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The Impact of Cigarette Packaging Design Among Young Females in Canada: Findings From a Discrete Choice Experiment

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Abstract

Introduction: The tobacco industry uses various aspects of cigarette packaging design to market to specific groups. The current study examined the relative importance of five cigarette packaging attributes—pack structure (eg, "slims"), brand, branding, warning label size, and price—on perceptions of product taste, harm, and interest in trying, among young females in Canada.

Methods: A discrete choice experiment was conducted with smoking and nonsmoking females, aged 16 to 24 ($N = 448$). Respondents were shown 10 choice sets, each containing four packs with different combinations of the attributes: pack structure (slim, lipstick, booklet, traditional); brand ("Vogue," "du Maurier"); branding (branded, plain); warning label size (50%, 75%); and price ($8.45, $10.45). For each choice set, respondents chose the brand that they: (1) would rather try, (2) would taste better, and (3) would be less harmful, or "none." For each outcome, the attributes' impact on consumer choice was analyzed using a multinomial logit model.

Results: The multinomial logit analyses revealed that young females weighted pack structure to be most important to their intention to try (46%), judgment of product taste (52%), and judgment of product harm (48%). Price and branding were weighted important in trial intent decisions (23% and 18%, respectively) and product taste judgments (29% and 15%, respectively). Whereas warning label size and brand were weighted important when judging product harm (23% and 17%, respectively).

Conclusion: The findings suggest that standardized cigarette packaging may decrease demand and reduce misleading perceptions about product harm among young females.

Introduction

Globally, young females represent a growing market of tobacco users.[1] Restrictions on tobacco marketing are a central component of tobacco control policy. In countries with comprehensive restrictions on traditional forms of advertising, tobacco packaging is among the most prominent forms of marketing.[2] In fact, industry documents reveal growing investments in cigarette packaging, including pack shapes and sizes that are targeted to women.[3,4]

Accordingly, the World Health Organization Framework Convention on Tobacco Control recommends that countries restrict

promotional elements on packs through the implementation of "plain" or "standardized" packaging, in combination with large pictorial health warnings.[5] Australia became the first country to implement standardized packaging in December 2012[6]; more recently, standardized packaging proposals have been passed by Ireland[7] and the United Kingdom,[8] and announced by governments in France,[9] and New Zealand.[10] The Australian regulations prohibit brand imagery and logos on packs, set parameters for pack shape and size, and include warnings that cover 75% of the front and 90% of the back panel.

Research examining the influence of cigarette packaging on the behavior and perceptions of females is limited.[11–15] Evidence suggests that branding on cigarette packaging, particularly female-oriented branding, appeals to young women.[11–14] Further, young adults' associate image attributes (eg, feminine) with brand-specific branding.[16,17] Among young people, ratings of attractiveness and positive characteristics decrease as colors, branded fonts, and brand imagery are removed from cigarette packs.[12–15,18–23] In addition, elements of branding can influence product perceptions, for example, young people associate lighter pack colors with better taste and reduced harm.[12,21]

Limited evidence details the impact of cigarette pack shape, size, and openings among young consumers. Young females have described slim and lipstick sizes as more attractive and less harmful.[24,25] Similarly, youth have appraised lipstick and novelty-opening packs more positively compared to a flip-top box.[22,26] Further, young people were more likely to rate packs with novel edges or openings as more attractive and of higher quality compared to a traditional flip-top pack.[27]

Other research has shown that health warnings interact with pack branding to influence product appeal and behavioral intentions. For example, packs with large pictorial warnings were perceived as less attractive and associated with less demand in experimental research.[28,29]

Several methods have been used to understand the influence of cigarette packaging on consumer demand. Pack selection tasks have demonstrated that females were significantly more likely to choose branded packs to be mailed to their household compared to non-branded "plain" packs.[12,13,14] Similarly, the results from an auction experiment showed that young adults were less likely to bid for cigarettes contained in "plain" packages.[29] In addition, demand for cigarette products is influenced by differences in cigarette prices[30]; notably, young female smokers have expressed that they would switch to cheaper brands if pack appearance was standardized.[31] However, few studies have tested several packaging elements simultaneously for the purpose of understanding how standardized packaging regulations, in combination with health warnings and price, would impact consumer preferences for tobacco products. This limitation has been highlighted by the tobacco industry.[32]

Considering the growing number of innovations in pack design, including "slim" and super-slim "lipstick" packs that are primarily targeted towards females, understanding the ways in which young women perceive variations in pack structure, in relation to other packaging elements, warrants further research. The current study used a discrete choice experiment to examine the trade-offs that young women make between cigarette packaging features when judging product characteristics related to taste and harm, and when making decisions to try cigarette products. Discrete choice studies are commonly used to predict consumer demand for products.[33] Specifically, the current study examined the relative importance that young women place on cigarette packaging structure, brand, branding, warning label size, and price when deciding whether or not to try a cigarette product, and when judging product taste and harm. The study also examined the extent to which young women's intentions to try and perceptions of product taste and harm are moderated by smoking status and age.

Methods

Discrete Choice Theory
Discrete choice methodology is based on Random Utility Theory which explains that consumers make trade-offs when engaging in decisions, and will choose alternatives that offer the greatest value, or utility.[34] Utility is determined by how much importance one places on the characteristics associated with a product.[34] Discrete choice differentiates from other stated preference methods in the way that responses are elicited.[35] In a discrete choice study, participants are presented with a series of choice sets, and are asked to choose between hypothetical products, referred to as profiles. The results model which attributes and attribute-levels are least and most important to respondents, thus predicting the trade-offs that consumers make. Unlike revealed preference methods, discrete choice does not measure actual behavior.[36] However, discrete choice enables modeling of decision making processes for products that do not yet exist on the real market.

