to indicate that they would read inserts (aOR=0.58; 95%CI 0.44-0.75), read them if trying to quit (aOR=0.74; 95%CI 0.55-0.99), that they would make them think about quitting (aOR 0.59 (0.45 to 0.78), help them if they decided to quit (aOR=0.51; 95%CI 0.38-0.67), that they would be effective for smokers if they decided to quit (aOR=0.55; 95%CI 0.41-0.73), or support them (aOR=0.56; 95%CI 0.42-0.74). Compared to those likely to make a successful quit attempt in the next six months, those unlikely to make a successful quit attempt in the next six months were more likely to read inserts if trying to quit (aOR=1.43; 95%CI 1.00-2.06), thought that they were a good way to provide information to smokers about quitting (aOR=1.46; 95%CI 1.02-2.08), and support them (aOR=1.43; 95%CI 1.00-2.04), see Table 3b.

Table 3 here

Perceptions of cigarette design

With respect to harm, participants were less likely to think that the standard cigarette (SC) (38.8%) looked harmful than the warning cigarette (WC) (69.1%) or green cigarette (GC) (70.2%) ($p<0.001$), and that the SC (20.9%) made them think more about the dangers of smoking than the WC (58.1%) or GC (53.5%) ($p<0.001$). Participants were also more likely to indicate that the WC would make them think of the dangers of smoking than the GC ($p=0.01$). In terms of appeal, participants were more likely to consider the SC (25.2%) attractive than the WC (61.7%) or GC (68.7%) ($p<0.001$), and the SC (37.4%) as stylish than

the WC (66.0%) or GC (69.4%) (p<0.001). The SC (19.8%) was also considered to be nicer to be seen with than the WC (55.2%) or GC (60.2%) (p<0.001), and the SC (17.8%) was viewed as not as appealing to people their age as the WC (51.5%) or GC (57.4) (p<0.001). In terms of trial, 79.4% indicated that they would try a SC if offered by a friend (35.7% WC, 21.5% GC), and 70.1% indicated that a never smoker their age would be most likely to try a SC (21.1% WC, 16.5% GC) (both p<0.001).

Perceptions of cigarette desirability

Main effects multivariable logistic regression modelling suggested that in comparison to the SC, the WC (aOR=17.71; 95%CI 13.75-22.80) and GC (aOR=30.88; 95%CI 23.98-39.76) were much more likely to be perceived as undesirable (i.e. less appealing, more harmful, less likely to be tried). The model also indicated which smokers were more likely to rate the cigarettes as undesirable: women were more likely than men (aOR=1.30; 95%CI 1.10-1.54), and low SES more likely than those not low SES (aOR=1.26; 95%CI 1.06-1.50), to consider all three cigarettes undesirable. Compared to exclusive factory-made cigarette smokers, those who also smoked roll-your-own cigarettes (aOR=0.78; 95%CI 0.65-0.93) or other tobacco products (aOR=0.73; 95%CI 0.56-0.93) were less likely to consider all three cigarettes undesirable. Those not likely to make a quit attempt in the next six months were less likely than those likely to make a quit attempt in the next six months (aOR=0.62; 95%CI 0.49-0.78) to consider all three cigarettes undesirable.

Only one significant interaction, between cigarette type and SES, was found. Both SES groups perceived the WC significantly more undesirable than the SC, and the GC significantly more undesirable than the WC. Low SES were significantly more likely than those not low SES to perceive the SC (aOR=17.71; 95%CI 13.75-22.80) and GC (aOR=30.88; 95%CI 23.98-39.76) as undesirable; there was no difference for the WC

(aOR=0.99; 95%CI 0.78-1.25), see Figure 3.

Table 4 here

DISCUSSION

Our findings suggest that inserts highlighting the benefits of quitting or providing tips on how to do so may have the potential to encourage cessation, and dissuasive cigarettes may help to reduce the desirability of smoking. Greater attention to how the interior of the cigarette pack could be used to promote cessation appears warranted.

Health messages need to capture attention to be effective.[23] In this regard, at least half our sample indicated that they would read inserts (50%) and read them if interested in quitting (60%). In Canada, observational studies found that approximately a quarter of smokers reported reading them at least once within the last month,[10] increasing to about one-third of smokers over two years of follow-up.[11] As in our study, smokers in Canada who had read/would read the inserts were more likely to be female, intend to quit or had recently tried to quit; in our study, they were also more likely to be white British, have moderate dependence, and use factory-made cigarettes and other tobacco products. Future research could explore why dual users (smokers of factory-made cigarettes and other tobacco products) were more likely to indicate that they would read inserts, but as inserts are typically only found in cigarette packs then for those who use other tobacco products they may be seen as more of a novelty and therefore more likely to capture attention.

Approximately three-fifths (61%) of smokers in our study thought that inserts were a good way to provide information about quitting to smokers, with only 25% disagreeing. In comparison, an earlier study in Canada, commissioned by Health Canada, found that 48% of smokers indicated that messaging on inserts was a good way to provide information to

smokers, with 47% disagreeing.[5] Just over half our sample agreed/strongly agreed that inserts may make them think more about quitting, help them if they decided to quit, and that they are an effective way of encouraging smokers to quit, whereas in New Zealand only 34% of smokers and recent quitters agreed/strongly agreed that inserts would be an effective way of encouraging reduced consumption or quitting.[6] There may be various reasons for the differences between our findings and earlier research. For instance, when this earlier research was conducted cigarette packs displayed text-only health warnings and it may be that having pictorial warnings on packs, as is required in Scotland, may prompt smokers to look for information on how to quit and the benefits of doing so. Insert design is also likely to be relevant. Whereas the inserts used in earlier research were limited to text, the inserts used in this study (which have been used in Canada since 2012) included coloured graphics, which likely enhanced their impact. This would be consistent with the health communications and warnings literature, which demonstrates the importance of supporting text with pictorials.[2,23,24] Future research exploring insert design (e.g. use of imagery, inclusion of cessation resource information, length and framing of messages, etc) would be of value.

More than half our sample supported the inclusion of inserts promoting cessation inside every cigarette pack, with only a fifth opposing this. Within the European Union, the recent Tobacco Products Directive (TPD)[25] does not require tobacco companies to include health communication inserts in packs, but allows member states to introduce measures beyond those specified. Among governmental representatives that responded to the consultation on the revision of the TPD there was strong support for improving consumer information via mandatory pictorial warnings, with those supportive arguing that additional information, such as pack inserts, would help to deliver more accurate health information.[26] If there is support for inserts among governmental representatives, and little opposition among smokers (the group most likely to be resistant), they are clearly a viable option for regulators.

Tobacco industry journals describe the cigarette as an increasingly important advertising medium for tobacco companies.[12] However, until recently, the public health focus has been on the potential of regulating the contents of cigarettes to reduce palatability or addictiveness,[27] with little consideration of the possibility of regulating the appearance of cigarettes to reduce its importance as a promotional tool. We found that the two dissuasive cigarettes were perceived as significantly more harmful and less appealing than the standard cigarette, and less likely to encourage trial. The harm, appeal and trial items loaded onto a single 'undesirability' factor, with the dissuasive cigarettes considered much more undesirable than the standard cigarette. The findings are consistent with earlier research, where cigarettes with the warning 'Smoking kills' were considered a constant reminder of the associated harms and, partly due to the perceived discomfort of being observed by others smoking a cigarette displaying this message, unappealing for smokers.[8,16,17,18] Previous studies have also found unattractively coloured cigarettes to be perceived as more harmful than other cigarettes and also repellent, being a cigarette that young people did not think that others their age would use.[15,16,28,29] As with the inserts, the dissuasive cigarettes (and also the standard cigarette) were considered more desirable among dual users than exclusive factory-made cigarette smokers; again it is not clear why this was the case but further research with dual users, or indeed those also using vaping devices (not assessed in this study), would be fruitful.

In terms of limitations, the cross-sectional design did not allow us to assess causality; that inserts and dissuasive cigarettes are not available on the UK market prevents more robust study designs such as longitudinal studies. Another potential limitation concerns the novelty of the stimuli, which may have influenced responses, and forced exposure to the stimuli. In addition, we only used four inserts, rather than the full set of eight used in Canada, which includes inserts that be less relevant to our sample. While online surveys have been used for

previous research exploring cigarette packaging, inserts and dissuasive cigarettes,[30-33] and are a suitable survey mode for young adults, the use of an online panel and self-selection limits the representativeness of our sample. In addition, the use of semantic differential scales can be criticised because answers can be subject to various response biases, although we attempted to diminish these through varying scale item direction and through our multivariate modelling methodology.

It was argued, over two decades ago, that to offer greater protection to consumers cigarettes should come in plain packs with messaging on both the pack exterior and interior.[34] This idea is a step closer in the UK, although there will still be no messaging on the pack interior. That more than half of the participants in this study suggested that inserts may help to promote cessation suggests that their inclusion in packs may be a meaningful supplement to the on-pack warnings. Our findings suggest however that to offer the greatest protection to consumers, it may be beneficial to supplement plain packaging and inserts with cigarettes designed to be dissuasive. Unattractively coloured cigarettes would complement the unattractively coloured packs, just as warnings on the cigarette would extend the warnings on the cigarette pack. Both options are clearly viable.

Contributors CM designed the data collection tool and drafted and revised the paper. RH analysed the data and drafted the Analysis and Results. JF and GR helped design the data collection tool and commented on the paper. All authors read and approved the final manuscript.

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Competing interests GR works for Health Scotland, who funded this study.

Ethics approval The study obtained ethics approval from the School of Health Sciences Ethics Committee at the University of Stirling. Participants provided informed consent before participating.

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Table 1: Sample and smoking-related characteristics

Characteristic	*N*	*%*
Total	1766	100.0
Age group		
16-19	413	23.4
20-24	401	22.7
25-34	952	53.9
Gender		
Male	888	50.3
Female	878	49.7
Educational qualifications		
Other qualifications	1357	76.8
None or GCSE	409	23.2
Economic status		
Other status	1350	76.4
Routine or manual occupation, unemployed or long term sick	416	23.6
Socioeconomic status (SES)		
No indicators of low SES	1114	63.1
Low education and/or low SES	652	36.9
Ethnicity		
White British	1264	71.6
White non-British	162	9.2
Black (including mixed black and white)	79	4.5
Asian (including mixed Asian and white)	196	11.1
Other or not declared	65	3.7
Location		
England	1550	87.8
Scotland	109	6.2
Wales	73	4.1
Northern Ireland	34	1.9
Tobacco products used		
Only factory-made (packet) cigarettes	813	46.0
Factory-made and roll-your-own cigarettes	681	38.6
Factory-made cigarettes and other products (e.g. cigars, shisha)	272	15.4
Cigarettes per day		
10 or less	1272	72.0
11-20	433	24.5
21-30	46	2.6
31 or more	15	0.8
Time to first cigarette		
Within 5 minutes	263	14.9
6 to 30 minutes	570	32.3
31 to 60 minutes	315	17.8

Characteristic	*N*	*%*
After 60 minutes	618	35.0
Heaviness of Smoking Index (HSI)		
0 little dependence	601	34.0
1	257	14.6
2	418	23.7
3	293	16.6
4	156	8.8
5	28	1.6
6 high dependence	13	0.7
Dependence (Tertiles of HSI)		
Low-dependence	601	34.0
Mid-dependence	675	38.2
High-dependence	490	27.7
Made an attempt to quit smoking that lasted at least 24 hours?		
Yes, within the last six months	788	44.6
Yes, more than six months ago	552	31.3
No, I have never tried to quit smoking for more than 24 hours	426	24.1
How likely are you to try to quit smoking within the next six months?		
Not at all	198	11.2
A little	382	21.6
Moderately	508	28.8
Very	308	17.4
Extremely	272	15.4
Don't know	98	5.5
If you decided to quit smoking in the next six months, how sure are you that you would succeed?		
Not at all	147	8.3
A little	346	19.6
Moderately	612	34.7
Very	297	16.8
Extremely	241	13.6
Don't know	123	7.0
Quit approach		
Moderately or less likely to make quit attempt in next six months (unlikely to make a quit attempt in the next six months)	1186	67.2
Very or extremely likely to attempt but moderately or less likely to succeed (unlikely to make a successful quit attempt in the next six months)	304	17.2
Very or extremely likely to attempt and very or extremely likely to succeed (likely to make a successful quit attempt in the next six months)	276	15.6

Table 2: Perceptions of whether inserts would be read, are a good way to provide information, whether they would help smokers to think about quitting or quit, and support for them

	Yes %	No %	Not sure %
Would they be read	50	37	13
Would they be read if interested in quitting	60	25	15
Good way to provide information about quitting	61	25	14

	Agree %	Disagree %	Neither / Don't know %
Make you think more about quitting	53	18	29
Might help you if you decided to quit	52	19	29
Effective way of encouraging smokers to quit	53	17	30
All packs should have inserts	55	20	25

Table 3a: Logistic regression models exploring perceptions of inserts by sociodemographic characteristics (gender, age, education, ethnicity)[1,2]

(n=1766)	Would read insert	Would read insert if trying to quit	Inserts make you think about quitting	Inserts might help you quit	Inserts a good way of providing information about quitting	Inserts are an effective way of encouraging smokers to quit	All packs should have inserts
Gender							
Male	1	1	1	1	1	1	1
Female	1.24 (1.02 to 1.50)	1.11 (0.91 to 1.35)	0.98 (0.81 to 1.19)	0.95 (0.79 to 1.15)	1.13 (0.93 to 1.37)	0.88 (0.73 to 1.07)	1.20 (0.99 to 1.46)
Age							
16-19	1	1	1	1	1	1	1
20-24	1.16 (0.87 to 1.54)	0.88 (0.66 to 1.18)	1.18 (0.89 to 1.56)	1.19 (0.89 to 1.58)	0.87 (0.65 to 1.16)	0.97 (0.73 to 1.28)	0.96 (0.72 to 1.29)
25-34	1.25 (0.97 to 1.60)	0.83 (0.65 to 1.07)	0.99 (0.78 to 1.26)	1.18 (0.92 to 1.50)	0.76 (0.60 to 0.98)	0.88 (0.69 to 1.12)	0.84 (0.65 to 1.07)
Education							
GCSEs (or equivalent) or none	1	1	1	1	1	1	1
More than GCSEs (or equivalent)	1.25 (0.99 to 1.58)	1.12 (0.89 to 1.42)	1.22 (0.97 to 1.54)	1.21 (0.97 to 1.52)	1.12 (0.89 to 1.40)	1.19 (0.95 to 1.50)	1.10 (0.87 to 1.40)
Ethnicity							
White British		1	1				1
White but not British		0.70 (0.50 to 0.98)	0.58 (0.41 to 0.81)				0.62 (0.44 to 0.87)
Black (inc mixed black & white)		0.92 (0.57 to 1.49)	0.61 (0.38 to 0.98)				0.99 (0.62 to 1.59)
Asian (inc mixed Asian & white)		0.67 (0.49 to 0.92)	1.19 (0.87 to 1.63)				0.70 (0.51 to 0.96)
other or not declared		0.84 (0.50 to 1.42)	1.06 (0.64 to 1.78)				1.08 (0.64 to 1.81)

