Original investigation

The Association Between Smokers' Perceived Importance of the Appearance of Cigarettes/Cigarette Packs and Smoking Sensory Experience: A Structural Equation Model

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Abstract

Objective: We assessed the reliability of a measure of the latent construct “smoking sensory experience.” We further measured the relationship between “smoking sensory experience” and smokers' rating of the importance of the appearance of cigarettes/cigarette packs in brand choice and smoking dependence.

Methods: Analyses involved a national sample of smokers ($n = 633$) who participated in the 2010 South African Social Attitudes Survey ($N = 3,112$). Smokers ranked on a scale of 1–5, the importance of the following attributes in choosing their cigarette brand: health concerns, cost, packaging, taste, satisfaction, and flavor/strength. Using structural equation modeling, an *a priori* model was specified based on the hypothesis that taste, satisfaction, and flavor/strength are measures of a construct of “smoking sensory experience” and that cigarette packaging would be positively related to “smoking sensory experience.” Furthermore, “smoking sensory experience” would be positively related to cigarettes smoked per day.

Results: The latent construct—“smoking sensory experience” was considered reliable (Cronbach's $\alpha = 0.75$). The structural equation model confirmed that the specified model fitted the data well (goodness of fit index = 0.993; normed fit index = 0.978; root mean square error of approximation = 0.031). Higher “smoking sensory experience” was positively associated with increasing cigarettes smoked per day ($\beta = 0.12$). Higher rating of the cigarette package in brand choice positively covaried with both “smoking sensory experience” ($\beta = 0.29$), and higher rating of health considerations ($\beta = 0.42$).

Conclusions: These findings support the regulation of the appearance of cigarettes/cigarette packs to reduce cigarettes' appeal and abuse liability in line with Article 11 of WHO's Framework Convention on Tobacco Control.

Introduction

Sensory attributes of tobacco smoke can be considered mainly as a combination of taste, smell, and chemesthesis—the latter including both mouth sensations or “mouthfeel” (e.g., mouth-fullness, cooling, biting, and burning sensations), as well as throat sensations (e.g., throat-grab, smoothness, stinging, peppery, and tobacco-aftertaste sensations).¹ Sensory perception is a key determinant of smoking behavior and, therefore, reinforcement and addiction.²

However, other marketing and psychological influences (e.g., pricing and tobacco packaging) have also been shown to play a secondary role in reinforcing tobacco use by cueing perceived sensory reward.^{3,4} Neuroimaging studies have shown activation of the neural systems of reward and cognitive control in response to exposure to familiar logos or brands.^{5,6} Also, internal tobacco industry documents show that enhanced cigarette pack design features have been used by the industry to target certain population groups, including young adults and women (e.g., packaging female-oriented cigarettes so that they appear slick, flashy, glittery, shiny, or silky).^{7,8} Such enhancements in cigarette packs and in the appearance of the cigarette itself (considered by marketers as the “primary” level of packaging), have been associated with increased total sales of cigarettes. For example, from 2008 to 2011, changes in packaging to the Silk Cut premium cigarette brand in the United Kingdom were much more frequent, and consequently, its share of the market grew 2.9% during the same period.⁹ Moodie et al¹⁰ concluded: “That a premium brand can report any level of growth within such a hostile market, where most advertising, promotion, and sponsorship is banned, taxation is among the highest in the world, and in the midst of a recession, is testament to the value of packaging.”

The tobacco industry has conducted studies to better understand smokers’ subjective assessment of their smoking sensory experiences in relation to three levels of sensation, namely: mouth level (taste), during inhalation (nose flavor, and throat impact or “strength”), and whole body response (satisfaction).¹¹ However, only limited data is available at a population level demonstrating the relationship between cigarette dependence and smokers’ perceived importance of various sensory and nonsensory attributes such as packaging design when making brand choices. This study therefore had two objectives: (a) to determine the reliability of a measure of the latent construct “smoking sensory experience”; and (b) to measure the relationship between “smoking sensory experience” and smokers’ rating of the importance of the appearance of cigarettes/cigarette packs in brand choice. This has implications for Article 11 of the World Health Organization’s Framework Convention on Tobacco Control (WHO FCTC), which calls for effective packaging and labeling measures as key components of a comprehensive and integrated approach to tobacco control.¹²