Selection of Attributes and Attribute-Levels
For the current study, cigarette packaging features and price are referred to as attributes, and the options corresponding to a packaging feature are referred to as attribute-levels. The literature and market practice informed the selection of relevant pack attributes and attribute-levels for inclusion in this study. The final selection of attribute-levels was confirmed through a qualitative interviewing technique conducted with seven smoking and nonsmoking females (mean age = 22 years), in which images of several structural designs and brands were shown, and participants were asked to rank the images from "most appealing" to "least appealing," as well as explain their choices. The top three structural designs (not including traditional) and top two brands that were ranked "most appealing" were chosen as attribute-levels.

Structural Packaging Design (Four Attribute-Levels)
The traditional design (height = 85 mm, width = 55 mm, depth = 20 mm) adhered to the minimum pack dimensions required in Australia, and consisted of rectangular surfaces and a flip-top lid.[37] The slim design (height = 100 mm, width = 55 mm, depth = 10 mm), and lipstick design (height = 100 mm, width = 30 mm, depth = 20 mm) represented female-oriented pack sizes. The booklet design (height = 85 mm, width = 55 mm, depth = 20 mm) represented a novel opening-style. At the time of this study, traditional, slim and lipstick designs were currently available on the Canadian market, whereas the booklet design was available in 2006 as a limited edition pack.

Cigarette Brand (Two Attribute-Levels)
Vogue, a female-oriented brand, and du Maurier, a gender-neutral brand, represented premium cigarette brands sold in Canada, with leading market shares in 2012. Discount brands were not included to avoid potential confounding in model estimation,[38] since individuals

may infer product quality from both price and brand type (ie, premium and discount).[39]

Branding (Two Attribute-Levels)

The plain (nonbranded) level was designed in accordance with Australian plain packaging requirements: the pack surface color was displayed in Pantone 448C (drab dark brown), brand name and variant was displayed in Lucinda Sans font, and capitalization and font size requirements were followed.[37] The branded level included existing brand images, logos, and colors associated with the cigarette brand.

Pictorial Warning Label Size (Two Attribute-Levels)

A constant pictorial warning label was used covering 50% and 75% of the pack display area, both sizes commonly implemented across countries. The 50% label corresponded to the Framework Convention on Tobacco Control's minimum recommended labeling size for cigarette packages.[5] At the time of the study, Canadian packs displayed pictorial warnings covering 75% of the principal display area.[40]

Price (Two Attribute-Levels)

To ensure that price differences were salient and reflective of the market, a lower price, $8.45, and a higher price, $10.45, was chosen based on the cost of "discount" and "premium" cigarettes sold in Canada, as of December 2012.

Experimental Design

A generic fractional factorial design was constructed using SAS version 9.3, with two estimable interactions: (1) branding × warning label size, and (2) branding × brand name. The number of estimable interactions is dictated by the number of choice sets in the design[41]; preliminary research highlighted the potential importance of the included interactions.[42] The experimental design included 10 choice sets; each choice set contained four pack profiles, and the alternative "none." The choice sets were presented as 2-D images. Pack profiles were generated by combining different levels of each attribute. A subset of 37 pack profiles were selected and arranged

into 10 orthogonal and balanced choice sets.[41] Design efficiency, a statistical measure of balance and orthogonality, was estimated to be 99%, indicating that the parameters could be estimated with maximum precision.[41] An example of one of the 10 choice sets is shown in Figure 1.

To mitigate the potential that 2-D images could underestimate the effect of different shapes and sizes, one additional balanced and orthogonal choice set was created and marked as a holdout. Each holdout profile was presented to respondents as a video, which offered a means to illustrate the structural differences between packs in a 3-D format, including package depth and opening-style. On a following screen, the holdout was presented as 2-D images and evaluated by subjects, however, responses did not contribute to utility computations. The full discrete choice design, including holdout, is located in Supplementary File 1.

Participants and Recruitment

The study was conducted online with smoking and nonsmoking females, 16 to 24 years of age, from Canada. Participants were recruited from Global Market Insite, Inc., a commercial market research service (www.gmi-mr.com), offering a Canadian panel consisting of 219 000 participants.[43] The sample included smokers and nonsmokers because within this age category there is reasonable uptake in smoking behaviors.[44] During November 2013, females belonging to the target age group were sent an email invitation to participate in an online survey. After providing consent and completing the survey, participants were remunerated from Global Market Insite, Inc. in accordance with their usual rate. This study was approved by the Office of Research Ethics at the University of Waterloo, Canada.

Protocol

After respondents accessed the survey link, screening questions were used to assess age, gender, and the type of device respondents were using to complete the survey. The survey was programmed to only operate on browsers that were at least 550 pixels wide and 900 pixels long (ie, larger than a smart-phone device) to ensure that pack images did not appear too small on the screen. If respondents were

$8.45 $8.45 $10.45 $10.45

None of the above

Images photographed by K. Kotnowski, 2013.

Figure 1. An example of one choice set.

using a tablet device, the survey was programmed to only operate when in landscape orientation.

Discrete Choice Experimental Procedure

Respondents were presented with the holdout choice set, and were required to click and watch each of the four videos before proceeding with the survey. Each video was between 25 to 28 seconds long, and consisted of two 360 degree rotations: one rotation with the pack closed, and one rotation with the pack opened. After watching the videos, respondents were informed that they would be asked three questions for each set of products. The 2-D version of the holdout choice set was presented first. The 10 experimental choice sets that followed were shown in a randomized order across participants. As well, the presentation of pack images within each choice set was randomized. For each choice set, respondents chose the brand that they: (1) would rather try, (2) would taste better, (3) would be less harmful, or "none."