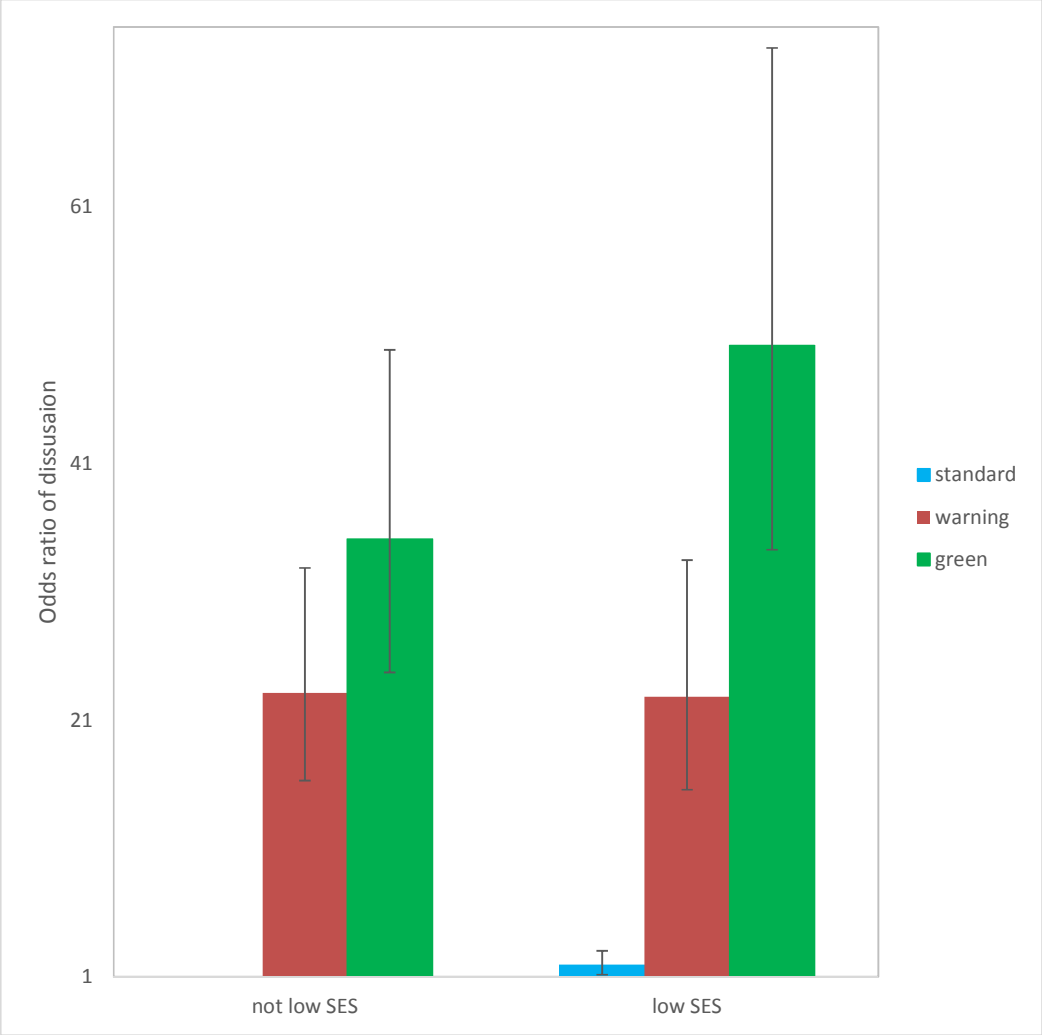
[1] Note smoking related characteristics (described in table 3b) were also entered into each model
[2] Blank cells indicate no significant relationship in bivariate analysis

Table 3b: Logistic regression models exploring perceptions of inserts by smoking related characteristics (dependence, tobacco products smoked, quit attempts, self-efficacy to quit)[1,2]

(n=1766)	Would read insert	Would read insert if trying to quit	Inserts make you think about quitting	Inserts might help you quit	Inserts a good way of providing information about quitting	Inserts are an effective way of encouraging smokers to quit	All packs should have inserts
Dependence (tertiles of HSI)							
Lower dependence	1						1
Mid dependence	1.39 (1.11 to 1.76)						1.02 (0.80 to 1.29)
Higher dependence	1.22 (0.94 to 1.59)						0.86 (0.66 to 1.12)
Tobacco products smoked							
Only factory-made	1	1	1	1		1	
Factory-made and roll-your-own	1.35 (1.09 to 1.66)	1.61 (1.30 to 2.00)	1.31 (1.06 to 1.62)	1.31 (1.06 to 1.61)		1.27 (1.03 to 1.56)	
Factory-made cigarettes and other	1.20 (0.90 to 1.59)	1.39 (1.04 to 1.86)	1.22 (0.92 to 1.63)	1.34 (1.01 to 1.78)		1.20 (0.91 to 1.60)	
Quit attempt lasting at least 24 hours							
No	1	1	1	1	1	1	1
Yes, more than six months ago	1.30 (1.00 to 1.69)	1.12 (0.86 to 1.45)	1.20 (0.93 to 1.56)	1.05 (0.81 to 1.36)	1.16 (0.90 to 1.50)	1.07 (0.82 to 1.38)	0.78 (0.60 to 1.01)
Yes within the last six months	1.67 (1.29 to 2.15)	1.51 (1.17 to 1.94)	1.46 (1.14 to 1.88)	1.35 (1.05 to 1.73)	1.54 (1.20 to 1.98)	1.33 (1.04 to 1.71)	1.06 (0.82 to 1.37)
Efficacy of quit attempt in next 6 months							
Likely to quit	1	1	1	1	1	1	1
Likely to make unsuccessful attempt	1.01 (0.72 to 1.40)	1.43 (1.00 to 2.06)	0.97 (0.69 to 1.37)	0.92 (0.65 to 1.29)	1.46 (1.02 to 2.08)	1.10 (0.78 to 1.55)	1.43 (1.00 to 2.04)
Unlikely to make attempt	0.58 (0.44 to 0.75)	0.74 (0.55 to 0.99)	0.59 (0.45 to 0.78)	0.51 (0.38 to 0.67)	0.76 (0.57 to 1.01)	0.55 (0.41 to 0.73)	0.56 (0.42 to 0.74)

[1] Note sociodemographic characteristics (described in table 3a) were also entered into each model
[2] Blank cells indicate no significant relationship in bivariate analysis

Table 4: Bar charts showing a combination of main effects and interactions between cigarette type and socioeconomic status on odds ratios for undesirability in multivariable models



[1] For the standard cigarette, participants categorised as 'not low SES' is the reference group, with an odds ratio of 1, thus they are not displayed

Figure 1: Pack inserts highlighting benefits of quitting or providing tips on how to do so

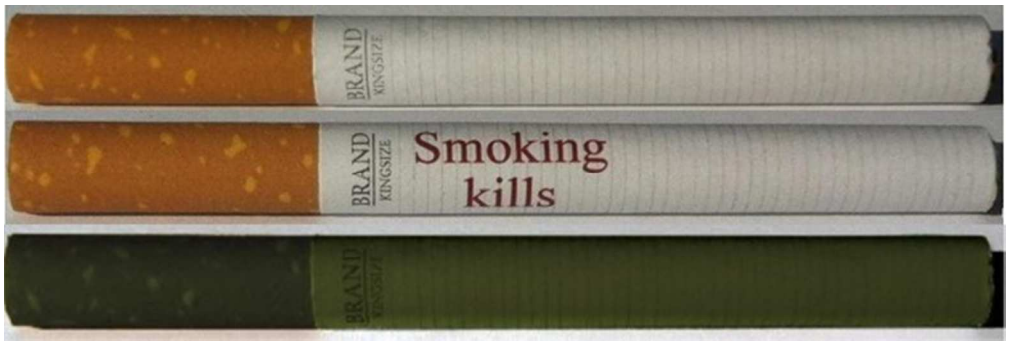


Figure 2: Standard cigarette, warning cigarette and green cigarette

105x35mm (150 x 150 DPI)

STROBE 2007 (v4) checklist of items to be included in reports of observational studies in epidemiology*
Checklist for cohort, case-control, and cross-sectional studies (combined)

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	2
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2-3
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4-5
Objectives	3	State specific objectives, including any pre-specified hypotheses	6
Methods			
Study design	4	Present key elements of study design early in the paper	6
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	6
Participants	6	*Cross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants	6
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	7-10
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	10-12
Bias	9	Describe any efforts to address potential sources of bias	6
Study size	10	Explain how the study size was arrived at	6
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	10-12
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	10-12
		(*b*) Describe any methods used to examine subgroups and interactions	10-12
		(*c*) Explain how missing data were addressed	7
		(*d*) *Cross-sectional study*—If applicable, describe analytical methods taking account of sampling strategy	NA
		(*e*) Describe any sensitivity analyses	NA
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	6, 28-29
		(b) Give reasons for non-participation at each stage	6
		(c) Consider use of a flow diagram	NA
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	25-26
		(b) Indicate number of participants with missing data for each variable of interest	NA
Outcome data	15*	*Cross-sectional study*—Report numbers of outcome events or summary measures	12-16
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	12-16
		(*b*) Report category boundaries when continuous variables were	28-29

		categorized	
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	NA
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	10-12
Discussion			
Key results	18	Summarise key results with reference to study objectives	16-18
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	18-19
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	16-18
Generalisability	21	Discuss the generalisability (external validity) of the study results	16-19
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	19

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

BMJ Open

Perceptions of cigarette pack inserts promoting cessation and dissuasive cigarettes among young adult smokers in the United Kingdom: A cross-sectional online survey

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Perceptions of cigarette pack inserts promoting cessation and dissuasive cigarettes among young adult smokers: A cross-sectional online survey

ABSTRACT

Objectives: To explore young adult smokers' perceptions of cigarette pack inserts promoting cessation and cigarettes designed to be dissuasive.

Design: Cross-sectional online survey.

Setting: United Kingdom.

Participants: The final sample was 1766 young adult smokers, with 50.3% male and 71.6% white British. To meet the inclusion criteria participants had to be 16-34 years old and smoke factory-made cigarettes.

Primary and secondary outcome measures: Salience of inserts, perceptions of inserts as information provision, perceptions of inserts on quitting, support for inserts, and perceived appeal, harm and trial of three cigarettes (a standard cigarette, a standard cigarette displaying the warning 'Smoking kills', and a green cigarette).

Results: Half the sample indicated that they would read inserts with three-fifths indicating that they be a good way to provide information about quitting (61%). Just over half indicated that inserts would make them think more about quitting (53%), help if they decided to quit (52%), are an effective way of encouraging smokers to quit (53%), and supported having them in all packs (55%). Participants who smoked factory-made cigarettes and other tobacco products (compared to exclusive factory-made cigarette smokers), had made a quit attempt within the last six months (compared to those that had never made a quit attempt), or were likely to make a successful quit attempt in the next six months (compared to those unlikely to make a quit attempt in the next six months), were more likely to indicate that inserts could assist with cessation. Multivariable logistic regression modelling suggested that compared

with the standard cigarette, the cigarette with warning (adjusted Odds Ratio=17.71; 95%CI 13.75-22.80) and green cigarette (adjusted Odds Ratio=30.88; 95%CI 23.98-39.76) were much less desirable (less appealing, more harmful, less likely to be tried).

Conclusions: Inserts and dissuasive cigarettes offer policy makers additional ways of using the pack to reduce smoking.

Strengths and limitations of this study

- The main strength of this study is that it allows an insight into how young adult smokers perceive two innovative tobacco control measures (pack inserts promoting cessation and dissuasive cigarettes).
- The main limitation of the study is that it does not provide any insight into actual smoking behaviour.
- Additional limitations include the novelty of the stimuli and forced exposure to this, and the use of self-selection.

INTRODUCTION

While packaging remains a key marketing driver for tobacco companies, more than 100 countries now require pictorial health warnings on cigarette packs,[1] which can limit pack appeal.[2] Some countries have gone even further by implementing plain (or standardised) packaging, which severely reduces the promotional power of the pack. The United Kingdom (UK) became the third country to fully implement standardised packaging in May 2017, following Australia in December 2012 and France in January 2017. In the UK all cigarette packs must be drab brown with pictorial warnings on 65% of the front and back of packs and additional health messages on 50% of the sides of the pack. Although these changes have reduced the ability of tobacco companies to use the pack to create favourable perceptions of the brand and of smoking, there is clearly more scope for using the packaging to dissuade consumers. Regulators and academics have typically focused on the exterior of the cigarette pack, with little consideration of how the pack interior, for instance pack inserts or cigarettes, which have long been used by tobacco companies to promote their brands, could potentially be used to encourage smokers to think about their smoking behaviour. This is the focus of our study.

