Short Communication

Predictive validity of the tobacco marketing receptivity index among non-smoking youth

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HIGHLIGHTS

- We developed a novel Marketing Receptivity Index (MRI).
- Integrating marketing exposures at PoS, brand recall and owner a branded merchandise.
- The MRI had an independent positive association with smoking initiation.
- The MRI appears valid and useful for future studies.

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ABSTRACT

Introduction: In a previous cross-sectional study of early adolescents, we developed a marketing receptivity index (MRI) that integrates point-of-sale (PoS) marketing exposures, brand recall, and ownership of branded merchandise. The MRI had independent, positive associations with smoking susceptibility among never smokers and with current smoking behavior. The current longitudinal study assessed the MRI's predictive validity among adolescents who have never smoked cigarettes

Methods: Data come from a longitudinal, school-based survey of 33 secondary schools in Argentina. Students who had never smoked at baseline were followed up approximately 17 months later (n = 1700). Questions assessed: PoS marketing exposure by querying frequency of going to stores where tobacco is commonly sold; cued recall of brand names for 3 cigarette packages from dominant brands but with the brand name removed; and ownership of branded merchandise. A four-level MRI was derived: 1.low PoS marketing exposure only; 2. high PoS exposure or recall of 1 brand; 3. recall of 2 or more brands; and 4. ownership of branded merchandise. Logistic regression models regressed smoking initiation by follow up survey on the MRI, each of its components, and students' willingness to try a brand, adjusting for sociodemographics, social network smoking, and sensation seeking.

Results: The MRI had an independent positive association with smoking initiation. When analyzed separately, each MRI component was associated with outcomes except branded merchandise ownership.

Conclusions: The MRI and its components were associated with smoking initiation, except for branded merchandise ownership, which may better predict smoking progression than initiation. The MRI appears valid and useful for future studies.

1. Background

Tobacco marketing promotes smoking initiation and progression, which mostly take place during adolescence and young adulthood: > 80% of adult smokers begin smoking by 18 years of age (Burton, Clark, & Jackson, 2012; DiFranza, Wellman, Sargent, et al., 2006; Kim et al., 2014; US Department of Health and Human Services, 2012). Accordingly, the World Health Organization's Framework Convention on

Tobacco Control (FCTC) recommends banning all tobacco advertising, promotion and sponsorship (WHO, 2003). As countries have increasingly banned tobacco marketing through traditional channels, such as television, radio, and billboards, the tobacco industry has increasingly relied on advertising and cigarette product pack displays at point of sale (PoS), as well as packaging itself, for communicating marketing messages (Henriksen, 2012; Wakefield, Morley, Horan, et al., 2002). The Marketing Receptivity Index (MRI) was developed to capture these marketing effects amongst youth; however, its predictive validity has not been assessed.

The MRI posits that tobacco marketing influences youth perceptions and behavior based on a hierarchy of effects. (Braun, Kollath-Cattano, Barrientos, et al., 2016; Barry & Howard, 1990) In the initial stage of this model, marketing exposures, which primarily take place through PoS promote pro-tobacco norms and expectancies. Middle stages involve encoding and identification of information about specific products, brands and brand varieties. This is assessed through cued recall of brands. This process culminates with the development of a consumer identity and brand loyalty (Braun et al., 2016; Barry & Howard, 1990), which the MRI measures through ownership of branded merchandise (Barry & Howard, 1990). Prior, cross-sectional research established the MRI had positive associations with susceptibility (OR = 1.66; OR = 1.64 and AOR = 2.95) and willingness to try cigarettes (AOR = 1.45; AOR = 2.38; AOR = 2.20) among never smokers adolescents in Argentina. Among current smokers a more market dose-response association was found (AOR2v1 = 2.47; AOR3v1 = 3.16; AOR4v1 = 3.62) (Braun et al., 2016).

1.1. Study context

Approximately 24.1% of Argentines aged 13–15 years had used some kind of tobacco product in the prior 30 days, with 19.6% smoking cigarettes, which is among the countries with the highest prevalence in Latin America (Ministerio de Salud de la Nación, 2012). Since 2013, Argentina has banned marketing through traditional channels, but allows some marketing at PoS: advertisements can be as large as 30 cm × 30 cm, but should include a health warning that covers 20% of the ad and should not be visible from outside the venue (Ley 26.687, n.d.). Furthermore, cigarette pack displays are allowed at PoS. Indeed, brand information is primarily communicated through cigarette packaging.