Measures

Outcome Measures

The outcome measures were pilot tested through cognitive interviews to ensure question wording was relevant to smokers and nonsmokers and perceived in similar ways.[45]

For each of the ten choice sets, respondents were asked to answer: "Which one of these brands would you rather try?" Purchase intentions are suggested to be associated to actual purchasing when measured as trial rates.[46] Taste related perceptions were measured by asking respondents: "Which one of these brands do you think would taste better?" Health related perceptions were measured by asking respondents: "Which one of these brands do you think would be less harmful?" Measures for perceptions of taste and harm were adapted from previous packaging research.[12,13]

Sociodemographic Variables

Demographic variables included age, education, ethnicity, occupation, and smoking status. Participants specified their age in years. Education, ethnicity, and smoking status were assessed using validated measures.[47] Education was categorized as "low" (completed high school or less), "moderate" (technical/trade school, community college, or some university), and "high" (university or post graduate degree). Ethnicity was categorized as "white" and "other". Occupation was assessed by indicating "main" work status over the past 12 months (employed full-time or part-time, attending school full-time or part-time, unemployed or home-maker). To assess smoking status, respondents were asked: "In the last 30 days, how often did you smoke cigarettes?" Respondents were defined as smokers if they reported smoking "every day," "at least once a week," or "at least once in the last 30 days." Nonsmokers were defined as respondents who reported smoking "not at all."

Analysis

Model Specification

All analyses were conducted using SAS version 9.3. Multinomial logit models were used to analyze the effect of each attribute on: (1) intentions to try, (2) perceptions of product taste, and (3) perceptions of product harm. Responses were analyzed based on Random Utility Theory.[48] For this study, the utility function was specified as:

$$
\begin{aligned}
U = &(\beta \text{pack structure} * X_i \text{ pack structure}) \\
&+ (\beta \text{brand} * X_i \text{ brand}) \\
&+ (\beta \text{branding} * X_i \text{ branding}) \\
&+ (\beta \text{warning label size} * X_i \text{ warning label size}) \\
&+ (\beta \text{price} * X_i \text{ price}) + \varepsilon
\end{aligned}
$$

where U is the overall utility that an individual derives from each package, the β coefficient attached to X_i is estimated by the multinomial logit model, and represents the part-worth utility attached to each attribute-level, and ε represents the unmeasured random error component of the model.

Fitting the Multinomial Logit Model

Attribute-level importance was modeled by the main effects multinomial logit models and estimated using "binary" coding. The multinomial logit models were extended to estimate two attribute interactions.

The estimated parameter coefficients from the main effects model, and re-specified using "effects" coding, were used in subsequent analyses to assess attribute importance. Attribute importance was expressed as a percentage and calculated by comparing ranges of attribute-level coefficient values, that is, the difference between an attribute's highest and lowest parameter coefficient values. The relative importance weight of each attribute was calculated with respect to the sum of utility ranges.

To account for the moderating effect of smoking status and age, adjusted multinomial logit models were constructed using "effects" coding by interacting smoking status and age with each attribute. Smoking status was modeled as a categorical variable (smoker, nonsmoker), and age was modeled as a continuous variable.

Results

Sample Characteristics

Table 1 shows the sociodemographic characteristics for the sample. The sample included 448 smoking and nonsmoking females of which 45% were between 16 to 19 years old, and 55% were between 20 to 24 years old.

Attribute-Level Importance

Table 2 presents the results from the multinomial logit model for each outcome.

Intentions to Try

Participants chose one of the presented four packs in 63% of choice sets, whereas "none" was selected in 37% of choice sets. Positive and larger coefficient values indicate greater preference for that attribute level when making the decision to try. Females had significantly greater preference to try the "lipstick" and "booklet" design compared with the "traditional" design. Significant moderating effects were found between age and pack structure in that younger females preferred to try slim packs (β = –0.03, *P* = .03) and older females preferred to try booklet packs (β = 0.03, *P* = .02). As well, females significantly preferred to try branded versus plain packs, and lower priced versus higher priced packs. Warning label size and brand name was not found to be a significant influence on intentions to try. The interaction between branding and brand was significant in that females preferred to try branded Vogue packs (β = 0.68, *P* < .01) and

Table 1. Sample Characteristics (*n* = 448)

Demographic characteristic	Frequency, % (*n*)
Age, years	
Mean (*SD*)	20.3 (*SD* = 2.3)
16–19	45.3 (203)
20–24	54.7 (245)
Education level	
Low	45.3 (203)
Moderate	41.3 (185)
High	13.2 (59)
Not stated	0.2 (1)
Main work status	
Employed full-time or part-time	37.7 (169)
Attending school, full time or part-time	49.1 (220)
Unemployed or homemaker	12.1 (54)
Not stated	1.1 (5)
Race	
White	70.3 (315)
Other	26.1 (117)
Not stated	3.6 (16)
Smoking status	
Smoker	48.7 (218)
Nonsmoker	51.3 (230)
Smoking frequency[a]	
Daily	52.7 (115)
Weekly	30.3 (66)
Monthly	17.0 (37)
Cigarettes per day[a]	
Mean	8.0 (*SD* = 6.8; range = 1–40)
Quit intentions[a]	
Within the next month	21.1 (46)
Within the next 6 months	21.1 (46)
Sometime in the future	36.6 (80)
Not planning to quit	10.6 (23)
Not stated	10.6 (23)

[a]Among current smokers only.

plain du Maurier packs (β = 0.68, *P* < .01). The interaction between brand and warning labels size was not significant.