Tobacco companies have used the inside of the cigarette pack to communicate with consumers since the late 19th century, via cigarette cards, coupons and promotional inserts. Only in Canada are they required, by law, to include pack inserts with health messaging. Sixteen text-only inserts were required in packs between 2000 and 2012, with nine encouraging cessation and seven providing health risk information.[3] These were replaced with eight new inserts, with coloured graphics and positively framed messages about the benefits of quitting or tips on how to do so, in 2012. Few studies have explored perceptions of pack inserts,[4-8] with only two assessing smokers' perceptions of, and responses to, the inserts used in Canada.[9-11] In focus group research in Scotland,[9] with smokers aged 16 and

over who were shown seven of the inserts used in Canada, the general view was that they would capture attention and be read due to their novelty and visibility when opening the pack. Inserts were also thought to have a long lasting impact as they would be removed from the pack and remain visible within the household or elsewhere, or as litter.[9] The positive messaging was liked and thought to increase message engagement. The inserts were often preferred to the on-pack warnings, although both were deemed necessary. Some participants suggested that inserts could encourage them to stop smoking, and they were generally considered to have the potential to alter the behaviour of younger people, would-be smokers and those wanting to quit.[9] In Canada, a longitudinal online survey with smokers aged 18 and over found that between 26% and 31% at each wave reported having read pack inserts at least once in the prior month; those intending to quit or having recently tried to do so were significantly more likely to have read them.[10] In addition, while reading warnings on the pack exterior decreased over time, reading pack inserts increased over time, with more frequent reading independently associated with self-efficacy to quit, quit attempts, and sustained quitting at follow-up.[11]

The cigarette itself is also an important communications tool,[12,13] which has long been used by tobacco companies as a marketing device but has yet to be used by regulators to deter smoking. As cigarettes are primarily responsible for tobacco related mortality and morbidity and predicted to continue to dominate the global market for some time yet,[14] research exploring the potential impact of standardising the appearance of cigarettes to make them less desirable is long overdue. Some recent research has examined consumer perceptions of cigarettes that have been designed to be 'dissuasive', including unattractively coloured cigarettes,[15,16] cigarettes with the warning 'Smoking kills' on the cigarette paper,[17,18] and cigarettes displaying the 'minutes of life lost due to smoking' on the cigarette paper.[19] In each of these studies the dissuasive cigarettes were generally viewed more negatively than regular

cigarettes. For instance, a qualitative study with young women smokers in New Zealand found that unattractively coloured cigarettes, particularly green or brown coloured cigarettes, were perceived as more harmful than other cigarettes, with it less likely that they or others their age would want to use them.[15] An in-home survey in the UK with 11-16 year olds, who were shown an image of a cigarette stick displaying 'Smoking kills', found that 53% indicated that this would make people want to give up smoking, 71% indicated that it would put people off starting to smoke, and 85% supported having a warning on all cigarettes.[18]

In this study our objective was to explore, for the first time, young adult smokers' perceptions of pack inserts and dissuasive cigarettes (a cigarette displaying the warning 'Smoking kills' and a green coloured cigarette).

METHODS

Design and sample

An online survey was conducted in January-February 2016 with smokers aged 16-34 years old in the UK; an online survey is a suitable approach given that 99% of this age group in the UK are recent internet users.[20] The sample (n=1970) was recruited by online market research company 'Research Now' from their panel of over 400,000 people (www.researchnow.com). After Research Now excluded those who had completed the survey in less than the minimum completion time (n=193), which they had set prior to data collection commencing, and those providing responses to open-ended questions that indicated that they had not taken the survey seriously (n=11), the final sample was 1766 (89.6% of completed surveys). The final sample was 50.3% male, with 53.9% aged 25-34 years and 71.6% white British. Most participants smoked 10 or less cigarettes per day, with 46.0% exclusive factory-made cigarette smokers (see Table 1 for sample and smoking-related characteristics).

Table 1 here

Procedure

An email invite was sent by Research Now to their online panel in the UK. Research Now is an established online market research company in the UK and elsewhere,[21] with their panels recruited from a wide range of sources, such as internet sites, advertising and partnerships with other websites. Research Now, like other online panels, has details of their members' demographics and other characteristics that are used to profile target samples. Response rate details are not available when using this sampling methodology however as recording contact, participation and refusal rates is not practical.[22] For those that responded to the email invite, they answered screening questions about their age, smoking status and types of tobacco products used, with those that did not meet the inclusion criteria (factory-made cigarette smokers aged 16-34 years) excluded.

Those eligible for inclusion were presented with an information page explaining the study aim (to explore what young adult smokers thought about cigarettes and pack inserts), and relevant ethical information (their right to withdraw at any time, assurances of confidentiality and anonymity, and contact details if they had any concerns or would like to request a copy of the published findings). They were then presented with a consent page, with consent required for participation. Survey questions were presented in the same order for all participants, except the questions exploring perceptions of the three cigarettes (standard cigarette, warning cigarette, green cigarette), where the ordering was randomised; the ordering of the presentation of the three cigarettes (shown in Figure 1) was also randomised. There was no missing data as participants could only proceed to the next question if they had provided an answer to the previous question.

Figure 1 here

Prior to the questions on inserts, participants were shown an image of a cigarette pack with an insert shown in the front of the pack – as they typically appear in packs – alongside the text 'We have some questions on pack inserts, which can sometimes be found inside packs (see image for example)'. For each question about inserts, participants were shown the question and an image of one insert. Four different inserts were used in total, as shown in Figure 2, with these chosen from the eight used in Canada as they were considered most relevant to our sample. The words 'Health Canada' were removed from the bottom of each insert to make them more relevant for participants in the UK. The median time for survey completion was 9 minutes 28 seconds. Participants received a nominal incentive (50 pence) for participation, as is common for online panels. The study received ethical approval from the School of Health Sciences Ethics Committee at the University of Stirling.

Figure 2 here

Patient and public involvement

There was no patient or public involvement in the development, design or conduct of this study.

Measures

Inserts: Salience and information provision

Participants were asked 'If this type of insert was in your cigarette pack, do you think that you would read it?' and 'If this type of insert was in your cigarette pack, do you think that you would read it if you were interested in quitting?' They were also asked 'Do you think that inserts would be a good way to provide information to smokers about quitting?'[5] Response options for each were 'Yes', 'No' and 'Not sure'.

Inserts: Cessation

Three questions assessed to what extent participants agreed or disagreed that inserts would make them think about quitting, and help them quit: 'Do you agree or disagree that having these types of inserts in every cigarette pack would make you think more about quitting?', 'Do you agree or disagree that having these types of inserts in every cigarette pack might help you if you decided to quit?', and 'Do you agree or disagree that having these types of inserts inside every cigarette pack would be an effective way of helping smokers who want to quit?'[6] Response options for each were 'Strongly disagree', 'Disagree', 'Neither agree nor disagree', 'Agree', 'Strongly agree' and 'Don't know'.

Inserts: Support

A five-point semantic scale assessed support, with anchors 'All cigarette packs should have inserts like this in them-No cigarette packs should have inserts like this in them'.

Cigarette design: Appeal, harm and trial

Seven-point semantic scales assessed appeal, harm and likely trial. Appeal was assessed via four scales, with anchors 'Attractive-Unattractive', 'Stylish-Not stylish', 'Not nice to be seen with-Nice to be seen with' and 'Not appealing to people my age-Appealing to people my age'. Harm was assessed via two scales, with anchors 'Looks harmful to health-Does not look

harmful to health' and 'Makes me think about the dangers of smoking-Does not make me think about the dangers of smoking'. Likely trial was assessed via two scales, 'If a friend offered you each of these cigarettes, how likely would you be to try them?' and 'If someone your age who had never smoked before was going to try a cigarette, how likely do you think they would be to try each of these cigarettes?' Both scales assessing trial ranged from 'Not at all likely' to 'Very likely'.

Sociodemographic characteristics

Age, gender, ethnicity, educational attainment and economic status (based on chief income earner) were obtained. A count procedure was used to create a variable for low socioeconomic status (SES): low education (General Certificate of Secondary Education: GCSE or below) and/or low economic status (routine or manual occupation, long-term unemployed or long-term sick or disabled).

Smoking behaviour

Smoking status was assessed with 'Which of these best describes you?' with response options: 'I have never smoked', 'I used to smoke, but don't now', 'I smoke, but not every day', and 'I smoke every day'. Type of products used was assessed with 'What type(s) of tobacco products do you smoke?' with response options: 'Only factory-made (packet) cigarettes', 'Factory-made and roll-your-own cigarettes', 'Factory-made cigarettes and other tobacco products (e.g. cigars, shisha, etc)', 'Only roll-your-own cigarettes' and 'Only other tobacco products (e.g. cigars, shisha, etc)'. The Heaviness of Smoking Index (HSI)[23] was used as a measure of dependence, based on daily consumption and time to first cigarette.

Quitting and self-efficacy

Participants were asked 'Have you ever made an attempt to quit smoking that lasted at least 24 hours?'[24] (Yes within the last six months, Yes more than six months ago, I have never tried to quit for more than 24 hours). They were also asked 'How likely are you to try to quit smoking within the next six months?'[25] (Not at all, A little, Moderately, Very, Extremely, Don't know), with those responding 'Not at all', 'A little', 'Moderately' or 'Don't know' classified as 'Unlikely to make a quit attempt in the next six months'. To measure quitting self-efficacy, participants were asked 'If you decided to quit smoking in the next six months, how sure are you that you would succeed?'[26] (Not at all, A little, Moderately, Very, Extremely, Don't know). Those who responded to the likelihood of quitting question with 'Very or 'Extremely' and to the quitting efficacy question with 'Not at all', 'A little', 'Moderately' or 'Don't know' were classified as 'unlikely to make a successful quit attempt in the next six months'. Those who responded 'Very' or 'Extremely' to both questions were classified as 'likely to make a successful quit attempt in the next six months'.

Analysis

Data was analysed using Microsoft office Excel 2013, SPSS v22 and v23 and MLWin v2.33.[27] The insert variables were dichotomised into yes/agreement and no/disagreement/neutral/not sure/don't know. The dichotomised insert variables were the outcomes of the logistic regression models. The independent variables were gender, age, education, ethnicity, dependence (tertiles of HSI), tobacco product(s) smoked, previous quit attempt lasting at least 24 hours, and likely efficacy of a quit attempt in the next six months. Percentages in agreement were calculated. Age, gender and education (as a measure of SES) were entered into all models to account for any sampling inadequacies. Other variables were entered where $p<0.10$ in chi square tests. The models were assessed for multicollinearity via comparison of standard errors[28] and none was found.

The cigarette variables were assessed using seven-point semantic scales, with percentages calculated for those indicating one of the three points nearest the undesirable anchor (e.g. unattractive, not nice to be seen with, looks harmful to health). Differences between the three cigarettes were tested using Cochran's Q and pairwise comparisons. A factor analysis of the eight perception variables, collated for all three cigarettes, was undertaken, with checks indicating that the data was suitable for factor analysis (Kaiser Meyer Olkin=0.845, Bartlett's test of sphericity (approx. chi-square 18062.842, df=276, $p<0.001$), with no correlations between the variables >0.9). The extraction method used was Principal Axis Factoring and the criteria for extraction was eigenvalues>1. All eight variables loaded on a single factor with factor loadings that were >0.5. High factor scores indicated that a cigarette was desirable and low scores that it was undesirable. Visual inspection and the Kolmogorov-Smirnov test indicated that the factor was non-normal (because responses for the dissuasive cigarettes indicated they were undesirable generally) and attempts to normalise it using normit rankit methods failed. Thus the factor was divided into tertiles and the tertile indicating undesirable factor scores was compared with the other two tertiles. This was the outcome variable in regression analysis.

Multilevel logistic regression modelling, with second order PQL estimation,[29] was undertaken with cigarette type (at level one) clustered with individual participants (at level two). All models included cigarette type as a fixed effect, where the standard cigarette was compared with the warning cigarette and green cigarette. Other fixed effects at the individual (participant) level were sociodemographic and smoking-related characteristics. This main effects model tested which characteristics were associated with perceiving cigarettes as desirable. In order to understand which characteristics differentiated the desirability of the three types of cigarettes, interactions between cigarette type and each significant characteristic were tested. Only one interaction was found, between cigarette type and SES.

The interacting variables (cigarette type and SES) were substituted by a cross classified variable which merged cigarette type and SES. This cross classified variable was split into six categories: low SES standard cigarette, low SES warning cigarette, low SES green cigarette, not low SES standard cigarette, not low SES warning cigarette, not low SES green cigarette. To understand the interaction several models were run with the reference category of the cross classified variable different each time.[30,31]

RESULTS

Perceptions of inserts

Half the sample indicated that they would read inserts, with approximately three-fifths indicating that they would read them if interested in quitting (60%), and that they would be a good way to provide information about quitting (61%). Just over half strongly agreed/agreed that inserts may make them think more about quitting (53%), help them if they decided to quit (52%), that they are an effective way of encouraging smokers to quit (53%), and that all cigarette packs should have inserts (55%), see Table 2.

Table 2 here

Sociodemographic differences in perceptions of inserts

Women were more likely than men to indicate that they would read inserts (aOR=1.24; 95%CI 1.02-1.50), and 25-34 year olds less likely than 16-19 year olds to think that they were a good way of providing information about quitting (aOR=0.76; 95%CI 0.60-0.98). Compared with white British participants, white non-British (aOR=0.70; 95%CI 0.50-0.98) and Asian (aOR=0.67; 95%CI 0.49-0.92) participants were less likely to suggest that they

would read inserts if trying to quit, white non-British (aOR=0.58; 95%CI 0.41-0.81) and Black (aOR=0.61; 95%CI 0.38-0.98) participants were less likely to indicate that inserts would make them think about quitting, and white non-British (aOR=0.62; 95%CI 0.44-0.87) and Asian (aOR=0.70; 95%CI 0.51-0.96) participants were less likely to support having inserts in all packs, see Table 3a.

Smoking-related differences

Compared to exclusive factory-made cigarette smokers, those who also smoked roll-your-own cigarettes were more likely to indicate they would read inserts (aOR=1.35; 95%CI 1.09-1.66), read them if trying to quit (aOR=1.61; 95%CI 1.30-2.00), that they would make them think about quitting (aOR=1.31; 95%CI 1.06-1.62), help them if they decided to quit (aOR=1.31; 95%CI 1.06-1.61), and that they would be an effective way of encouraging smokers to quit (aOR=1.27; 95%CI 1.03-1.56). Compared to exclusive factory-made cigarette smokers, those who also smoked other tobacco products (e.g. cigars, shisha) were more likely to indicate they would read inserts if trying to quit (aOR=1.39; 95%CI 1.04-1.86) and that inserts might help them if they decided to quit (aOR=1.34; 95%CI 1.01-1.78).