The current longitudinal study aims to assess the predictive validity of the MRI and its components among early adolescents in Argentina.

2. Methods

2.1. Design, procedure, and study sample

In 2014, a sample of 3172 first-year secondary students was surveyed from 33 public and private schools that were purposively selected from three of the largest cities in Argentina (Buenos Aires, Córdoba and Tucumán). Follow-up surveys were conducted in November 2015, towards the end of their second year of secondary school (i.e., US equivalent of 9th grade). More details on representativeness of the sample and the study protocol have been published elsewhere (Mejía, Pérez, Peña, et al., 2017).

2.2. Measures

2.2.1. Marketing exposure and receptivity

At baseline, marketing exposures at PoS was assessed through self-reported frequency of shopping in stores where tobacco is sold (Henriksen, Feighery, Schleicher, et al., 2008), both near school (within five blocks) and further away (> 5 blocks) (Braun et al., 2016; Feighery, Wang, and Fortmann, 2006; Henriksen et al., 2008). Responses (0 = never; 1 = sometimes; 2 = often; 3 = very often) were

summed across the two questions, and scores were dichotomized into low and high exposure (i.e., 1 or less vs. 2 or more). Cued brand recall was assessed adapting techniques commonly used for television and print ads (Braun et al., 2016), wherein images of cigarette packages were shown with the brand name removed, and students were asked to write out the name of the brand. Each student was shown three packs, one from each of the most popular brand in Argentina (i.e. Philip Morris; Marlboro; Lucky Strike) (Ministerio de Salud de la Nación, 2012). Misspelled brand names were classified as correctly recognized if the letters used clearly distinguished the brand family from others (e.g., 'Marbro' 'Luky'). The number of correctly recalled brand names was then summed (range 0–3). Finally, students were asked if they owned any branded merchandise, using phrasing from the Global Youth Tobacco Survey (Do you own something (e.g., t-shirt, pen, backpack) with a tobacco product brand logo on it?) (Ministerio de Salud de la Nación, 2012). This last was included to reflect historical ownership since brand stretching was banned in 2013. After the brand recall task, students were also asked to indicate which of all brands they evaluated, if any, they would be willing to try, with the option to indicate that they would not try any of the brands (Braun et al., 2016).

Based on the hierarchy of effects models in advertising, the marketing receptivity index was derived by creating a four-level variable that progressed from marketing exposure to brand recall and ownership of branded merchandise: (1) never or sometimes visit convenience stores AND no brands recalled AND no ownership branded merchandise; (2) visit convenience stores often or very often OR recall of one pack brand AND no ownership of branded merchandise; (3) recall of two or more pack brands AND no ownership of branded merchandise; (4) ownership of branded merchandise (Braun et al., 2016). All participants fell into one of the four categories.

2.2.2. Outcomes

At baseline and follow up, students were asked if they had ever smoked, even a puff, (i.e., ever smokers). Those who indicated prior use at baseline were excluded from the sample, and those who did so at follow-up were coded as having initiated smoking.

2.2.3. Smoking susceptibility

Smoking susceptibility was measured using validated questions for those who did not smoke, asking their intention to smoke both during the next year and if a friend offered them a cigarette, with four response options ranging from 'definitively yes' to 'definitively no'. As in prior research, (Pierce, Choi, Gilpin, et al., 1996) participants who stated 'definitely not' to both questions were coded as 'not susceptible never-smokers', and the rest were coded as 'susceptible never-smokers'.

2.2.4. Control variables

At baseline, sociodemographic variables were assessed, including: sex; age (12 and younger, 13, 14 and older), and highest educational attainment for either parent (≤ 7 years; 8–12 years; ≥ 12 years; not known). Smoking-related variables included smoking status of three types of close network members (i.e., any parent; any siblings; any of five closest friends). A four-item scale of sensation seeking was also used, as it is a robust predictor of smoking behavior and has been associated with marketing and media exposures to tobacco (Braun et al., 2016; Feighery, Henriksen, Wang, Schleicher, & Fortmann, 2006).

2.3. Analysis

All analyses were conducted using STATA V.13. We used χ^2 and t-tests to assess significant differences between baseline never smoker students who were and were not followed-up. Among never smokers at baseline, we used bivariate and adjusted logistic regression (accounting for clustering at the school level), regressing smoking initiation at follow-up on marketing variables. We fitted three separate models: MRI was treated as a 4-level index using indicator variables for each level

Table 1
Characteristics of the sample Argentine Secondary school students.