Perceptions of Product Taste
When judging product taste, participants chose a pack in 60% of cases, and chose "none" in 40% of cases. Among pack structures, the lipstick design was perceived as significantly "better tasting". As well, branded packs were attributed with significantly better taste than plain packs, and cheaper packs were judged as significantly better tasting than expensive packs. The interaction between brand name and branding was significant in that females believed branded Vogue packs (β = 0.84, *P* < .01) and plain du Maurier packs (β = 0.84, *P* < .01) would be better tasting. Warning label size, brand name, smoking status, age, and the interaction between branding and warning label size did not significantly influence taste related perceptions.

Perceptions of Product Harm
When judging product harm, participants chose a pack in 45% of cases, and chose "none" in 55% of cases. Positive parameter coefficients indicate that women attributed that attribute level with reduced harm. Lipstick, slim and booklet designs were perceived as significantly less harmful compared with the traditional pack design. Packs with smaller warnings were attributed with significantly

less harm compared to packs with larger warnings. Specifically, nonsmokers believed more strongly than smokers that packs with smaller warning labels would be less harmful (β = 0.05, *P* = .03). In addition, the du Maurier brand was perceived as significantly less harmful compared with Vogue. Branding and price did not significantly influence harm-related perceptions. The interactions between brand and branding and branding and warning label size were not significant.

Attribute Importance

Table 3 shows the relative importance of pack attributes on each outcome. Attribute importance indicates the relative weight that women placed on an independent pack attribute when deciding whether they would try a cigarette product and when judging product taste and harm. An attribute has greater importance, or weight, on an outcome when its attribute-levels are associated with a strong positive or negative impact on utility.

Intentions to Try
Overall, pack structure was the most influential factor to motivate trial intent among females, accounting for 46% of the decision to try. Price (23%) and branding (18%) were the next most influential factors to motivate trial intent among females. Brand and warning label size were not found to be significant predictors of trial intent.

Perceptions of Product Taste
Pack structure contributed strongly to taste related perceptions, accounting for half (52%) of the judgment on product taste. To a lesser extent, taste perceptions were also driven by price (29%), and branding (15%). Warning label size and brand name did not significantly impact perceptions of product taste.

Perceptions of Product Harm
Pack structure was the strongest contributor to harm related perceptions, accounting for 48% of the judgment on product harm. In addition, warning label size (23%) and brand name (17%) moderately influenced judgments of product harm. Branding and price were not significant predictors of harm related perceptions.

Discussion

To our knowledge, this is the first study to apply discrete choice methods to examine demand for cigarette packaging, and moreover, the first study to examine how young women value "slim" and "lipstick" designs relative to other packaging features. The findings suggest that young females make tradeoffs between cigarette packaging attributes when deciding to try a cigarette product, and when judging the product's taste and harm.

The current study illustrates that young females have reduced demand for cigarette packaging features that are typically associated with standardized packaging. Females revealed significantly greater preferences to try "lipstick" sized, "booklet" opening, branded and cheaper packs compared with higher priced, "traditional," and nonbranded pack features, which are reflective of standardized packaging. Pack structural preferences were significantly moderated by age, in that younger females had greater preferences to try the "slim" size, whereas older females preferred to try the "booklet" opening, suggesting that certain structural designs may be more salient among specific demographic groups. Cigarette trial is an important

Table 2. Estimated Parameters of the Multinomial Logit Models Predicting Intentions to Try, Perceptions of Product Taste, and Perceptions of Product Harm

	Which one of these brands would you rather try?		Which one of these brands do you think would taste better?		Which one of these brands do you think would be less harmful?	
	Coeff.	SE	Coeff.	SE	Coeff.	SE
Pack structure						
Traditional (ref) vs. Lipstick	0.33**	0.05	0.41**	0.05	0.46**	0.06
Traditional (ref) vs. Slim	−0.02	0.06	−0.14*	0.06	0.20**	0.07
Traditional (ref) vs. Booklet	0.12*	0.06	0.08	0.06	0.18**	0.07
Booklet (ref) vs. Lipstick	0.21**	0.05	0.32**	0.05	0.28**	0.06
Booklet (ref) vs. Slim	−0.14*	0.06	−0.22**	0.06	0.02	0.07
Slim (ref) vs. Lipstick	0.35**	0.05	0.54**	0.06	0.26**	0.06
Branding						
Plain (ref) vs. Branded	0.15**	0.04	0.17**	0.04	−0.07	0.05
Warning label size						
75% (ref) vs. 50%	−0.04	0.04	0.01	0.04	0.22**	0.05
Brand						
du Maurier (ref) vs. Vogue	0.05	0.04	−0.04	0.04	−0.17**	0.04
Price						
$8.45 (ref) vs. $10.45	−0.19**	0.04	−0.29**	0.04	0.06	0.05
Attribute interactions						
Vogue × Branded	0.68**	0.08	0.84**	0.08	0.13	0.09
Vogue × Plain	−0.68**	0.08	−0.84**	0.08	−0.13	0.09
du Maurier × Branded	−0.68**	0.08	−0.84**	0.08	−0.13	0.09
du Maurier × Plain	0.68**	0.08	0.84**	0.08	0.13	0.09
Branded × 50%	0.10	0.08	0.16	0.08	0.02	0.09
Plain × 50%	−0.10	0.08	−0.16	0.08	−0.02	0.09
Branded × 75%	−0.10	0.08	−0.16	0.08	−0.02	0.09
Plain × 75%	0.10	0.08	0.16	0.08	0.02	0.09

SE = standard error. The parameter estimate represents the contribution of that attribute level to the final model. Parameter estimates reflect binary coding of attribute levels.
*Significant at the $P < .05$ level; **Significant at the $P < .01$ level.