Participants who had made a quit attempt more than six months ago (aOR=1.30; 95%CI 1.00-1.69), or within the last six months (aOR=1.67; 95%CI 1.29-2.15), were more likely to indicate that they would read inserts than those who had never made a quit attempt. Those who had made a quit attempt in the last six months were also more likely than those who had never made a quit attempt to indicate that inserts were a good way to provide information about quitting (aOR=1.54; 95%CI 1.20-1.98), that they would read them if trying to quit (aOR=1.51; 95%CI 1.17-1.94), make them think about quitting (aOR=1.46; 95%CI 1.14-1.88), help them if they decided to quit (aOR=1.35; 95%CI 1.05-1.73), and that they would be an effective way of encouraging smokers to quit (aOR=1.33; 95%CI 1.04-1.71).

Compared to those likely to make a successful quit attempt in the next six months, those unlikely to make a quit attempt in the next six months were less likely to indicate that they would read inserts (aOR=0.58; 95%CI 0.44-0.75), read them if trying to quit (aOR=0.74; 95%CI 0.55-0.99), that they would make them think about quitting (aOR 0.59 (0.45 to 0.78), help them if they decided to quit (aOR=0.51; 95%CI 0.38-0.67), that they would be effective for smokers if they decided to quit (aOR=0.55; 95%CI 0.41-0.73), or support them (aOR=0.56; 95%CI 0.42-0.74). Compared to those likely to make a successful quit attempt in the next six months, those unlikely to make a successful quit attempt in the next six months were more likely to read inserts if trying to quit (aOR=1.43; 95%CI 1.00-2.06), thought that they were a good way to provide information to smokers about quitting (aOR=1.46; 95%CI 1.02-2.08), and support them (aOR=1.43; 95%CI 1.00-2.04), see Table 3b.

Table 3 here

Perceptions of cigarette design

With respect to harm, participants were less likely to think that the standard cigarette (SC) looked harmful than the warning cigarette (WC) or green cigarette (GC) ($p<0.001$), and less likely to think that the SC made them think more about the dangers of smoking than the WC or GC ($p<0.001$). Participants were also less likely to indicate that the GC would make them think of the dangers of smoking than the WC ($p=0.01$). In terms of appeal, participants were more likely to consider the SC attractive, and stylish, than the WC or GC (both $p<0.001$). The SC was also considered to be nicer to be seen with, and more appealing to people their age, than the WC or GC (both $p<0.001$). In terms of trial, 79.4% indicated that they would try a SC if offered by a friend (35.7% WC, 21.5% GC), and 70.1% indicated that a never smoker

their age would be most likely to try a SC (21.1% WC, 16.5% GC) (both p<0.001), see Table 4.

Table 4 here

Perceptions of cigarette desirability

Main effects multivariable logistic regression modelling suggested that in comparison to the SC, the WC (aOR=17.71; 95%CI 13.75-22.80) and GC (aOR=30.88; 95%CI 23.98-39.76) were much more likely to be perceived as undesirable (i.e. less appealing, more harmful, less likely to be tried). The model also indicated which smokers were more likely to rate the cigarettes as undesirable: women were more likely than men (aOR=1.30; 95%CI 1.10-1.54), and low SES more likely than those not low SES (aOR=1.26; 95%CI 1.06-1.50), to consider all three cigarettes undesirable. Compared to exclusive factory-made cigarette smokers, those who also smoked roll-your-own cigarettes (aOR=0.78; 95%CI 0.65-0.93) or other tobacco products (aOR=0.73; 95%CI 0.56-0.93) were less likely to consider all three cigarettes undesirable. Those not likely to make a quit attempt in the next six months were less likely than those likely to make a quit attempt in the next six months (aOR=0.62; 95%CI 0.49-0.78) to consider all three cigarettes undesirable.

Only one significant interaction, between cigarette type and SES, was found (p<0.05). Both SES groups perceived the WC significantly more undesirable than the SC, and the GC significantly more undesirable than the WC. Low SES were significantly more likely than those not low SES to perceive the SC (aOR=17.71; 95%CI 13.75-22.80) and GC (aOR=30.88; 95%CI 23.98-39.76) as undesirable; there was no difference for the WC (aOR=0.99; 95%CI 0.78-1.25).

DISCUSSION

Our findings suggest that inserts highlighting the benefits of quitting or providing tips on how to do so may have the potential to encourage cessation, and dissuasive cigarettes may help to reduce the desirability of smoking. Just as tobacco companies have used inserts and cigarette design to create interest in their products, our study suggests that greater attention to how these could be used to promote cessation appears warranted.

Health messages need to capture attention to be effective.[32] In this regard, at least half our sample indicated that they would read inserts (50%) and read them if interested in quitting (60%). In Canada, an observational study found that approximately a quarter of smokers reported reading them at least once within the last month,[10] increasing to about one-third of smokers over two years of follow-up.[11] As in our study, smokers in Canada who had read/would read the inserts were more likely to be female, intend to quit or had recently tried to quit; in our study, they were also more likely to be white British, have moderate dependence, and use factory-made cigarettes and other tobacco products. Future research could explore why dual users (smokers of factory-made cigarettes and other tobacco products) were more likely to indicate that they would read inserts, but as inserts are typically only found in cigarette packs then for those who use other tobacco products they may be seen as more of a novelty and therefore more likely to capture attention.

Approximately three-fifths (61%) of smokers in our study thought that inserts were a good way to provide information about quitting to smokers, with only 25% disagreeing. In comparison, an earlier study in Canada, commissioned by Health Canada, found that 48% of smokers indicated that messaging on inserts was a good way to provide information to smokers, with 47% disagreeing.[5] Just over half our sample agreed/strongly agreed that inserts may make them think more about quitting, help them if they decided to quit, and that they are

an effective way of encouraging smokers to quit, whereas in New Zealand only 34% of smokers and recent quitters agreed/strongly agreed that inserts would be an effective way of encouraging reduced consumption or quitting.[6] There may be various reasons for the differences between our findings and earlier research. For instance, when this earlier research was conducted cigarette packs displayed text-only health warnings and it may be that having pictorial warnings on packs, as is required in Scotland, may prompt smokers to look for information on how to quit and the benefits of doing so. Insert design is also likely to be relevant. Whereas the inserts used in earlier research were limited to text, the inserts used in this study (which have been used in Canada since 2012) included coloured graphics, which is typical of promotional inserts used by tobacco companies and likely enhanced their impact. This would be consistent with the health communications and warnings literature, which demonstrates the importance of supporting text with pictorials.[32,33] Future research exploring insert design (e.g. use of imagery, inclusion of cessation resource information, length and framing of messages, etc) would be of value.

More than half our sample supported the inclusion of inserts promoting cessation inside every cigarette pack, with only a fifth opposing this. Within the European Union, the recent Tobacco Products Directive (TPD)[34] does not require tobacco companies to include health communication inserts in packs, but allows member states to introduce measures beyond those specified. Among governmental representatives that responded to the consultation on the revision of the TPD there was strong support for improving consumer information via mandatory pictorial warnings, with those supportive arguing that additional information, such as pack inserts, would help to deliver more accurate health information.[35] If there is support for inserts among governmental representatives, and little opposition among smokers (the group most likely to be resistant), they are clearly a viable option for regulators.

Tobacco industry journals describe the cigarette as an increasingly important

advertising medium for tobacco companies.[12] However, until recently, the public health focus has been on the potential of regulating the contents of cigarettes to reduce palatability or addictiveness,[36] with little consideration of the possibility of regulating the appearance of cigarettes to reduce its importance as a promotional tool. We found that the two dissuasive cigarettes were perceived as significantly more harmful and less appealing than the standard cigarette, and less likely to encourage trial. The harm, appeal and trial items loaded onto a single 'undesirability' factor, with the dissuasive cigarettes considered much more undesirable than the standard cigarette. The findings are consistent with earlier research, where cigarettes with the warning 'Smoking kills' were considered a constant reminder of the associated harms and, partly due to the perceived discomfort of being observed by others smoking a cigarette displaying this message, unappealing for smokers.[8,16,17,18] Previous studies have also found unattractively coloured cigarettes to be perceived as more harmful than other cigarettes and also repellent, being a cigarette that young people did not think that others their age would use.[15,16,37,38] As with the inserts, the dissuasive cigarettes (and also the standard cigarette) were considered more desirable among dual users than exclusive factory-made cigarette smokers; again it is not clear why this was the case but further research with dual users, or indeed those also using vaping devices (not assessed in this study), would be fruitful.

In terms of limitations, the cross-sectional design did not allow us to assess causality; that inserts and dissuasive cigarettes are not available on the UK market prevents more robust study designs such as longitudinal studies. Another potential limitation concerns the novelty of the stimuli, which may have influenced responses, and forced exposure to the stimuli. In addition, we only used four inserts, rather than the full set of eight used in Canada, which includes inserts that be less relevant to our sample. While online surveys have been used for previous research exploring cigarette packaging, inserts and dissuasive cigarettes,[39-42] and are

a suitable survey mode for young adults, the use of an online panel and self-selection limits the representativeness of our sample. In addition, the use of semantic differential scales can be criticised because answers can be subject to various response biases, although we attempted to diminish these through varying scale item direction and through our multivariate modelling methodology.

It was argued, over two decades ago, that to offer greater protection to consumers cigarettes should come in plain packs with messaging on both the pack exterior and interior.[43] This idea is a step closer in the UK, although there will still be no messaging on the pack interior. That more than half of the participants in this study suggested that inserts may help to promote cessation suggests that their inclusion in packs may be a meaningful supplement to the on-pack warnings. Our findings suggest however that to offer the greatest protection to consumers, it may be beneficial to supplement plain packaging and inserts with cigarettes designed to be dissuasive. Unattractively coloured cigarettes would complement the unattractively coloured packs, just as warnings on the cigarette would extend the warnings on the cigarette pack. Both options are clearly viable.

Contributors CM designed the data collection tool and drafted and revised the paper. RH analysed the data and drafted the Analysis and Results. JT and GR helped design the data collection tool and commented on the paper. All authors read and approved the final manuscript.

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Competing interests GR works for Health Scotland, who funded this study.

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Table 1: Sample and smoking-related characteristics

Characteristic	*N*	*%*
Total	1766	100.0
Age group		
16-19	413	23.4
20-24	401	22.7
25-34	952	53.9
Gender		
Male	888	50.3
Female	878	49.7
Educational qualifications		
Other qualifications	1357	76.8
None or GCSE	409	23.2
Economic status		
Other status	1350	76.4
Routine or manual occupation, unemployed or long term sick	416	23.6
Socioeconomic status (SES)		
No indicators of low SES	1114	63.1
Low education and/or low SES	652	36.9
Ethnicity		
White British	1264	71.6
White non-British	162	9.2
Black (including mixed black and white)	79	4.5
Asian (including mixed Asian and white)	196	11.1
Other or not declared	65	3.7
Location		
England	1550	87.8
Scotland	109	6.2
Wales	73	4.1
Northern Ireland	34	1.9
Tobacco products used		
Only factory-made (packet) cigarettes	813	46.0
Factory-made and roll-your-own cigarettes	681	38.6
Factory-made cigarettes and other products (e.g. cigars, shisha)	272	15.4
Cigarettes per day		
10 or less	1272	72.0
11-20	433	24.5
21-30	46	2.6
31 or more	15	0.8
Time to first cigarette		
Within 5 minutes	263	14.9
6 to 30 minutes	570	32.3
31 to 60 minutes	315	17.8

Characteristic	*N*	*%*
After 60 minutes	618	35.0
Heaviness of Smoking Index (HSI)		
0 little dependence	601	34.0
1	257	14.6
2	418	23.7
3	293	16.6
4	156	8.8
5	28	1.6
6 high dependence	13	0.7
Dependence (Tertiles of HSI)		
Low-dependence	601	34.0
Mid-dependence	675	38.2
High-dependence	490	27.7
Made an attempt to quit smoking that lasted at least 24 hours?		
Yes, within the last six months	788	44.6
Yes, more than six months ago	552	31.3
No, I have never tried to quit smoking for more than 24 hours	426	24.1
How likely are you to try to quit smoking within the next six months?		
Not at all	198	11.2
A little	382	21.6
Moderately	508	28.8
Very	308	17.4
Extremely	272	15.4
Don't know	98	5.5
If you decided to quit smoking in the next six months, how sure are you that you would succeed?		
Not at all	147	8.3
A little	346	19.6
Moderately	612	34.7
Very	297	16.8
Extremely	241	13.6
Don't know	123	7.0
Quit approach		
Moderately or less likely to make quit attempt in next six months (unlikely to make a quit attempt in the next six months)	1186	67.2
Very or extremely likely to attempt but moderately or less likely to succeed (unlikely to make a successful quit attempt in the next six months)	304	17.2
Very or extremely likely to attempt and very or extremely likely to succeed (likely to make a successful quit attempt in the next six months)	276	15.6

Table 2: Perceptions of whether inserts would be read, are a good way to provide information, whether they would help smokers to think about quitting or quit, and support for them

	Yes %	No %	Not sure %
Would they be read	50	37	13
Would they be read if interested in quitting	60	25	15
Good way to provide information about quitting	61	25	14

	Agree %	Disagree %	Neither / Don't know %
Make you think more about quitting	53	18	29
Might help you if you decided to quit	52	19	29
Effective way of encouraging smokers to quit	53	17	30
All packs should have inserts	55	20	25

Table 3a: Logistic regression models exploring perceptions of inserts by sociodemographic characteristics (gender, age, education, ethnicity)[1,2]