Baseline characteristics	No smokers at w1 n (%)	Students lost at follow up n (%)	Total n (%) (n = 3172)
Gender			
Girls	750 (44)§	281 (35)	1031 (42)
Age			
≤ 12	877 (52)§	301 (38)	1178 (47)
13	636 (37)§	315 (39)	951 (38)
≥ 14	186 (11)§	184 (23)	370 (15)
Parental education			
Primary or less	86 (5)‡	57 (7)	143 (5)
Secondary	663 (40)‡	322 (41)	985 (40)
Terciary or more	769 (46)‡	313 (40)	1082 (44)
Unknown	152 (9)‡	97 (12)	249 (10)
Household/peer smoking			
Either parent smokes	638 (38)†	343 (43)	981 (39)
Any sibling smokes	153 (9)§	126 (16)	279 (11)
One or more best friends smoke	486 (29)	335 (42)	821 (33)
Frequency of visiting stores			
Low	964 (58)	444 (56)	1408 (57)
High	705 (42)	349 (44)	1054 (43)
Brands recalled			
None	1147 (67)	528 (66)	1675 (67)
1 brand	279 (16)	138 (17)	417 (17)
2 brands	186 (11)	87 (11)	273 (11)
3 brands	88 (5)	49 (6)	137 (5)
Own branded merchandise			
MRI	94 (6)‡	66 (8)	160 (6)
1 = Not receptive	666 (40)†	280 (35)	946 (38)
2 = High PoS exposure OR some brand awareness	247 (15)	332 (42)	998 (40)
3 = High brand awareness	247 (15)	116 (15)	363 (15)
4 = Own branded merchandise	94 (6)†	66 (8)	160 (6)
Personal smoking involvement at wave 2			
Never smoker, not-susc.	895 (53)§		895 (53)§
Never smoker, susc.	389 (23)§		389 (23)§
Tried smoking, not current	250 (15)§		250 (15)§

MRI: Marketing Receptivity Index 3 level MRI: 1, 2 and 3.
† p < 0.05.
‡ p < 0.01.
§ p < 0.00.

(low MRI = reference group); MRI was treated as a continuous variable by summing across all three variables included in the MRI and with all three variables that comprise the MRI entered simultaneously into the model.

3. Results

The baseline sample consisted of 3172 adolescents, of whom 2502 (78.9%) had never tried smoking and were therefore eligible. Approximately 68.9% (n = 1700) of these never smoker students were successfully followed up and used as the analytic sample. In the analytic sample at baseline, more than half were boys (55.6%, n = 939), with a mean age of 12.6 and 59.2% attended a public school. By follow up, 15% (n = 250) had tried smoking and 9% (n = 160) had smoked in the previous 30 days. (Table 1).

The 4-level MRI had an independent, statistically significant association with smoking initiation (AOR2 vs. 1 = 1.42, 95% CI = 1.12–1.79; AOR3 vs 1 = 2.04, 95% CI = 1.38–3.00; AOR 4 vs. 1 = 2.16, 95% CI = 1.21–3.82; see Table 2). Being female; having greater sensation seeking tendencies; and smoking among parents and friends were also independently associated with greater likelihood of smoking initiation.

Table 2
Predictors of smoking initiation among secondary school never smoker students.