Table 3. Attribute Relative Importance Weights Predicting Intentions to Try, Perceptions of Product Taste, and Perceptions of Product Harm

	Which one of these brands would you rather try?			Which one of these brands do you think would taste better?			Which one of these brands do you think would be less harmful?		
	Coeff.	Range	Relative attribute importance (%)	Coeff.	Range	Relative attribute importance (%)	Coeff.	Range	Relative attribute importance (%)
Pack structure		0.35	**46**		0.55	**52**		0.46	**48**
Lipstick	0.22**			0.32**			0.25**		
Slim	−0.13**			−0.23**			−0.01		
Booklet	0.01			−0.01			−0.03		
Traditional	0.11**			−0.09*			−0.21**		
Branding		0.14	**18**		0.16	**15**		0.06	**6**
Branded	0.07**			0.08**			−0.03		
Plain	−0.07**			−0.08**			0.03		
Warning label size		0.04	**5**		0.00	**0**		0.22	**23**
50%	−0.02			0.00			0.11**		
75%	0.02			0.00			−0.11**		
Brand		0.06	**8**		0.04	**4**		0.16	**17**
Vogue	0.03			−0.02			−0.08**		
du Maurier	−0.03			0.02			0.08**		
Price		0.18	**23**		0.30	**29**		0.06	**6**
$8.45	0.09**			0.15**			−0.03		
$10.45	−0.09**			−0.15**			0.03		

Bold values represent the range of utility values within each attribute.
Parameter estimate values reflect effects coding of attribute levels. When effects coding is used, the data is analyzed in relation to the grand mean, as opposed to in relation to a coded reference level. With effects coding, the estimated part-worth utility indicates the overall effect of that level.
*Significant at the $P < .05$ level; **Significant at the $P < .01$ level.

outcome given that most young people try cigarettes prior to purchasing, and commonly obtain cigarettes from social versus commercial sources.[49,50]

The findings are consistent with previous evidence that young females associated "lipstick" and "branded" packs with positive image characteristics, as well as with greater appeal.[12,13,24,28] Findings on the importance of price are consistent with research demonstrating reductions in demand in response to price increases.[51] The findings also add to research suggesting that young female smokers would trade-down to cheaper brands in response to standardized packaging.[31] Within the context of the current study, warning label size did not significantly impact trial decisions. It should be noted that the current study used a less graphic pictorial warning image. Previous research has shown that more graphic pictorial warnings, such as those depicting lung disease and cancer, evoke stronger motivation to quit among young people.[52] The potential effect of labeling size should be further tested in future discrete choice studies by including a range of pictorial warning images.

The findings illustrate that differences in packaging features can effectively dictate perceptions of product taste among females. Overall, expectations of "better taste" were reduced for plain packages, findings that are consistent with other research.[12,13] The findings add to research suggesting that young people perceive alternative packaging shapes as "higher quality,"[27] and plain packages as "lower quality."[53] The findings are relevant to packaging regulations given that perceptions of taste are closely associated with perceptions of risk among smokers.[54]

Warning label size was not found to significantly influence taste related perceptions. This finding is surprising since prior research has demonstrated that larger pictorial warnings reduced positive taste characteristics.[55] It is possible that the warning label tested in the current study was not salient enough or the difference between the two tested sizes was not prominent enough to evoke taste utility, and can be explored further in future studies.

In 45% of cases, young women incorrectly reported that some of the cigarette brands were less harmful than others, based on differences in packaging features. Above all, pack structure was the most influential driver of false beliefs among females. Notably, females expected that "lipstick," "slim," and "booklet" designs contained a less harmful product compared to "traditional" packs. The findings are consistent with research in which young people described smaller shaped packs as less harmful.[24,25] The findings underscore the importance of warning label size and harm related perceptions among females. Labeling size was found to be a significant predictor of health risk in that larger warnings were attributed with greater harm compared to smaller warnings; findings that align with previous research.[28] Harm-related perceptions may be exacerbated by the pack structure, given that narrow lipstick sizes, which were perceived as less harmful, also displayed smaller warnings relative to the proportion of the display area on traditional packs. The findings also demonstrate that relative to brand, branding and price, females attach greater weight to warning label size when considering health risk. The findings suggest that standardizing the physical structure of cigarette packaging and increasing warning label size would be effective at reducing false beliefs about the relative risk of cigarette brands.

Surprisingly, branding did not significantly contribute to health-related perceptions among females; whereas other packaging research has demonstrated that the removal of branding increases perceptions of risk.[12,13] In addition, the female-oriented Vogue brand was perceived as significantly more harmful than the gender-neutral du Maurier brand, which is inconsistent with previous findings.[12]

One interpretation that can be drawn is that differences in branding and brand name were less salient among females relative to the impact of pack structure and warning label size, which combined, accounted for 71% of harm expectations. However, these interpretations should be explored further by testing further iterations of brands and branding.

Notably, results of interaction effects on trial-intent and taste suggested that females perceived utility from certain combinations of attribute levels (ie, Vogue-branded and du Maurier-plain). To fully understand the effects of pack-attribute interactions, future research should explore additional attribute-interactions, such as with pack structure, given its high utility observed in this study.