Methods

Data Source

Data were obtained from the 2010 South African Social Attitudes Survey (SASAS)—an annual, in-person, household survey of noninstitutionalized South Africans aged ≥ 16 years.¹³ SASAS uses a multistage probability sampling strategy with census enumeration areas as the primary sampling unit. The original protocols for the SASAS were approved by the South African Human Sciences Research Council. In 2010, a total of 3,112 persons completed the survey (overall response rate = 88.9%). This SASAS sample was stratified by sociodemographic domain for each province and geographical

subtypes, namely tribal areas, formal rural, formal urban, and informal urban to ensure sufficient geographical distribution across all nine provinces, and adequate distribution between South Africa’s four race groups. The pretested survey questionnaires were administered in-person by trained interviewers in the respondents’ preferred language, which was selected from among all 11 South African official languages (questionnaires were available in all official languages).

Measures

Current Cigarette Smoking and Measures of Smoking Experience

Current cigarette smokers were respondents who reported smoking cigarettes daily or some days. Data were also collected among smokers on lifetime duration of smoking (years), and the number of cigarettes smoked per day.

Current smokers were asked “How important do you think each of the following was in your decision to smoke the current brand used?” The factors assessed included

1. How they taste.
2. How satisfying they are.
3. Price of the cigarettes.
4. Flavor or strength of the cigarettes.
5. It may not be as bad for your health.
6. The appearance of the packaging or cigarette.

Each of these attributes was rated on a scale of 1–5 corresponding to “Not important at all,” “Not important,” “Can’t choose,” “Important,” or “Very important.” Data were also collected on past year quit attempts and intention to quit smoking.

Sociodemographic Characteristics

Sociodemographic characteristics assessed included age (16–24, 25–34, 35–44, 45–54, or ≥ 55 years); sex (male or female); race/ethnicity (Black African, Colored, Indian or Asian, or White); residence type (urban or rural); educational attainment (primary school or less, secondary school [i.e., grades 8–12], or tertiary education [i.e., >12 years of schooling]); marital status (single, never married, married, or widowed/divorced/separated); employment status (unemployed or in school, pensioner/housewife/sick, or employed).

Hypothesis

The *a priori* specified model which was tested specified the following: (a) taste, satisfaction, and flavor/strength are measures of a construct of “smoking sensory experience”; (b) self-rating of importance of the appearance of cigarettes/cigarette packs in brand choice would be positively related to “smoking sensory experience”; and (c) “smoking sensory experience” would be positively related to physical dependence on cigarettes (i.e., cigarettes smoked per day), which in turn would be negatively/inversely associated with past quit attempts (Figure 1).

Statistical Analyses

Using principal component analysis with varimax rotation, an exploratory factor analysis was first performed to explore the construct of “smoking sensory experience” as a function of the three suggested sensory attributes as reported by the tobacco industry.¹¹ The reliability of the factor structure obtained was then tested using Cronbach’s alpha coefficient for internal consistency. Subsequently, confirmatory factor analysis was performed using structural

Figure 1. Hypothesized structural model assessing the relationship between “smoking sensory experience,” tobacco packaging, and other nonsensory attributes, South African Social Attitudes Survey, 2010 ($n = 633$). Note: The hypothesized model suggested that “smoking sensory experience” which is a function of the three sensory attributes would be positively influenced by smokers’ rating of the importance of cigarette pack or appearance, health, and price considerations in brand choice. Higher “smoking sensory experience” would then be associated with increased number of cigarettes smoked per day (CPD), which in turn would be associated with reduced quit attempts.

equation modeling (SEM) with “smoking sensory experience” as a latent construct determined by three observed variables namely: ratings of importance of attributes related to sensation at mouth level (taste), during inhalation (flavor/strength), and whole body response (satisfaction). This measurement model was then expanded to a general model to further test our *a priori* hypotheses. The specified general model was adjusted by removing nonsignificant pathways (bootstrap standardized estimates) and further modified based on inspection of modification indices. Adequacy of model fit was assessed using chi-squared statistics (>0.05); normed fit index (NFI) (>0.9); comparative fit index (CFI) (>0.9); and root mean square error of approximation (RMSEA) (≤ 0.06). All data were weighted and analyzed using AMOS 19.0 and Stata version 12.0.