(n=1766)	Would read insert	Would read insert if trying to quit	Inserts make you think about quitting	Inserts might help you quit	Inserts a good way of providing information about quitting	Inserts are an effective way of encouraging smokers to quit	All packs should have inserts
Gender							
Male	1	1	1	1	1	1	1
Female	1.24 (1.02 to 1.50)	1.11 (0.91 to 1.35)	0.98 (0.81 to 1.19)	0.95 (0.79 to 1.15)	1.13 (0.93 to 1.37)	0.88 (0.73 to 1.07)	1.20 (0.99 to 1.46)
Age							
16-19	1	1	1	1	1	1	1
20-24	1.16 (0.87 to 1.54)	0.88 (0.66 to 1.18)	1.18 (0.89 to 1.56)	1.19 (0.89 to 1.58)	0.87 (0.65 to 1.16)	0.97 (0.73 to 1.28)	0.96 (0.72 to 1.29)
25-34	1.25 (0.97 to 1.60)	0.83 (0.65 to 1.07)	0.99 (0.78 to 1.26)	1.18 (0.92 to 1.50)	0.76 (0.60 to 0.98)	0.88 (0.69 to 1.12)	0.84 (0.65 to 1.07)
Education							
GCSEs (or equivalent) or none	1	1	1	1	1	1	1
More than GCSEs (or equivalent)	1.25 (0.99 to 1.58)	1.12 (0.89 to 1.42)	1.22 (0.97 to 1.54)	1.21 (0.97 to 1.52)	1.12 (0.89 to 1.40)	1.19 (0.95 to 1.50)	1.10 (0.87 to 1.40)
Ethnicity							
White British		1	1				1
White but not British		0.70 (0.50 to 0.98)	0.58 (0.41 to 0.81)				0.62 (0.44 to 0.87)
Black (inc mixed black & white)		0.92 (0.57 to 1.49)	0.61 (0.38 to 0.98)				0.99 (0.62 to 1.59)
Asian (inc mixed Asian & white)		0.67 (0.49 to 0.92)	1.19 (0.87 to 1.63)				0.70 (0.51 to 0.96)
other or not declared		0.84 (0.50 to 1.42)	1.06 (0.64 to 1.78)				1.08 (0.64 to 1.81)

[1] Note smoking related characteristics (described in table 3b) were also entered into each model
[2] Blank cells indicate no significant relationship in bivariate analysis

Table 3b: Logistic regression models exploring perceptions of inserts by smoking related characteristics (dependence, tobacco products smoked, quit attempts, self-efficacy to quit)[1,2]

(n=1766)	Would read insert	Would read insert if trying to quit	Inserts make you think about quitting	Inserts might help you quit	Inserts a good way of providing information about quitting	Inserts are an effective way of encouraging smokers to quit	All packs should have inserts
Dependence (tertiles of HSI)							
Lower dependence	1						1
Mid dependence	1.39 (1.11 to 1.76)						1.02 (0.80 to 1.29)
Higher dependence	1.22 (0.94 to 1.59)						0.86 (0.66 to 1.12)
Tobacco products smoked							
Only factory-made	1	1	1	1		1	
Factory-made and roll-your-own	1.35 (1.09 to 1.66)	1.61 (1.30 to 2.00)	1.31 (1.06 to 1.62)	1.31 (1.06 to 1.61)		1.27 (1.03 to 1.56)	
Factory-made cigarettes and other	1.20 (0.90 to 1.59)	1.39 (1.04 to 1.86)	1.22 (0.92 to 1.63)	1.34 (1.01 to 1.78)		1.20 (0.91 to 1.60)	
Quit attempt lasting at least 24 hours							
No	1	1	1	1	1	1	1
Yes, more than six months ago	1.30 (1.00 to 1.69)	1.12 (0.86 to 1.45)	1.20 (0.93 to 1.56)	1.05 (0.81 to 1.36)	1.16 (0.90 to 1.50)	1.07 (0.82 to 1.38)	0.78 (0.60 to 1.01)
Yes within the last six months	1.67 (1.29 to 2.15)	1.51 (1.17 to 1.94)	1.46 (1.14 to 1.88)	1.35 (1.05 to 1.73)	1.54 (1.20 to 1.98)	1.33 (1.04 to 1.71)	1.06 (0.82 to 1.37)
Efficacy of quit attempt in next 6 months							
Likely to quit	1	1	1	1	1	1	1
Likely to make unsuccessful attempt	1.01 (0.72 to 1.40)	1.43 (1.00 to 2.06)	0.97 (0.69 to 1.37)	0.92 (0.65 to 1.29)	1.46 (1.02 to 2.08)	1.10 (0.78 to 1.55)	1.43 (1.00 to 2.04)
Unlikely to make attempt	0.58 (0.44 to 0.75)	0.74 (0.55 to 0.99)	0.59 (0.45 to 0.78)	0.51 (0.38 to 0.67)	0.76 (0.57 to 1.01)	0.55 (0.41 to 0.73)	0.56 (0.42 to 0.74)

[1] Note sociodemographic characteristics (described in table 3a) were also entered into each model
[2] Blank cells indicate no significant relationship in bivariate analysis

Table 4: Perceptions of cigarette design (harm, appeal, trial)

	Standard cigarette %[1]	Cigarette with warning %[1]	Green cigarette %[1]
Harmful to health	38.8	69.1*	70.2*
Think of dangers	20.9	58.1*#	53.5*
Unattractive	25.2	61.7*	68.7*
Unstylish	37.4	66.0*	69.4*
Not nice to be seen with	19.8	55.2*	60.2*
Not appealing to people my age	17.8	51.5*	57.4*
Likely trial (personally)	79.4	35.7*	21.5*
Likely trial (for never smokers)	70.1	21.1*	16.5*

[1] Percentages shown indicate an answer within the three highest agreement categories on a seven point semantic scale.

* Significant difference in comparison to the standard cigarette ($p<0.001$)

Significant difference in comparison to the green cigarette ($p<0.05$)

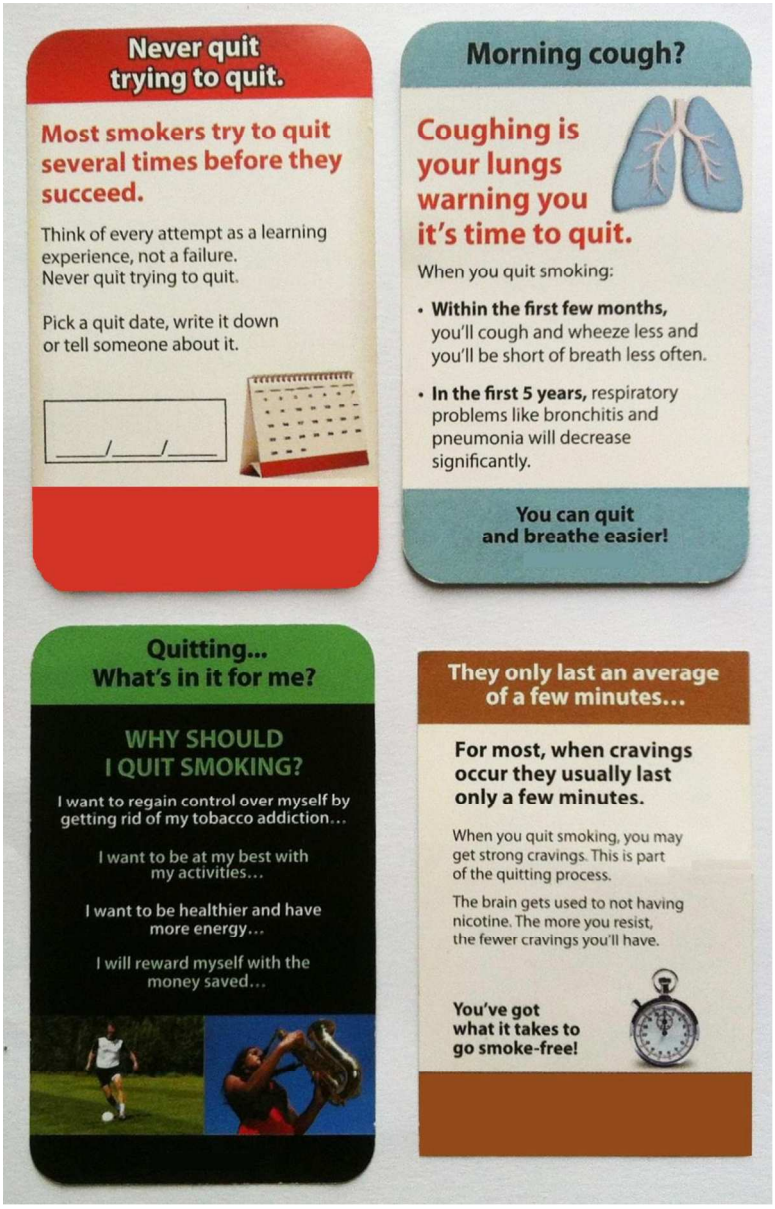

Figure 1 Pack inserts highlighting the benefits of quitting or providing tips on how to do so

142x222mm (300 x 300 DPI)

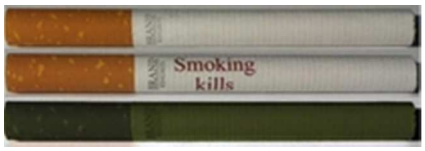

Figure 2: Standard cigarette, warning cigarette and green cigarette

17x5mm (300 x 300 DPI)

STROBE 2007 (v4) checklist of items to be included in reports of observational studies in epidemiology*
Checklist for cohort, case-control, and cross-sectional studies (combined)

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	2
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2-3
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4-5
Objectives	3	State specific objectives, including any pre-specified hypotheses	6
Methods			
Study design	4	Present key elements of study design early in the paper	6
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	6
Participants	6	*Cross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants	6,7
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	8-11
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	10-12
Bias	9	Describe any efforts to address potential sources of bias	6
Study size	10	Explain how the study size was arrived at	6
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	10-12
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	11-12
		(*b*) Describe any methods used to examine subgroups and interactions	11-12
		(*c*) Explain how missing data were addressed	7
		(*d*) *Cross-sectional study*—If applicable, describe analytical methods taking account of sampling strategy	NA
		(*e*) Describe any sensitivity analyses	NA
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	6,29-30
		(b) Give reasons for non-participation at each stage	6
		(c) Consider use of a flow diagram	NA
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	26-27
		(b) Indicate number of participants with missing data for each variable of interest	NA
Outcome data	15*	*Cross-sectional study*—Report numbers of outcome events or summary measures	13-16
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	13-16
		(*b*) Report category boundaries when continuous variables were	28-29

		categorized	
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	NA
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	10-12
Discussion			
Key results	18	Summarise key results with reference to study objectives	16-19
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	18
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	19-20
Generalisability	21	Discuss the generalisability (external validity) of the study results	17-19
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	20

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

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Perceptions of cigarette pack inserts promoting cessation and dissuasive cigarettes among young adult smokers in the United Kingdom: A cross-sectional online survey

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Title: Perceptions of cigarette pack inserts promoting cessation and dissuasive cigarettes among young adult smokers in the United Kingdom: A cross-sectional online survey

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Perceptions of cigarette pack inserts promoting cessation and dissuasive cigarettes among young adult smokers in the United Kingdom: A cross-sectional online survey

ABSTRACT

Objectives: To explore young adult smokers' perceptions of cigarette pack inserts promoting cessation and cigarettes designed to be dissuasive.

Design: Cross-sectional online survey.

Setting: United Kingdom.

Participants: The final sample was 1766 young adult smokers, with 50.3% male and 71.6% white British. To meet the inclusion criteria participants had to be 16-34 years old and smoke factory-made cigarettes.

Primary and secondary outcome measures: Salience of inserts, perceptions of inserts as information provision, perceptions of inserts on quitting, support for inserts, and perceived appeal, harm and trial of three cigarettes (a standard cigarette, a standard cigarette displaying the warning 'Smoking kills', and a green cigarette).

Results: Half the sample indicated that they would read inserts with three-fifths indicating that they be a good way to provide information about quitting (61%). Just over half indicated that inserts would make them think more about quitting (53%), help if they decided to quit (52%), are an effective way of encouraging smokers to quit (53%), and supported having them in all packs (55%). Participants who smoked factory-made cigarettes and other tobacco products (compared to exclusive factory-made cigarette smokers), had made a quit attempt within the last six months (compared to those that had never made a quit attempt), or were likely to make a successful quit attempt in the next six months (compared to those unlikely to make a quit attempt in the next six months), were more likely to indicate that inserts could assist with cessation. Multivariable logistic regression modelling suggested that compared

with the standard cigarette, the cigarette with warning (adjusted Odds Ratio=17.71; 95%CI 13.75-22.80) and green cigarette (adjusted Odds Ratio=30.88; 95%CI 23.98-39.76) were much less desirable (less appealing, more harmful, less likely to be tried).

Conclusions: Inserts and dissuasive cigarettes offer policy makers additional ways of using the pack to reduce smoking.

Strengths and limitations of this study

- The main strength of this study is that it allows an insight into how young adult smokers perceive two innovative tobacco control measures (pack inserts promoting cessation and dissuasive cigarettes).
- The main limitation of the study is that it does not provide any insight into actual smoking behaviour.
- Additional limitations include the novelty of the stimuli and forced exposure to this, and the use of self-selection.

INTRODUCTION

While packaging remains a key marketing driver for tobacco companies, more than 100 countries now require pictorial health warnings on cigarette packs,[1] which can limit pack appeal.[2] Some countries have gone even further by implementing plain (or standardised) packaging, which severely reduces the promotional power of the pack. The United Kingdom (UK) became the third country to fully implement standardised packaging in May 2017, following Australia in December 2012 and France in January 2017. In the UK all cigarette packs must be drab brown with pictorial warnings on 65% of the front and back of packs and additional health messages on 50% of the sides of the pack. Although these changes have reduced the ability of tobacco companies to use the pack to create favourable perceptions of the brand and of smoking, there is clearly more scope for using the packaging to dissuade consumers. Regulators and academics have typically focused on the exterior of the cigarette pack, with little consideration of how the pack interior, for instance pack inserts or cigarettes, which have long been used by tobacco companies to promote their brands, could potentially be used to encourage smokers to think about their smoking behaviour. This is the focus of our study.