Strengths and Limitations

The study had a number of strengths and limitations. First, the study sample was not representative of the larger population of females in Canada, as participants were not selected using probability sampling. Nevertheless, a diverse sample suitable for discrete choice experiments was included. Second, the proportion of "none" responses suggest that some individuals did not derive utility from the pack attributes studied. Not all attributes or attribute-levels that may potentially influence packaging-related decisions among consumers were tested (eg, alternative brands), which may have resulted in "none" responses by individuals that derive utility from packaging based on other types of attributes. Nonetheless, efforts were made to include attributes and attribute-levels that were most relevant among women using evidence from the literature. Third, since packages were shown as 2-D images to respondents, differences between packaging structures may have been less salient, particularly between the slim and traditional design, which could have caused an underestimation of part-worth utilities. However, efforts were made to convey pack structures to the highest degree possible by including video clips that demonstrated the different package types. Fourth, the sample size was insufficient to enable testing of certain demographic stratifications, such as effects of smoking frequency; potential demographic effects should be explored in future studies. Finally, the discrete choice experiment measured behavioral intentions and not actual behavior. Nonetheless, behavioral intentions are consistently found to be a strong predictor of future behavior.[56,57]

The findings from the current study are an important addition to the evidence base on packaging. The discrete choice methodology included several unique design elements, such as the use of orthogonal and balanced choice-sets, and the presentation of packages in a comparative fashion as opposed to "one-at-a-time". It is noteworthy that the results of the current discrete choice study are consistent with results from previous packaging research that examined behavioral intentions and perceptions through methods such as focus groups, rating scales, and experimental bidding.[12,24,58] Cross validation of findings across study designs is an important strength of the research.

Conclusions

The findings of the current discrete choice study can inform cigarette packaging regulations. Under the World Health Organization Framework Convention on Tobacco Control, countries are obligated to eliminate misleading information on packaging. The findings indicated that females incorrectly associate super-slim "lipstick" and "slim" pack sizes with less harm. The findings also suggest that standardized packaging is needed to reduce false beliefs among females about the relative risk of different types of cigarettes. Features of

standardized packs, including removal of branding and fixed pack shape, were also associated with lower levels of demand. This finding is consistent with studies conducted in Australia following the implementation of plain packaging suggesting that plain packaging may have prompted an increase in quitting among smokers and contributed to historical declines in youth smoking.[59,60]

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Supplementary Material

Supplementary File 1 can be found online at http://www.ntr.oxford-journals.org.

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Declaration of Interests

None declared.

References

1. Ng M, Freeman MK, Fleming TD, et al. Smoking prevalence and cigarette consumption in 187 countries, 1980–2012. *JAMA*. 2014;311(2):183–192. doi:10.1001/jama.2013.384692.

2. Hammond D. Health warning messages on tobacco products: a review. *Tob Control*. 2011;20(5):327–337. doi:10.1136/tc.2010.037630.

3. Kotnowski K, Hammond D. The impact of cigarette pack shape, size and opening: evidence from tobacco company documents. *Addiction*. 2013;108(9):1658–1668. doi:10.1111/add.12183.

4. Wakefield M, Morley C, Horan J, Cummings K. The cigarette pack as image: new evidence from tobacco industry documents. *Tob Control*. 2002;11:173–180. doi:10.1136/tc.suppl_1.i73.

5. World Health Organization. WHO Framework Convention on Tobacco Control: guidelines for implementation Article 5.3; Article 8; Article 11; Article 13. 2009. http://whqlibdoc.who.int/publications/2009/9789241598224_eng.pdf. Accessed June 1, 2015.

6. Department of Health, Australian Government. Introduction of Tobacco Plain Packaging in Australia. 2013. www.health.gov.au/internet/main/publishing.nsf/Content/tobacco-plain. Accessed June 1, 2015.

7. Houses of the Oireachtas. Public Health (Standardized Packaging of Tobacco) Bill 2014. 2014. www.oireachtas.ie/viewdoc.asp?DocID=26331. Accessed June 1, 2015.

8. Department of Health, United Kingdom Government. Government backs standardized packaging of tobacco. 2015. www.gov.uk/government/news/government-backs-standardised-packaging-of-tobacco. Accessed June 1, 2015.

9. Ministère des Affaires Sociales, de la Santè et des Droits des femmes. Programme national de reduction du tabagisme. 2014. www.sante.gouv.fr/IMG/pdf/250914_-_Dossier_de_Presse_-_PNRT_2_.pdf. Accessed June 1, 2015.

10. Select Committee of the New Zealand House of Representatives. Smoke-free Environments (Tobacco Plain Packaging) Amendment Bill. Secondary Smoke-free Environments (Tobacco Plain Packaging) Amendment Bill. 2014. 2014. www.parliament.nz/en-nz/pb/legislation/bills/00DBHOH_BILL12969_1/smoke-free-environments-tobacco-plain-packaging-amendment. Accessed June 1, 2015.

11. Doxey J, Hammond D. Deadly in pink: the impact of cigarette packaging among young women. *Tob Control*. 2011;20(5):353–360. doi:10.1136/tc.2010.038315.

12. Hammond D, Doxey J, Daniel S, Bansal-Travers M. Impact of female-oriented cigarette packaging in the United States. *Nicotine Tob Res*. 2011;13(7): 579–588. doi:10.1093/ntr/ntr045.

13. White CM, Hammond D, Thrasher JF, Fong GT. The potential impact of plain packaging of cigarette products among Brazilian young women: an experimental study. *BMC Public Health*. 2012;12:737. doi:10.1186/1471-2458-12-737.

14. Hammond D, Daniel S, White CM. The effect of cigarette branding and plain packaging on female youth in the United Kingdom. *J Adolesc Health*. 2013;52(2):151–157. doi:10.1016/j.jadohealth.2012.06.003.