Results

Characteristics of Study Population

In total, 18.1% ($n = 633$) of adults aged ≥ 16 years were current tobacco smokers (15.3% daily and 2.8% nondaily smokers) during 2010, with significant differences by race/ethnicity. Smoking prevalence by race/ethnicity was as follows: Black Africans (13.8%); Coloreds (36.3%); Indians/Asians (22.1%); and whites (30.8%). The average number of cigarettes smoked per day was 9.4 (95% CI = 8.5–10.3), with significant differences by ethnicity: Black Africans (7.5); Coloreds (8.3); Indians/Asians (8.9); and Whites (16.5) (Table 1). On aggregate, the study participants had smoked for an average of 14.3 years (95% CI = 13.0–15.6).

With respect to smoking-related behavior, over half of current tobacco smokers had made a past year quit attempt (54.5%), and about 46% intended to quit smoking.

Exploratory factor analysis revealed a one-factor structure for the three measured sensory attributes, with 66.9% of the variance explained (Table 2). Cronbach’s internal consistency coefficient suggested that the three-item measure of “Smoking sensory experience” was considered reliable ($\alpha = 0.75$) and was confirmed structurally valid in a measurement model using SEM.

Relationship Between Cigarette Pack or Product Appearance, Other Nonsensory Attributes, and Smoking Sensory Experience

Level of satisfaction was the most frequently reported (90.8%) sensory attribute that determined brand choice in the studied population, while price (65.0%) was the most frequently reported nonsensory attribute. About 42.7% of current smokers indicated that the appearance of cigarettes/cigarette packs was important for them in selecting a brand, with no significant differences observed by sociodemographic characteristics of the study participants. However, whites were significantly more likely to rate all sensory attributes higher in brand selection than other ethnic groups, except for Black Africans who rated “satisfaction” equally as high in considering their choice of cigarette brand. Furthermore, those with >12 years of schooling were significantly less price-sensitive than those with lower educational achievement when choosing a brand (Table 1).

The final SEM demonstrated that the general model specified, with additional modification, fitted the data well as demonstrated by all model fit statistics (χ^2 ($df = 10$) = 16.1, $p = .10$; GFI = 0.993; CFI = 0.99; NFI = 0.978; RMSEA = 0.031) (Figure 2). “Smoking sensory experience” was directly associated with increasing number of cigarettes smoked per day ($\beta = 0.12$). Although originally specified as unidirectional, the final structural model suggested that ratings

Table 1. Composition of Current Smokers, and Self-Rated Importance of Various Sensory and Nonsensory Attributes in Selection of Cigarette Brand, South African Social Attitudes Survey, 2010 (n = 633)