Tobacco companies have used the inside of the cigarette pack to communicate with consumers since the late 19th century, via cigarette cards, coupons and promotional inserts. Only in Canada are they required, by law, to include pack inserts with health messaging. Sixteen text-only inserts were required in packs between 2000 and 2012, with nine encouraging cessation and seven providing health risk information.[3] These were replaced with eight new inserts, with coloured graphics and positively framed messages about the benefits of quitting or tips on how to do so, in 2012. Few studies have explored perceptions of pack inserts,[4-8] with only two assessing smokers' perceptions of, and responses to, the inserts used in Canada.[9-11] In focus group research in Scotland,[9] with smokers aged 16 and

over who were shown seven of the inserts used in Canada, the general view was that they would capture attention and be read due to their novelty and visibility when opening the pack. Inserts were also thought to have a long lasting impact as they would be removed from the pack and remain visible within the household or elsewhere, or as litter.[9] The positive messaging was liked and thought to increase message engagement. The inserts were often preferred to the on-pack warnings, although both were deemed necessary. Some participants suggested that inserts could encourage them to stop smoking, and they were generally considered to have the potential to alter the behaviour of younger people, would-be smokers and those wanting to quit.[9] In Canada, a longitudinal online survey with smokers aged 18 and over found that between 26% and 31% at each wave reported having read pack inserts at least once in the prior month; those intending to quit or having recently tried to do so were significantly more likely to have read them.[10] In addition, while reading warnings on the pack exterior decreased over time, reading pack inserts increased over time, with more frequent reading independently associated with self-efficacy to quit, quit attempts, and sustained quitting at follow-up.[11]

The cigarette itself is also an important communications tool,[12,13] which has long been used by tobacco companies as a marketing device but has yet to be used by regulators to deter smoking. As cigarettes are primarily responsible for tobacco related mortality and morbidity and predicted to continue to dominate the global market for some time yet,[14] research exploring the potential impact of standardising the appearance of cigarettes to make them less desirable is long overdue. Some recent research has examined consumer perceptions of cigarettes that have been designed to be 'dissuasive', including unattractively coloured cigarettes,[15,16] cigarettes with the warning 'Smoking kills' on the cigarette paper,[17,18] and cigarettes displaying the 'minutes of life lost due to smoking' on the cigarette paper.[19] In each of these studies the dissuasive cigarettes were generally viewed more negatively than regular

cigarettes. For instance, a qualitative study with young women smokers in New Zealand found that unattractively coloured cigarettes, particularly green or brown coloured cigarettes, were perceived as more harmful than other cigarettes, with it less likely that they or others their age would want to use them.[15] An in-home survey in the UK with 11-16 year olds, who were shown an image of a cigarette stick displaying 'Smoking kills', found that 53% indicated that this would make people want to give up smoking, 71% indicated that it would put people off starting to smoke, and 85% supported having a warning on all cigarettes.[18]

In this study our objective was to explore, for the first time, young adult smokers' perceptions of pack inserts and dissuasive cigarettes (a cigarette displaying the warning 'Smoking kills' and a green coloured cigarette).

METHODS

Design and sample

An online survey was conducted in January-February 2016 with smokers aged 16-34 years old in the UK; an online survey is a suitable approach given that 99% of this age group in the UK are recent internet users.[20] The sample (n=1970) was recruited by online market research company 'Research Now' from their panel of over 400,000 people (www.researchnow.com). After Research Now excluded those who had completed the survey in less than the minimum completion time (n=193), which they had set prior to data collection commencing, and those providing responses to open-ended questions that indicated that they had not taken the survey seriously (n=11), the final sample was 1766 (89.6% of completed surveys). The final sample was 50.3% male, with 53.9% aged 25-34 years and 71.6% white British. Most participants smoked 10 or less cigarettes per day, with 46.0% exclusive factory-made cigarette smokers (see Table 1 for sample and smoking-related characteristics).

Table 1 here

Procedure

An email invite was sent by Research Now to their online panel in the UK. Research Now is an established online market research company in the UK and elsewhere,[21] with their panels recruited from a wide range of sources, such as internet sites, advertising and partnerships with other websites. Research Now, like other online panels, has details of their members' demographics and other characteristics that are used to profile target samples. Response rate details are not available when using this sampling methodology however as recording contact, participation and refusal rates is not practical.[22] For those that responded to the email invite, they answered screening questions about their age, smoking status and types of tobacco products used, with those that did not meet the inclusion criteria (factory-made cigarette smokers aged 16-34 years) excluded.

Those eligible for inclusion were presented with an information page explaining the study aim (to explore what young adult smokers thought about cigarettes and pack inserts), and relevant ethical information (their right to withdraw at any time, assurances of confidentiality and anonymity, and contact details if they had any concerns or would like to request a copy of the published findings). They were then presented with a consent page, with consent required for participation. Survey questions were presented in the same order for all participants, except the questions exploring perceptions of the three cigarette types (standard cigarette (SC), warning cigarette (WC), green cigarette (GC)), where the ordering was randomised; the ordering of the presentation of the three cigarettes (shown in Figure 1) was also randomised. There was no missing data as participants could only proceed to the next question if they had provided an answer to the previous question.

Figure 1 here

Prior to the questions on inserts, participants were shown an image of a cigarette pack with an insert shown in the front of the pack – as they typically appear in packs – alongside the text 'We have some questions on pack inserts, which can sometimes be found inside packs (see image for example)'. For each question about inserts, participants were shown the question and an image of one insert. Four different inserts were used in total, as shown in Figure 2, with these chosen from the eight used in Canada as they were considered most relevant to our sample. The words 'Health Canada' were removed from the bottom of each insert to make them more relevant for participants in the UK. The median time for survey completion was 9 minutes 28 seconds. Participants received a nominal incentive (50 pence) for participation, as is common for online panels. The study received ethical approval from the School of Health Sciences Ethics Committee at the University of Stirling.

Figure 2 here

Patient and public involvement

There was no patient or public involvement in the development, design or conduct of this study.

Measures

Inserts: Salience and information provision

Participants were asked 'If this type of insert was in your cigarette pack, do you think that you would read it?' and 'If this type of insert was in your cigarette pack, do you think that you would read it if you were interested in quitting?' They were also asked 'Do you think that inserts would be a good way to provide information to smokers about quitting?'[5] Response options for each were 'Yes', 'No' and 'Not sure'.

Inserts: Cessation

Three questions assessed to what extent participants agreed or disagreed that inserts would make them think about quitting, and help them quit: 'Do you agree or disagree that having these types of inserts in every cigarette pack would make you think more about quitting?', 'Do you agree or disagree that having these types of inserts in every cigarette pack might help you if you decided to quit?', and 'Do you agree or disagree that having these types of inserts inside every cigarette pack would be an effective way of helping smokers who want to quit?'[6] Response options for each were 'Strongly disagree', 'Disagree', 'Neither agree nor disagree', 'Agree', 'Strongly agree' and 'Don't know'.

Inserts: Support

A five-point semantic scale assessed support, with anchors 'All cigarette packs should have inserts like this in them-No cigarette packs should have inserts like this in them'.

Cigarette design: Appeal, harm and trial

Seven-point semantic scales assessed appeal, harm and likely trial. Appeal was assessed via four scales, with anchors 'Attractive-Unattractive', 'Stylish-Not stylish', 'Not nice to be seen with-Nice to be seen with' and 'Not appealing to people my age-Appealing to people my age'. Harm was assessed via two scales, with anchors 'Looks harmful to health-Does not look

harmful to health' and 'Makes me think about the dangers of smoking-Does not make me think about the dangers of smoking'. Likely trial was assessed via two scales, 'If a friend offered you each of these cigarettes, how likely would you be to try them?' and 'If someone your age who had never smoked before was going to try a cigarette, how likely do you think they would be to try each of these cigarettes?' Both scales assessing trial ranged from 'Not at all likely' to 'Very likely'.

A factor analysis of the eight variables on appeal, harm and trial, collated for the three cigarette types (SC, WC, GC), was undertaken. Checks indicated that the data was suitable for factor analysis (Kaiser Meyer Olkin=0.845, Bartlett's test of sphericity (approx. chi-square 18062.842, df=276, $p<0.001$), with no correlations between the variables >0.9). The extraction method used was Principal Axis Factoring and the criteria for extraction was eigenvalues>1. All eight variables loaded on a single factor with factor loadings that were >0.5. High factor scores indicated that a cigarette was desirable and low scores that it was undesirable. The factor was used as the outcome measure of cigarette desirability in the regression analysis. Visual inspection and the Kolmogorov-Smirnov test indicated that the factor was non-normal (because responses for the dissuasive cigarettes indicated they were undesirable generally) and attempts to normalise it using normit rankit methods failed. Therefore, the factor was divided into tertiles, with the tertile indicating undesirable factor scores compared with the other two tertiles. This was the outcome variable in logistic regression analysis.

Sociodemographic characteristics

Age, gender, ethnicity, educational attainment and economic status (based on chief income earner) were obtained. Preliminary analysis showed that education was associated with how pack inserts were perceived, whereas both education and economic status were associated

with how cigarettes were perceived. As such, for the analysis of the cigarettes a count procedure was used to create a variable for low socioeconomic status (SES): low education (General Certificate of Secondary Education: GCSE or below) and/or low economic status (routine or manual occupation, long-term unemployed or long-term sick or disabled).

Smoking behaviour

Smoking status was assessed with 'Which of these best describes you?' with response options: 'I have never smoked', 'I used to smoke, but don't now', 'I smoke, but not every day', and 'I smoke every day'. Type of products used was assessed with 'What type(s) of tobacco products do you smoke?' with response options: 'Only factory-made (packet) cigarettes', 'Factory-made and roll-your-own cigarettes', 'Factory-made cigarettes and other tobacco products (e.g. cigars, shisha, etc)', 'Only roll-your-own cigarettes' and 'Only other tobacco products (e.g. cigars, shisha, etc)'. The Heaviness of Smoking Index (HSI)[23] was used as a measure of dependence, based on daily consumption and time to first cigarette.

Quitting and self-efficacy

Participants were asked 'Have you ever made an attempt to quit smoking that lasted at least 24 hours?'[24] (Yes within the last six months, Yes more than six months ago, I have never tried to quit for more than 24 hours). They were also asked 'How likely are you to try to quit smoking within the next six months?'[25] (Not at all, A little, Moderately, Very, Extremely, Don't know), with those responding 'Not at all', 'A little', 'Moderately' or 'Don't know' classified as 'Unlikely to make a quit attempt in the next six months'. To measure quitting self-efficacy, participants were asked 'If you decided to quit smoking in the next six months, how sure are you that you would succeed?'[26] (Not at all, A little, Moderately, Very, Extremely, Don't know). Those who responded to the likelihood of quitting question with

'Very or 'Extremely' and to the quitting efficacy question with 'Not at all', 'A little', 'Moderately' or 'Don't know' were classified as 'unlikely to make a successful quit attempt in the next six months'. Those who responded 'Very' or 'Extremely' to both questions were classified as 'likely to make a successful quit attempt in the next six months'.

Analysis

Data was analysed using Microsoft office Excel 2013, SPSS v22 and v23 and MLWin v2.33.[27] The insert variables were dichotomised into yes/agreement and no/disagreement/neutral/not sure/don't know. The dichotomised insert variables were the outcomes of the logistic regression models. The independent variables were gender, age, education, ethnicity, dependence (tertiles of HSI), tobacco product(s) smoked, previous quit attempt lasting at least 24 hours, and likely efficacy of a quit attempt in the next six months. Percentages in agreement were calculated. Age, gender and education (as a measure of SES) were entered into all models to account for any sampling inadequacies. Other variables were entered where $p<0.10$ in chi square tests. The models were assessed for multicollinearity via comparison of standard errors[28] and none was found.

For each of the eight seven-point semantic scales, the percentage of participants choosing one of the three points nearest the undesirable anchor (e.g. unattractive, not nice to be seen with, looks harmful to health) was calculated for each of the three cigarette types (SC, WC, GC). Thus, 24 percentages were calculated. Differences between the three cigarettes were tested using Cochran's Q and pairwise comparisons.

Multilevel logistic regression modelling of cigarette desirability, with second order PQL estimation,[29] was undertaken with cigarette evaluations (participants' response to each of the three cigarettes) clustered within individual participants. Therefore, cigarette evaluations were level one cases and participants were entered at level two as a random

effect. All models included cigarette type as a fixed effect, where the standard cigarette was compared with the warning cigarette and green cigarette. Other fixed effects at the individual (participant) level were sociodemographic and smoking-related characteristics, which were significantly associated with the outcome in multivariable models. This main effects model tested which characteristics were associated with perceiving cigarettes as desirable. In order to understand which characteristics differentiated the desirability of the three types of cigarettes, interactions between cigarette type and each significant characteristic were tested. Only one interaction was found, between cigarette type and SES. The interacting variables (cigarette type and SES) were substituted by a cross classified variable which merged cigarette type and SES. This cross classified variable was split into six categories: low SES standard cigarette, low SES warning cigarette, low SES green cigarette, not low SES standard cigarette, not low SES warning cigarette, not low SES green cigarette. To understand the interaction five models were run with the reference category of the cross classified variable different each time.[30,31]

RESULTS

Perceptions of inserts

Half the sample indicated that they would read inserts, with approximately three-fifths indicating that they would read them if interested in quitting (60%), and that they would be a good way to provide information about quitting (61%). Just over half strongly agreed/agreed that inserts may make them think more about quitting (53%), help them if they decided to quit (52%), that they are an effective way of encouraging smokers to quit (53%), and that all cigarette packs should have inserts (55%), see Table 2.

Table 2 here

Sociodemographic differences in perceptions of inserts

Women were more likely than men to indicate that they would read inserts (aOR=1.24; 95%CI 1.02-1.50), and 25-34 year olds less likely than 16-19 year olds to think that they were a good way of providing information about quitting (aOR=0.76; 95%CI 0.60-0.98). Compared with white British participants, white non-British (aOR=0.70; 95%CI 0.50-0.98) and Asian (aOR=0.67; 95%CI 0.49-0.92) participants were less likely to suggest that they would read inserts if trying to quit, white non-British (aOR=0.58; 95%CI 0.41-0.81) and Black (aOR=0.61; 95%CI 0.38-0.98) participants were less likely to indicate that inserts would make them think about quitting, and white non-British (aOR=0.62; 95%CI 0.44-0.87) and Asian (aOR=0.70; 95%CI 0.51-0.96) participants were less likely to support having inserts in all packs, see Table 3.