15. Moodie CS, Mackintosh AM. Young adult women smokers' response to using plain cigarette packaging: a naturalistic approach. *BMJ Open*. 2013;3(3):e002402. doi:10.1136/bmjopen-2012-002402.

16. Gendall P, Hoek J, Edwards R, McCool J. A cross-sectional analysis of how young adults perceive tobacco brands: implications for FCTC signatories. *BMC Public Health*. 2012;12(1):796. doi:10.1186/1471-2458-12-796.

17. Gendall P, Hoek J, Thomson G, et al. Young adults' interpretations of tobacco brands: implications for tobacco control. *Nicotine Tob Res*. 2011;13(10):630–639. doi:10.1177/1049732311431070.

18. Gallopel-Morvan K, Moodie C, Eker F, Beguinot E, Martinet Y. Perceptions of plain packaging among young adult roll-your-own smokers in France: a naturalistic approach. *Tob Control*. 2014;24(e1):e39–e44. doi:10.1136/tobaccocontrol-2013-051513.

19. Germain D, Wakefield MA, Durkin SJ. Adolescents' perceptions of cigarette brand image: does plain packaging make a difference? *J Adolesc Health*. 2010;46(4):385–392. doi:10.1016/j.jadohealth.2009.08.009.

20. Hoek J, Wong C, Gendall P, Louviere J, Cong K. Effects of dissuasive packaging on young adult smokers. *Tob Control*. 2011;20(3):183–188. doi:10.1136/tc.2010.037861.

21. Hammond D, Dockrell M, Arnott D, Lee A, McNeill A. Cigarette pack design and perceptions of risk among UK adults and youth. *Eur J Public Health*. 2009;19(6):631–637. doi:10.1093/eurpub/ckp122.

22. Ford A, Mackintosh AM, Moodie C, Richardson S, Hastings G. Cigarette pack design and adolescent smoking susceptibility: a cross-sectional survey. *BMJ Open*. 2013;3(9):e003282. doi:10.1136/bmjopen-2013-003282.

23. Wakefield MA, Germain D, Durkin SJ. How does increasingly plainer cigarette packaging influence adult smokers' perceptions about brand image? An experimental study. *Tob Control*. 2008;17(6):416–421. doi:10.1136/tc.2008.026732.

24. Ford A, Moodie C, MacKintosh AM, Hastings G. How adolescents perceive cigarette packaging and possible benefits of plain packaging. *Education and Health*. 2013;31(2):83–88. http://hdl.handle.net/1893/16411. Accessed June 1, 2015.

25. Moodie C, Ford A. Young adult smokers' perceptions of cigarette pack innovation, pack colour and plain packaging. *Australasian Marketing Journal*. 2011;19(3):174–80. doi:10.1016/j.ausmj.2011.05.003.

26. Moodie C, Ford A, Mackintosh AM, Hastings G. Young people's perceptions of cigarette packaging and plain packaging: an online survey. *Nicotine Tob Res*. 2012;14(1):98–105. doi:10.1093/ntr/ntr136.

27. Borland R, Sawas S, Sharkie F, Moore K. The impact of structural packaging design on young adult smokers' perceptions of tobacco products. *Tob Control*. 2013;22(2):97–102. doi:10.1136/tobaccocontrol-2011-050078.

28. Hammond D, White C, Anderson W, Arnott D, Dockrell M. The perceptions of UK youth of branded and standardized, 'plain' cigarette packaging. *Eur J Public Health*. 2014;24(4):537–543. doi:10.1093/eurpub/ckt142.

29. Thrasher JF, Rousu MC, Hammond D, Navarro A, Corrigan JR. Estimating the impact of pictorial health warnings and "plain" cigarette packaging: evidence from experimental auctions among adult smokers in the United States. *Health Policy*. 2011;102(1):41–48. doi:10.1016/j.healthpol.2011.06.003.

30. Gallet CA, List JA. Cigarette demand: a meta-analysis of elasticities. *Health Econ*. 2003;12(10):821–835. doi:10.1002/hec.765.

31. Moddie C, Purves R, McKell J, de Andrade M. Young women smokers' perceptions of counterfeit cigarettes: would plain packaging make a difference? *Addict Res Theory*. 2014;22(3):263–270.

32. Devinney TM. Analysis of Consumer Research Evidence on the Impact of Plain Packaging for Tobacco Products (Updated to 2012). Prepared on behalf of Japan Tobacco International. 2012. http://www.smoke-free.ca/plain-packaging/documents/2010/Devinney.pdf. Accessed June 1, 2015.

33. Louviere J, Hensher D, Swait J. *Stated Choice Methods: Analysis and Applications*. Cambridge, Cambridge University Press; 2000.

34. McFadden D. Conditional Logit Analysis of qualitative choice behaviour. In: Zarembka P, ed. *Frontiers of Econometrics*. New York, NY: Academic Press; 1974:105–142.

35. Potoglou D, Burge P, Flynn T, et al. Best-worst scaling vs. discrete choice experiments: an empirical comparison using social care data. *Soc Sci Med*. 2011;72(10):1717–1727. doi:10.1016/j.socscimed.2011.03.027.

36. Lambooij MS, Harmsen IA, Veldwijk J, et al. Consistency between stated and revealed preferences: a discrete choice experiment and a behavioural experiment on vaccination behaviour compared. *BMC Med Res Methodol*. 2015;15(1):19. doi:10.1186/s12874-015-0010-5.