Characteristics	Composition% (n)	Cigarettes smoked per day		Sensory attributes (% of current smokers who reported that assessed attribute was important or very important in their selection of a cigarette brand)		Nonsensory attributes (% of current smokers who reported that assessed attribute was important or very important in their selection of a cigarette brand)	
		Mean (95% CI)	Taste% (95% CI)	Flavor/strength% (95% CI)	Satisfaction% (95% CI)	Price% (95% CI)	Health concerns% (95% CI)
Overall	100.0 (633)	9.4 (8.5–10.3)	81.2 (76.8–85.5)	76.0 (71.5–80.5)	90.8 (88.1–93.5)	65.0 (59.4–70.6)	43.2 (37.5–48.9)
Age, years							
16–24	25.8 (109)	7.4 (6.2–8.6)	76.7 (66.1–87.4)	79.8 (70.9–88.7)	93.2 (88.8–97.5)	68.7 (57.3–80.1)	44.8 (32.0–57.6)
25–34	24.7 (146)	8.6 (7.2–9.9)	85.9 (78.9–92.8)	77.2 (67.5–86.9)	92.2 (86.8–97.6)	59.6 (47.9–71.4)	40.3 (28.5–52.1)
35–44	21.0 (144)	10.5 (8.3–12.7)	77.9 (67.4–88.5)	69.6 (58.0–81.2)	84.8 (76.4–93.2)	55.6 (43.1–68.0)	36.7 (24.7–48.7)
45–54	12.9 (100)	10.1 (8.3–11.9)	87.8 (78.4–97.3)	75.7 (62.0–89.5)	96.1 (92.0–100.0)	80.0 (70.4–89.6)	38.6 (24.5–52.6)
55+	15.6 (133)	11.6 (9.6–13.7)	80.6 (70.7–90.5)	76.3 (66.6–86.0)	88.2 (82.4–93.9)	66.7 (55.4–78.0)	53.8 (42.7–64.9)
Sex							
Male	71.9 (384)	9.3 (8.3–10.3)	81.0 (75.6–86.5)	76.2 (70.5–81.9)	92.6 (89.7–95.6)	65.7 (58.8–72.6)	41.1 (33.9–48.2)
Female	28.1 (249)	9.4 (7.8–11.0)	81.5 (74.1–88.9)	75.5 (67.5–83.4)	86.1 (80.5–91.7)	63.2 (54.2–72.3)	46.9 (36.9–56.9)
Ethnicity							
Black African	59.3 (247)	7.5 (6.6–8.5)	77.9 (71.3–84.6)	70.8 (64.1–77.6)	93.2 (89.8–96.6)	64.8 (56.7–72.9)	44.2 (35.9–52.5)
Colored	18.7 (198)	8.3 (7.1–9.6)	81.1 (73.7–88.4)	81.2 (75.0–87.5)	81.2 (74.6–87.9)	73.8 (65.4–82.1)	33.6 (24.5–42.6)
Indian or Asian	3.6 (73)	8.9 (7.8–10.1)	74.9 (60.4–89.3)	80.4 (67.0–93.7)	86.1 (75.1–97.2)	73.9 (58.9–88.9)	53.0 (30.0–76.1)
White	18.4 (115)	16.5 (14.5–18.6)	92.6 (87.6–97.7)	86.2 (78.7–93.7)	94.0 (89.5–98.4)	54.8 (43.1–66.4)	45.2 (33.4–56.9)
Residence							
Urban	76.0 (511)	9.9 (8.8–10.9)	80.4 (75.3–85.6)	78.6 (73.9–83.3)	91.7 (88.9–94.6)	63.5 (56.9–70.0)	46.9 (40.2–53.5)
Rural	24.0 (122)	7.8 (6.3–9.4)	83.4 (75.6–91.1)	68.1 (56.8–79.3)	87.9 (81.5–94.3)	69.6 (59.0–80.3)	29.7 (18.8–40.7)
Marital status							
Single, never married	50.9 (254)	7.3 (6.4–8.3)	81.0 (74.4–87.5)	75.5 (68.6–82.3)	91.1 (87.1–95.1)	66.1 (57.8–74.4)	42.3 (33.8–50.7)
Widowed/divorced/separated	11.3 (98)	10.4 (8.6–12.1)	78.2 (63.7–92.8)	72.2 (57.2–87.2)	81.1 (70.0–92.2)	59.6 (46.2–73.0)	41.5 (27.7–55.4)
Married	37.8 (272)	11.8 (10.1–13.4)	82.1 (75.1–89.1)	78.4 (70.9–85.8)	93.0 (89.8–96.3)	65.0 (56.2–73.9)	43.4 (34.6–52.3)
Educational attainment							
Primary school or less	19.3 (119)	8.0 (6.2–9.7)	78.4 (69.4–87.3)	71.6 (60.4–82.8)	85.6 (78.3–92.8)	71.9 (61.3–82.4)	36.7 (25.1–48.3)
Secondary school, grade 8–12	63.5 (401)	9.3 (8.2–10.5)	83.1 (78.1–88.2)	79.5 (74.7–84.3)	93.4 (90.7–96.0)	70.4 (63.9–76.9)	46.1 (38.7–53.5)
Tertiary education, >grade 12	17.2 (110)	11.1 (9.2–12.9)	77.1 (63.9–90.4)	69.9 (55.8–83.9)	87.0 (78.4–95.7)	39.8 (26.1–53.6)	37.6 (23.8–51.4)
Employment status							
Unemployed or in school	38.2 (173)	7.9 (6.5–9.3)	77.9 (69.4–86.4)	78.5 (70.2–86.7)	89.1 (83.8–94.5)	69.6 (59.8–79.4)	47.9 (37.7–58.2)
Pensioner/housewife/sick	15.8 (148)	9.8 (8.2–11.5)	77.2 (67.7–86.8)	75.6 (66.6–84.6)	88.1 (82.2–94.1)	68.7 (59.3–78.2)	54.0 (43.2–64.7)
Employed	46.1 (312)	10.3 (9.1–11.5)	85.1 (79.3–90.9)	74.2 (66.9–81.4)	93.1 (89.9–96.2)	60.0 (51.9–68.1)	34.7 (26.7–42.7)

All analyses were restricted to current tobacco smokers (n = 633).