Smoking-related differences

Compared to exclusive factory-made cigarette smokers, those who also smoked roll-your-own cigarettes were more likely to indicate they would read inserts (aOR=1.35; 95%CI 1.09-1.66), read them if trying to quit (aOR=1.61; 95%CI 1.30-2.00), that they would make them think about quitting (aOR=1.31; 95%CI 1.06-1.62), help them if they decided to quit (aOR=1.31; 95%CI 1.06-1.61), and that they would be an effective way of encouraging smokers to quit (aOR=1.27; 95%CI 1.03-1.56), see Table 3. Compared to exclusive factory-made cigarette smokers, those who also smoked other tobacco products (e.g. cigars, shisha) were more likely to indicate they would read inserts if trying to quit (aOR=1.39; 95%CI 1.04-1.86) and that inserts might help them if they decided to quit (aOR=1.34; 95%CI 1.01-1.78).

Participants who had made a quit attempt more than six months ago (aOR=1.30; 95%CI 1.00-1.69), or within the last six months (aOR=1.67; 95%CI 1.29-2.15), were more likely to indicate that they would read inserts than those who had never made a quit attempt. Those who had made a quit attempt in the last six months were also more likely than those who had never made a quit attempt to indicate that inserts were a good way to provide information about quitting (aOR=1.54; 95%CI 1.20-1.98), that they would read them if trying to quit (aOR=1.51; 95%CI 1.17-1.94), make them think about quitting (aOR=1.46; 95%CI 1.14-1.88), help them if they decided to quit (aOR=1.35; 95%CI 1.05-1.73), and that they would be an effective way of encouraging smokers to quit (aOR=1.33; 95%CI 1.04-1.71).

Compared to those likely to make a successful quit attempt in the next six months, those unlikely to make a quit attempt in the next six months were less likely to indicate that they would read inserts (aOR=0.58; 95%CI 0.44-0.75), read them if trying to quit (aOR=0.74; 95%CI 0.55-0.99), that they would make them think about quitting (aOR 0.59; 95%CI 0.45-0.78), help them if they decided to quit (aOR=0.51; 95%CI 0.38-0.67), that they would be effective for smokers if they decided to quit (aOR=0.55; 95%CI 0.41-0.73), or support them (aOR=0.56; 95%CI 0.42-0.74). Compared to those likely to make a successful quit attempt in the next six months, those unlikely to make a successful quit attempt in the next six months were more likely to read inserts if trying to quit (aOR=1.43; 95%CI 1.00-2.06), thought that they were a good way to provide information to smokers about quitting (aOR=1.46; 95%CI 1.02-2.08), and support them (aOR=1.43; 95%CI 1.00-2.04).

Table 3 here

Perceptions of cigarette design

With respect to harm, participants were less likely to think that the standard cigarette (SC)

looked harmful than the warning cigarette (WC) or green cigarette (GC) (p<0.001), and less likely to think that the SC made them think more about the dangers of smoking than the WC or GC (p<0.001), see Table 4. Participants were also less likely to indicate that the GC would make them think of the dangers of smoking than the WC (p=0.01). In terms of appeal, participants were more likely to consider the SC attractive, and stylish, than the WC or GC (both p<0.001). The SC was also considered to be nicer to be seen with, and more appealing to people their age, than the WC or GC (both p<0.001). In terms of trial, whereas only 8.9% indicated that they would be unlikely to try a SC if offered by a friend, this was 45.4% for the WC and 66.5% for the GC (both p<0.001). Similarly, while only 14.8% indicated that a never smoker their age would be unlikely to try a SC, this was 63.3% for the WC and 71.6% for the GC (both p<0.001), see Table 4.

Table 4 here

Perceptions of cigarette desirability

Main effects multivariable logistic regression modelling suggested that in comparison to the SC, the WC (aOR=17.71; 95%CI 13.75-22.80) and GC (aOR=30.88; 95%CI 23.98-39.76) were much more likely to be perceived as undesirable (i.e. less appealing, more harmful, less likely to be tried). The model also indicated which smokers were more likely to rate the cigarettes as undesirable: women were more likely than men (aOR=1.30; 95%CI 1.10-1.54), and low SES more likely than those not low SES (aOR=1.26; 95%CI 1.06-1.50), to consider all three cigarettes undesirable. Compared to exclusive factory-made cigarette smokers, those who also smoked roll-your-own cigarettes (aOR=0.78; 95%CI 0.65-0.93) or other tobacco products (aOR=0.73; 95%CI 0.56-0.93) were less likely to consider all three cigarettes undesirable. Those not likely to make a quit attempt in the next six months were less likely

than those likely to make a quit attempt in the next six months (aOR=0.62; 95%CI 0.49-0.78) to consider all three cigarettes undesirable.

Only one significant interaction, between cigarette type and SES, was found ($p<0.05$). Both SES groups perceived the WC significantly more undesirable than the SC, and the GC significantly more undesirable than the WC (see Table 5). Low SES participants were significantly more likely than those not low SES to perceive the SC (aOR=1.89; 95%CI 1.18-3.03) and GC (aOR=1.43; 95%CI 1.13-1.80) as undesirable; there was no difference for the WC (aOR=0.99; 95%CI 0.78-1.25).

Table 5 here

DISCUSSION

Our findings suggest that inserts highlighting the benefits of quitting or providing tips on how to do so may have the potential to encourage cessation, and dissuasive cigarettes may help to reduce the desirability of smoking. Just as tobacco companies have used inserts and cigarette design to create interest in their products, our study suggests that greater attention to how these could be used to promote cessation appears warranted.

Health messages need to capture attention to be effective.[32] In this regard, at least half our sample indicated that they would read inserts (50%) and read them if interested in quitting (60%). In Canada, an observational study found that approximately a quarter of smokers reported reading them at least once within the last month,[10] increasing to about one-third of smokers over two years of follow-up.[11] Like the smokers in our study who indicated that they would read the inserts, smokers in Canada who had read the inserts were more likely to be female, intend to quit or had recently tried to quit; in our study, they were also more likely to be white British, have moderate dependence, and use factory-made cigarettes

and other tobacco products. Future research could explore why dual users (smokers of factory-made cigarettes and other tobacco products) were more likely to indicate that they would read inserts, but as inserts are typically only found in cigarette packs then for those who use other tobacco products they may be seen as more of a novelty and therefore more likely to capture attention.

Approximately three-fifths (61%) of smokers in our study thought that inserts were a good way to provide information about quitting to smokers, with only 25% disagreeing. In comparison, an earlier study in Canada, commissioned by Health Canada, found that 48% of smokers indicated that messaging on inserts was a good way to provide information to smokers, with 47% disagreeing.[5] Just over half our sample agreed/strongly agreed that inserts may make them think more about quitting, help them if they decided to quit, and that they are an effective way of encouraging smokers to quit, whereas in New Zealand only 34% of smokers and recent quitters agreed/strongly agreed that inserts would be an effective way of encouraging reduced consumption or quitting.[6] There may be various reasons for the differences between our findings and earlier research. For instance, when this earlier research was conducted cigarette packs displayed text-only health warnings and it may be that having pictorial warnings on packs, as is required in Scotland, may prompt smokers to look for information on how to quit and the benefits of doing so. Insert design is also likely to be relevant. Whereas the inserts used in earlier research were limited to text, the inserts used in this study (which have been used in Canada since 2012) included coloured graphics, which is typical of promotional inserts used by tobacco companies and likely enhanced their impact. This would be consistent with the health communications and warnings literature, which demonstrates the importance of supporting text with pictorials.[32,33] Future research exploring insert design (e.g. use of imagery, inclusion of cessation resource information, length and framing of messages, etc) would be of value.

More than half our sample supported the inclusion of inserts promoting cessation inside every cigarette pack, with only a fifth opposing this. Within the European Union, the Tobacco Products Directive (TPD)[34] does not require tobacco companies to include health communication inserts in packs, but allows member states to introduce measures beyond those specified. Among governmental representatives that responded to the consultation on the revision of the TPD there was strong support for improving consumer information via mandatory pictorial warnings, with those supportive arguing that additional information, such as pack inserts, would help to deliver more accurate health information.[35] If there is support for inserts among governmental representatives, and little opposition among smokers (the group most likely to be resistant), they are clearly a viable option for regulators.

Tobacco industry journals describe the cigarette as an increasingly important advertising medium for tobacco companies.[12] However, until recently, the public health focus has been on the potential of regulating the contents of cigarettes to reduce palatability or addictiveness,[36] with little consideration of the possibility of regulating the appearance of cigarettes to reduce its importance as a promotional tool. We found that the two dissuasive cigarettes were perceived as significantly more harmful and less appealing than the standard cigarette, and less likely to encourage trial. The harm, appeal and trial items loaded onto a single 'desirability' factor, with the dissuasive cigarettes considered much more undesirable than the standard cigarette. The findings are consistent with earlier research, where cigarettes with the warning 'Smoking kills' were considered a constant reminder of the associated harms and, partly due to the perceived discomfort of being observed by others smoking a cigarette displaying this message, unappealing for smokers.[8,16,17,18] Previous studies have also found unattractively coloured cigarettes to be perceived as more harmful than other cigarettes and also repellent, being a cigarette that young people did not think that others their age would use.[15,16,37,38] As with the inserts, the dissuasive cigarettes (and also the standard

cigarette) were considered more desirable among dual users than exclusive factory-made cigarette smokers; again it is not clear why this was the case but further research with dual users, or indeed those also using vaping devices (not assessed in this study), would be fruitful.

In terms of limitations, the cross-sectional design did not allow us to assess causality; that inserts and dissuasive cigarettes are not available on the UK market prevents more robust study designs such as longitudinal studies. Another potential limitation concerns the novelty of the stimuli, which may have influenced responses, and forced exposure to the stimuli. In addition, we only used four inserts, rather than the full set of eight used in Canada, which includes inserts less relevant to our sample. While online surveys have been used for previous research exploring cigarette packaging, inserts and dissuasive cigarettes,[39-42] and are a suitable survey mode for young adults, the use of an online panel and self-selection limits the representativeness of our sample. In addition, the use of semantic differential scales can be criticised because answers can be subject to various response biases, although we attempted to diminish these through varying scale item direction and through our multivariate modelling methodology.

It was argued, over two decades ago, that to offer greater protection to consumers cigarettes should come in plain packs with health messaging on both the pack exterior and interior.[43] This idea is a step closer in the UK, although there will still be no messaging on the pack interior. That more than half of the participants in this study suggested that inserts may help to promote cessation suggests that their inclusion in packs may be a meaningful supplement to the on-pack warnings. Our findings suggest however that to offer the greatest protection to consumers, it may be beneficial to supplement plain packaging and inserts with cigarettes designed to be dissuasive. Unattractively coloured cigarettes would complement

the unattractively coloured packs, just as warnings on the cigarette would extend the warnings on the cigarette pack. Both options are clearly viable.

Contributors CM designed the data collection tool and drafted and revised the paper. RH analysed the data and drafted the Analysis and Results. JT and GR helped design the data collection tool and commented on the paper. All authors read and approved the final manuscript.

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Competing interests GR works for Health Scotland, who funded this study.

Ethics approval The study obtained ethics approval from the School of Health Sciences Ethics Committee at the University of Stirling. Participants provided informed consent before participating.

Provenance and peer review Not commissioned; externally peer reviewed.

Data sharing statement No additional data are available.

Figure Legends:

Figure 1: Standard cigarette, warning cigarette and green cigarette

Figure 2: Pack inserts highlighting the benefits of quitting or providing tips on how to do so

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Table 1: Sample and smoking-related characteristics

Characteristic	*N*	*%*
Total	1766	100.0
Age group		
16-19	413	23.4
20-24	401	22.7
25-34	952	53.9
Gender		
Male	888	50.3
Female	878	49.7
Educational qualifications		
Other qualifications	1357	76.8
None or GCSE	409	23.2
Economic status		
Other status	1350	76.4
Routine or manual occupation, unemployed or long term sick	416	23.6
Socioeconomic status (SES)		
No indicators of low SES	1114	63.1
Low education and/or low SES	652	36.9
Ethnicity		
White British	1264	71.6
White non-British	162	9.2
Black (including mixed black and white)	79	4.5
Asian (including mixed Asian and white)	196	11.1
Other or not declared	65	3.7
Location		
England	1550	87.8
Scotland	109	6.2
Wales	73	4.1
Northern Ireland	34	1.9
Tobacco products used		
Only factory-made (packet) cigarettes	813	46.0
Factory-made and roll-your-own cigarettes	681	38.6
Factory-made cigarettes and other products (e.g. cigars, shisha)	272	15.4
Cigarettes per day		
10 or less	1272	72.0
11-20	433	24.5
21-30	46	2.6
31 or more	15	0.8
Time to first cigarette		
Within 5 minutes	263	14.9
6 to 30 minutes	570	32.3

Characteristic	*N*	*%*
31 to 60 minutes	315	17.8
After 60 minutes	618	35.0
Heaviness of Smoking Index (HSI)		
0 little dependence	601	34.0
1	257	14.6
2	418	23.7
3	293	16.6
4	156	8.8
5	28	1.6
6 high dependence	13	0.7
Dependence (Tertiles of HSI)		
Low-dependence	601	34.0
Mid-dependence	675	38.2
High-dependence	490	27.7
Made an attempt to quit smoking that lasted at least 24 hours?		
Yes, within the last six months	788	44.6
Yes, more than six months ago	552	31.3
No, I have never tried to quit smoking for more than 24 hours	426	24.1
How likely are you to try to quit smoking within the next six months?		
Not at all	198	11.2
A little	382	21.6
Moderately	508	28.8
Very	308	17.4
Extremely	272	15.4
Don't know	98	5.5
If you decided to quit smoking in the next six months, how sure are you that you would succeed?		
Not at all	147	8.3
A little	346	19.6
Moderately	612	34.7
Very	297	16.8
Extremely	241	13.6
Don't know	123	7.0
Quit approach		
Moderately or less likely to make quit attempt in next six months (unlikely to make a quit attempt in the next six months)	1186	67.2
Very or extremely likely to attempt but moderately or less likely to succeed (unlikely to make a successful quit attempt in the next six months)	304	17.2
Very or extremely likely to attempt and very or extremely likely to succeed (likely to make a successful quit attempt in the next six months)	276	15.6

Table 2: Perceptions of whether inserts would be read, are a good way to provide information, whether they would help smokers to think about quitting or quit, and support for them

	Yes %	No %	Not sure %
Would they be read	50	37	13
Would they be read if interested in quitting	60	25	15
Good way to provide information about quitting	61	25	14