37. Commonwealth of Australia. Tobacco Plain Packaging Act 2011. No. 148. 2011. www.comlaw.gov.au/Details/C2011A00148/Html/Text#_Toc309642368. Accessed June 1, 2015.

38. Hensher D, Rose J, Greene W. *Applied Choice Analysis: A Primer*. New York, NY: Cambridge University Press; 2005.

39. Rao, A & Monroe, K. The effect of price, brand name, and store name on buyers' perceptions of product quality: an integrated review. *J Marketing Res*. 1989;26(3):351–357. doi:10.230713172907.

40. Tobacco products labelling regulations (cigarettes and little cigars) (SOR/2011–177). 2011. http://laws-lois.justice.gc.ca/eng/regulations/SOR-2011-177/. Accessed June 1, 2015.

41. Kuhfeld W. *Marketing Research Methods in SAS. Experimental Design, Choice, Conjoint and Graphical Techniques, SAS 9.2 Edition*. Cary, NC: SAS Institute Inc.; 2010. http://support.sas.com/techsup/technote/mr2010.pdf. Accessed June 1, 2015.

42. Kotnowski K. The impact of standardized cigarette packaging among young women in Canada: A discrete choice experiment. (Master's thesis). University of Waterloo Electronic Theses and Dissertations. 2013. http://hdl.handle.net/10012/7908. Accessed June 1, 2015.

43. Global Market Insite, Inc. GMI panel book: Q1 2013. 2012. www.lightspeedgmi.com/#home. Accessed June 1, 2015.

44. Freedman KS, Nelson, NM, Feldman, LL. Smoking initiation among young adults in the United States and Canada, 1998–2010: a systematic review. *Prev Chronic Dis*. 2012;9:E05. doi:10.5888/pcd9.110037.

45. Drennan J. Cognitive interviewing: verbal data in the design and pretesting of questionnaires. *J Adv Nurs*. 2003;42(1):57–63. doi:10.1046/j.1365-2648.2003.02579.x.

46. Morwitz V, Steckel J, Gupta A. When do purchase intentions predict sales? *Int J Forecasting*. 2007;23(3):347–64. doi:10.1016/j.ijforecast.2007.05.015.

47. Thompson ME, Fong GT, Hammond D, et al. Methods of the International Tobacco Control (ITC) Four Country Survey. *Tob Control*. 2006;15(suppl 3):s12–18. doi:10.1136/tc.2005.013870.

48. Train K. *Discrete Choice Methods With Simulation*. Cambridge: Cambridge University Press; 2003.

49. Reid JL, Hammond D, Burkhalter R, Rynard VL, Ahmed R. *Tobacco Use in Canada: Patterns and Trends, 2013 Edition*. Waterloo, ON: Propel Centre for Population Health Impact, University of Waterloo; 2013. http://tobaccoreport.ca/2013/. Accessed June 1, 2015.

50. Jansen P, Toorney TL, Nelson TF, Fabian LEA, Lenk KM, Forster JL. Sources of cigarettes among adolescent smokers: free or purchased. *Am J Health Educ*. 2011;42(3): 154–60. doi:10.1080/19325037.2011.10599182.

51. Chaloupka FJ, Yurekli A, Fong GT. Tobacco taxes as a tobacco control strategy. *Tob Control*. 2012;21(2):172–180. doi:10.1136/tobaccocontrol-2011-050417.

52. Mays D, Niaura RS, Evans WD, Hammond D, Luta G, Tercyak KP. Cigarette packaging and health warnings: the impact of plain packaging and message framing on young smokers. *Tob Control*. 2014;24(e1):e87–e92. doi:10.1136/tobaccocontrol-2013-051234.

53. Wakefield MA, Hayes L, Durkin S, Borland R. Introduction effects of the Australian plain packaging policy on adult smokers: a cross-sectional study. *BMJ Open*. 2014;3(7):e003175. doi:10.1136/bmjopen-2013-003175.

54. Pollay RW, Dewhirst T. *Marketing cigarettes with low machine measured yields. Smoking and Tobacco Control Monograph 13: Risks Associated with Smoking Cigarettes With Low Machine-Measured Yields of Tar and Nicotine*. Bethesda, MD: US Department of Health and Human Services, Public Health Services, National Institutes of Health; National Cancer Institute; 2001:199–233.

55. Wakefield M, Germain D, Durkin S, Hammond D, Goldberg M, Borland R. Do larger pictorial health warnings diminish the need for plain packaging of cigarettes? *Addiction*. 2012;107(6):1159–1167. doi:10.1111/j.1360-0443.2012.03774.x.

56. Churchill GA, Iacobucci D. *Marketing Research: Methodological Foundations*. 9th ed. New York, NY: South-Western; Thompson Learning; 2004.

57. Sheeran P. Intention-behavior relations: a conceptual and empirical review. *Eur Rev Soc Psychol*. 2002;12(1):1–36. doi:10.1080/14792772143000003.

58. Rousu MC, Thrasher JF. Demand reduction from plain and pictorial cigarette warning labels: evidence from experimental auctions. *Appl Econ Perspect Pol*. 2013;35(1):171–84. doi:10.1093/aepp/pps049.

59. Young J, Stacey I, Dobbins TA, Dunlop S, Dessaix AL, Currow DC. Association between tobacco plain packaging and Quitline calls: a population-based, interrupted time-series analysis. *Med J Aust*. 2014;200(1):29–32. doi:10.5694/mja13.11070.

60. Australia Institute of Health and Welfare. National Drugs Strategy Household Surveys (NDSHS). 2013. www.aihw.gov.au/alcohol-and-other-drugs/ndshs/. Accessed June 1, 2015.