Table 2. Exploratory Factor Analysis and Reliability Coefficient of “smoking sensory experience”

Sensory attributes	Component factor loading	Total variance explained (%)	Cronbach's alpha
Taste	0.832	66.9	0.75
Flavor and strength	0.794		
Satisfaction	0.836

Figure 2. Final structural model assessing the relationship between “smoking sensory experience,” tobacco packaging, and other nonsensory attributes, South African Social Attitudes Survey, 2010 ($n = 633$). Note: All analyses were restricted to current tobacco smokers ($n = 633$). CPD = number of cigarettes smoked per day. Model fit indices were as follows: chi-squared statistic ($df = 10$) = 16.1; $p = .10$; goodness-of-fit index (GFI) = 0.993; comparative fit index (CFI) = 0.991; normed fit index (NFI) = 0.978; root mean square error of approximation (RMSEA) = 0.031.

of the importance of all the three nonsensory attributes were not only positively correlated with the ratings of the importance of “sensory smoking experience” in cigarette brand choice, but were also positively correlated with each other. The nonsensory attribute that had the strongest correlation with “smoking sensory experience” was self-rated importance of the appearance of cigarettes/cigarette packs in making a brand choice ($\beta = 0.29$). Similarly, the strongest correlation observed between nonsensory attributes themselves was between self-rated importance of the appearance of cigarettes/cigarette packs, and the importance of health concern considerations when making a brand choice ($\beta = 0.42$). Finally, higher ratings of considerations for health concerns in brand choice was positively associated with having made a quit attempt, but the number of cigarettes smoked per day was not significantly associated with quit attempts as originally specified.

Discussion

This study demonstrated that higher rating of the importance of the appearance of cigarettes/cigarette packs in brand choice covaried with “smoking sensory experience” and higher rating of health considerations. This is consistent with the previously reported role of

tobacco packaging in cueing expectations of sensory reward, or less relative harm from tobacco use.⁸ Packaging of tobacco products is a critically important communication strategy used by the tobacco industry to enhance appeal of tobacco products to consumers and potential consumers.^{14–17} The power of tobacco packaging, including cigarette stick appearance, as an advertisement tool lies in its ability not just to convey cognitive information, but more importantly, to elicit emotive and behavioral responses.¹⁸ The impact of tobacco packaging is well demonstrated by the fact that children as young as 5 or 6 years old have been shown to be able to recognize and distinguish different cigarette brands on the tobacco markets in several countries.¹⁹

Further demonstration of the impact of cigarette packaging on smoking sensory experience are findings from tobacco industry research which showed that smokers reported different sensory experiences when the same cigarettes were switched between blue and red packs.²⁰

Indeed, internal tobacco industry documents have shown that sensory perceptions of cigarettes can be manipulated simply by changing the appearance of the cigarette, or the color or shade of color on a cigarette pack—a process called “sensation transfer.”⁸ Such visual communication strategies are topical issues in tobacco control because

despite a ban on misleading descriptors such as “light,” “low,” or “mild,” which falsely convey a perception of less relative harm, the tobacco industry in South Africa and elsewhere continues to use packaging innovations to subvert the intent of those bans, specifically by using different color gradations and intensities to perpetuate smokers’ perception that a particular brand is allegedly lower or higher yield.^{8,21}

Notably, ratings of the importance of cigarette packaging were correlated with price considerations (which in turn correlated with “smoking sensory experience”). This relationship between perceived “smoking sensory experience,” tobacco packaging and price is confirmed by previous research showing that cigarette packages that displayed fewer branding design elements (i.e., plain packs), were more likely to be unfavorably perceived by smokers as being “cheap looking,” thus reducing the appeal associated with smoking.^{8,22,23} Research has also shown that such plain packaging reduces perception of tobacco taste,^{24–26} while increasing visual attention toward health-warning information.²⁷

This study is limited by the cross-sectional nature of the data which precludes drawing of causal inferences. In addition, all measures, including frequency of tobacco use, were self-reported and may be subject to misreporting. The study findings are however consistent with the literature, but propose a more comprehensive potential evaluation framework of the potential effect of cigarette pack or cigarette stick appearance on smoking behavior, including “smoking sensory experience.”

Conclusions

This study demonstrated that higher ratings of the importance of the appearance of cigarettes/cigarette packs in brand choice correlated with greater “smoking sensory experience” and higher rating of health considerations in brand choice. This study’s findings are consistent with previous reports and highlight the fact that the tobacco industry uses pack and cigarette design to reinforce tobacco use by cueing perceived sensory reward. Stronger regulation of cigarette stick and cigarette pack design features may help in reducing the product’s abuse liability.

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Declaration of Interests

None declared.

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