	Agree %	Disagree %	Neither / Don't know %
Make you think more about quitting	53	18	29
Might help you if you decided to quit	52	19	29
Effective way of encouraging smokers to quit	53	17	30
All packs should have inserts	55	20	25

Table 3: Logistic regression models exploring perceptions of inserts by sociodemographic and smoking related characteristics[1]

(n=1766)	Would read insert	Would read insert if trying to quit	Inserts make you think about quitting	Inserts might help you quit	Inserts a good way of providing information about quitting	Inserts are an effective way of encouraging smokers to quit	All packs should have inserts
Gender **(ref[2] = male)**							
Female	1.24 (1.02 to 1.50)	1.11 (0.91 to 1.35)	0.98 (0.81 to 1.19)	0.95 (0.79 to 1.15)	1.13 (0.93 to 1.37)	0.88 (0.73 to 1.07)	1.20 (0.99 to 1.46)
Age **(ref = 16-19)**							
20-24	1.16 (0.87 to 1.54)	0.88 (0.66 to 1.18)	1.18 (0.89 to 1.56)	1.19 (0.89 to 1.58)	0.87 (0.65 to 1.16)	0.97 (0.73 to 1.28)	0.96 (0.72 to 1.29)
25-34	1.25 (0.97 to 1.60)	0.83 (0.65 to 1.07)	0.99 (0.78 to 1.26)	1.18 (0.92 to 1.50)	0.76 (0.60 to 0.98)	0.88 (0.69 to 1.12)	0.84 (0.65 to 1.07)
Education **(ref = GCSEs (or equivalent) or none)**							
More than GCSEs (or equivalent)	1.25 (0.99 to 1.58)	1.12 (0.89 to 1.42)	1.22 (0.97 to 1.54)	1.21 (0.97 to 1.52)	1.12 (0.89 to 1.40)	1.19 (0.95 to 1.50)	1.10 (0.87 to 1.40)
Ethnicity **(ref = White British)**							
White but not British		0.70 (0.50 to 0.98)	0.58 (0.41 to 0.81)				0.62 (0.44 to 0.87)
Black (inc mixed black & white)		0.92 (0.57 to 1.49)	0.61 (0.38 to 0.98)				0.99 (0.62 to 1.59)
Asian (inc mixed Asian & white)		0.67 (0.49 to 0.92)	1.19 (0.87 to 1.63)				0.70 (0.51 to 0.96)
other or not declared		0.84 (0.50 to 1.42)	1.06 (0.64 to 1.78)				1.08 (0.64 to 1.81)
Dependence **(tertiles of HSI) (ref = lower dependence)**							
Mid dependence	1.39 (1.11 to 1.76)						1.02 (0.80 to 1.29)
Higher dependence	1.22 (0.94 to 1.59)						0.86 (0.66 to 1.12)
Tobacco products smoked **(ref = only factory-made cigarettes)**							
Factory-made and roll-your-own	1.35 (1.09 to 1.66)	1.61 (1.30 to 2.00)	1.31 (1.06 to 1.62)	1.31 (1.06 to 1.61)		1.27 (1.03 to 1.56)	
Factory-made and other	1.20 (0.90 to 1.59)	1.39 (1.04 to 1.86)	1.22 (0.92 to 1.63)	1.34 (1.01 to 1.78)		1.20 (0.91 to 1.60)	
Quit attempt lasting at least 24 hours **(ref = no)**							
Yes, more than six months ago	1.30 (1.00 to 1.69)	1.12 (0.86 to 1.45)	1.20 (0.93 to 1.56)	1.05 (0.81 to 1.36)	1.16 (0.90 to 1.50)	1.07 (0.82 to 1.38)	0.78 (0.60 to 1.01)
Yes, within the last six months	1.67 (1.29 to 2.15)	1.51 (1.17 to 1.94)	1.46 (1.14 to 1.88)	1.35 (1.05 to 1.73)	1.54 (1.20 to 1.98)	1.33 (1.04 to 1.71)	1.06 (0.82 to 1.37)
Efficacy of quit attempt in next 6 months **(ref = likely to quit)**							
Likely to make unsuccessful attempt	1.01 (0.72 to 1.40)	1.43 (1.00 to 2.06)	0.97 (0.69 to 1.37)	0.92 (0.65 to 1.29)	1.46 (1.02 to 2.08)	1.10 (0.78 to 1.55)	1.43 (1.00 to 2.04)
Unlikely to make attempt	0.58 (0.44 to 0.75)	0.74 (0.55 to 0.99)	0.59 (0.45 to 0.78)	0.51 (0.38 to 0.67)	0.76 (0.57 to 1.01)	0.55 (0.41 to 0.73)	0.56 (0.42 to 0.74)

[1] Blank cells indicate no significant relationship in bivariate analysis; [2] Odds ratios for reference categories are always 1.

Table 4: Perceptions of cigarette design (harm, appeal, trial)

	Standard cigarette (SC) %[1]	Cigarette with warning (WC) %[1]	Green Cigarette (GC) %[1]
Harmful to health	38.8	69.1*	70.2*
Think of dangers	20.9	58.1*#	53.5*
Unattractive	25.2	61.7*	68.7*
Unstylish	37.4	66.0*	69.4*
Not nice to be seen with	19.8	55.2*	60.2*
Not appealing to people my age	17.8	51.5*	57.4*
Unlikely to try (personally)	8.9	45.4*	66.5*
Unlikely to try (for never smokers)	14.8	63.3*	71.6*

[1] Percentages shown indicate participants choosing one of the three points nearest the undesirable anchor on a seven-point semantic scale.

* Significant difference in comparison to the standard cigarette ($p<0.001$)

Significant difference in comparison to the green cigarette ($p<0.05$)

Table 5: Multilevel and multivariable modelling of perceiving cigarettes as undesirable (n=5298 cigarette evaluations, u=1766 participants)

		Multivariable model	*Multivariable model + cigarette*SES interaction*
		Odds ratio (95%CI)	***Odds ratio (95%CI)***
	cons	0.05 (0.04 to 0.07)	0.04 (0.03 to 0.06)
Cigarette type **(ref = standard cigarette[1])**	warning on cigarette	17.71 (13.75 to 22.80)	23.29 (16.40 to 33.08)
	green cigarette	30.88 (23.98 to 39.76)	35.41 (24.93 to 50.29)
Gender **(ref = male)**	Female	1.30 (1.10 to 1.54)	1.30 (1.10 to 1.55)
SES **(ref = higher SES)**	low education AND/OR low economic status	1.26 (1.06 to 1.50)	1.89 (1.18 to 3.04)
Ethnicity **(ref = White British)**	White but not British	0.96 (0.72 to 1.30)	0.96 (0.72 to 1.30)
	Black (inc mixed black & white)	0.94 (0.62 to 1.42)	0.94 (0.62 to 1.42)
	Asian (inc mixed Asian & white)	0.79 (0.60 to 1.05)	0.79 (0.60 to 1.05)
	other or not declared	0.90 (0.58 to 1.42)	0.90 (0.57 to 1.42)
Product category **(ref = Factory–made only)**	Factory-made and roll-your-own cigarettes	0.78 (0.65 to 0.90)	0.77 (0.64 to 0.93)
	Factory-made cigarettes and other tobacco products (e.g. cigars, shisha, etc)	0.73 (0.56 to 0.93)	0.72 (0.56 to 0.93)
Efficacy **(ref = likely to quit)**	Not likely to make a quit attempt in next six months	0.62 (0.49 to 0.78)	0.61 (0.49 to 0.78)
	Likely to make unsuccessful attempt	1.05 (0.78 to 1.41)	1.05 (0.78 to 1.41)
Interaction Cigarette type * SES **(ref = SC*higher SES)**	WC*low SES		0.52 (0.31 to 0.87)
	GC*low SES		0.76 (0.46 to 1.26)
	Variation between participants (U(std err))	*1.14(0.11)*	*1.14(0.11)*

Models varying reference category of cross classified variable[1]

Reference Category: ***Cigarette type & SES***	***SC not low SES***	***SC low SES***	***WC not low SES***	***WC low SES***	***GC not low SES***
SC: not low SES	1	0.53 (0.33 to 0.85)	0.04 (0.03 to 0.06)	0.04 (0.03 to 0.06)	0.03 (0.02 to 0.04)
SC: low SES	1.89 (1.18 to 3.03)	1	0.08 (0.06 to 0.12)	0.08 (0.06 to 0.12)	0.05 (0.04 to 0.08)
WC: not low SES	23.13 (16.28 to 32.85)	12.21 (8.48 to 17.58)	1	1.01 (0.80 to 1.28)	0.66 (0.55 to 0.79)
WC: low SES	22.83 (15.58 to 33.46)	12.05 (8.37 to 17.35)	0.99 (0.78 to 1.25)	1	0.65 (0.52 to 0.82)
GC: not low SES	35.09 (24.71 to 49.84)	18.52 (12.86 to 26.67)	1.52 (1.27 to 1.81)	1.54 (1.22 to 1.94)	1
GC: low SES	50.15 (34.29 to 73.35)	26.47 (18.35 to 38.19)	2.17 (1.72 to 2.74)	2.20 (1.74 to 2.77)	1.43 (1.13 to 1.80)

[1]Variables included are those in the above models with the exception that cigarette type and SES are replaced with the cross classified variable

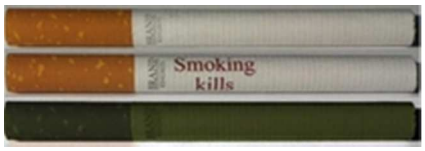

Figure 1: Standard cigarette, warning cigarette and green cigarette

17x5mm (300 x 300 DPI)

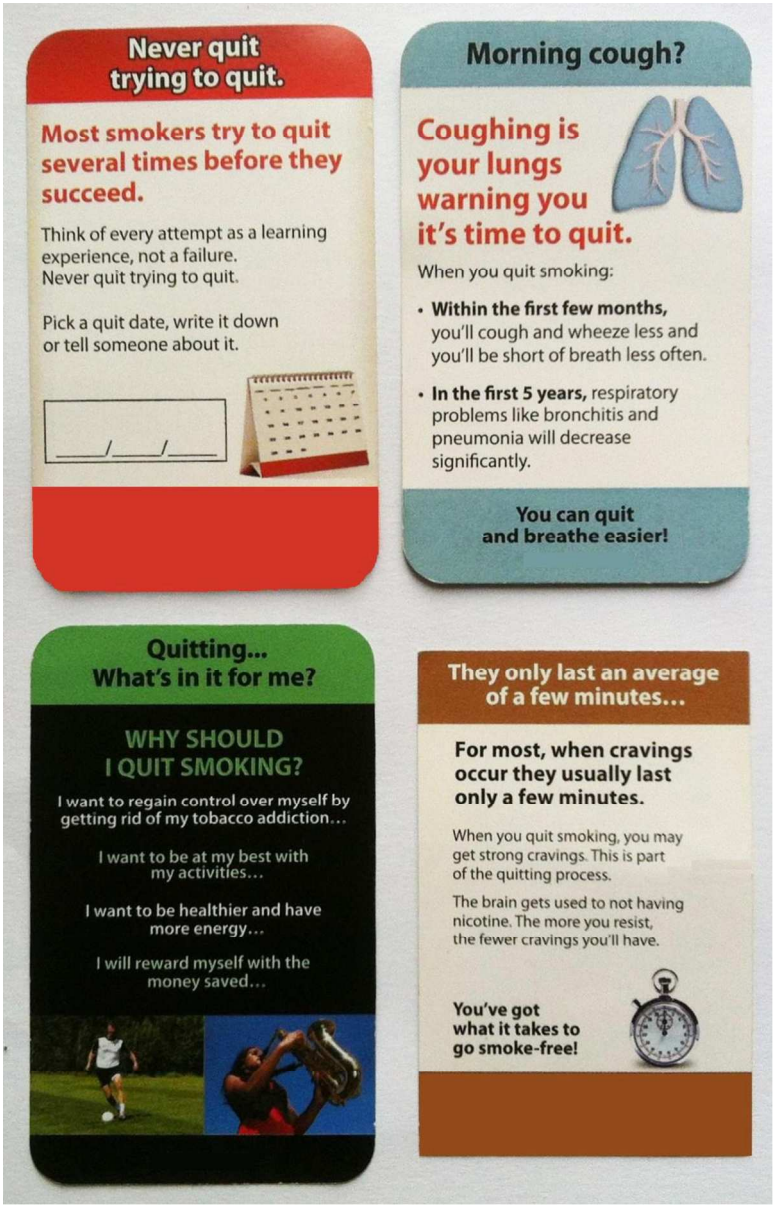

Figure 2: Pack inserts highlighting the benefits of quitting or providing tips on how to do so

142x222mm (300 x 300 DPI)

STROBE 2007 (v4) checklist of items to be included in reports of observational studies in epidemiology*
Checklist for cohort, case-control, and cross-sectional studies (combined)

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	2
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2-3
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4-5
Objectives	3	State specific objectives, including any pre-specified hypotheses	6
Methods			
Study design	4	Present key elements of study design early in the paper	6
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	6
Participants	6	*Cross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants	6,7
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	8-12
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	9-12
Bias	9	Describe any efforts to address potential sources of bias	6
Study size	10	Explain how the study size was arrived at	6
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	10-13
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	12-13
		(*b*) Describe any methods used to examine subgroups and interactions	12-13
		(*c*) Explain how missing data were addressed	7
		(*d*) *Cross-sectional study*—If applicable, describe analytical methods taking account of sampling strategy	NA
		(*e*) Describe any sensitivity analyses	NA
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	6
		(b) Give reasons for non-participation at each stage	6
		(c) Consider use of a flow diagram	NA
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	27-28
		(b) Indicate number of participants with missing data for each variable of interest	7
Outcome data	15*	*Cross-sectional study*—Report numbers of outcome events or summary measures	13-17
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	13-17
		(*b*) Report category boundaries when continuous variables were	30,32

		categorized	
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	NA
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	12-13,29,31
Discussion			
Key results	18	Summarise key results with reference to study objectives	17-20
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	20
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	20
Generalisability	21	Discuss the generalisability (external validity) of the study results	17-20
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	21

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.