	OR	AOR (MRI)	AOR (continous MRI)	AOR (3 levels of BR)
Gender (ref male)				
Female	1.67§ (1.26–2.20)	2.08§ (1.49–2.88)	2.08§ (1.50–2.87)	2.08§ (1.48–2.91)
Age, years (ref ≤ 12)				
13	0,89 (0.64–1.21)	0,8 (0.59–1.08)	0,8 (0.59–1.08)	0,78 (0.57–1.05)
≥ 14	1,16 (0.83–1.60)	1,04 (0.71–1.52)	1,05 (0.72–1.54)	1,02 (0.70–1.48)
Parental education, years (ref ≤ 7)				
8–12 years	1,11 (0.75–1.63)	1,04 (0.72–1.48)	1,05 (0.74–1.49)	1,11 (0.74–1.65)
≥ 12 years	0,76 (0.51–1.11)	0,74 (0.52–1.03)	0,75 (0.54–1.03)	0,77 (0.52–1.14)
Unknown	0,87 (0.58–1.29)	0,83 (0.56–1.22)	0,84 (0.57–1.24)	0,9 (0.60–1.34)
Sensation seeking	1.44§ (1.28–1.62)	1.45§ (1.26–1.65)	1.44§ (1.26–1.64)	1.44§ (1.26–1.65)
Any parent smokes				
Yes	1.52§ (1.19–1.92)	1.27† (1.01–1.59)	1.30† (1.04–1.61)	1.27† (1.00–1.60)
Sibling smoke				
Yes	1.71‡ (1.14–2.54)	1,21 (0.82–1.75)	1,22 (0.84–1.78)	1,21 (0.82–1.79)
Friend smoke				
Yes	2.12§ (1.67–2.69)	1.86§ (1.47–2.35)	1.84§ (1.45–2.34)	1.81§ (1.43–2.30)
MRI (continuous)			1.35§ (1.16–1.56)	
MRI (ref. not receptive)				
2 = high PoS exposure OR some brand recognition	1,12 (0.91–1.39)	1.42‡ (1.12–1.79)		
3 = high brand awareness	1.75§ (1.32–2.31)	2.04§ (1.38–3)		
4 = ownership of branded merch	1.95† (1.16–3.29)	2.16‡ (1.21–3.82)		
Own branded merch				
Yes	1.97† (1.16–3.31)			1,43 (0.83–2.45)
3 levels BR (ref. none)				
1 brand				1 (0.73–1.37)
2 or 3 brands				1.63‡ (1.16–2.29)
PoS exposure (ref never/sometimes)				
Often/very often	1.55§ (1.20 - 2.00)			1.47‡ (1.14–1.89)

Adjusted models include all the variables shown in the table, as well as age, sex, and parental education.
† p < 0.05.
‡ p < 0.01.
§ p < 0.00.

Similar results were found for the continuous version of the MRI (AOR = 1.35, 95% CI = 1.16–1.56). When index components were analyzed separately, higher PoS exposure was independently associated with greater likelihood of smoking initiation (AOR High vs. low = 1.47 95% CI 1.14 to 1.89), as was the highest level of brand recall (AOR2-3 brands vs. none = 1.63 95% CI 1.16–2.29). Ownership of branded merchandise was associated with the outcome in crude models, but not in adjusted models. Finally, willingness to try one of the brand varieties shown in the brand recall task was independently associated with smoking initiation (AOR = 1.73, 95% CI = 1.31–2.28).

4. Discussion

Our study suggests that the MRI has predictive validity for smoking initiation. This index integrates established indicators of marketing exposure (i.e., PoS exposures) and receptivity (i.e., ownership of branded merchandise) with a novel assessment of brand recall that involves cueing with masked cigarette packaging stimuli (i.e., no brand name shown). Indeed, our package-based assessment of willingness to try cigarettes also exhibited evidence of predictive validity. It is noteworthy that ownership of branded merchandise, when considered separately from the MRI, was a significant predictor of smoking initiation only in bi-variate models. Furthermore, its inclusion as the highest level of receptivity in the 4-level index did not appear explain much additional variance in smoking initiation relative to higher levels of brand recall (i.e., $AOR_{3 \text{ vs } 1} = 2.04$; $AOR_{4 \text{ vs } 1} = 2.16$). In this population of never smokers, recall of the most popular brands may explain variance in smoking initiation associated with owning branded merchandise. Because it captures brand loyalty and identification, ownership of branded merchandise may better predict smoking progression than initiation. By contrast, PoS exposure had a positive and independent relationship with smoking initiation even when analyzed separately from the other index components. The association we found ($AOR = 1.47$) is consistent with that found in a recent meta-analysis ($OR = 1.6$) (Robertson, Cameron, McGee, et al., 2016), as well as with our MRI conceptualization, whereby PoS exposures are more likely to promote more general, positive perceptions of tobacco and its use, especially amongst never smokers.

One of the main limitations of our study was the fact that schools were not randomly selected, so our results cannot generalize to all secondary students in Argentina. Nevertheless, students were from both private and public schools that represent a wide range of socioeconomic status groups (Linetzky, Mejia, Ferrante, et al., 2012). Furthermore, the prevalence of tobacco use in our sample was similar to the GYTS (Ministerio de Salud de la Nación, 2012), (24.1%) suggesting that our sample may be representative of urban Argentine school students. Another limitation was differential loss to follow-up, which is quite common in school-based research (Thrasher et al., 2009). However, students lost to follow-up were more likely to have stronger smoking risk factors. Although we controlled for these factors in our analysis, future research may consider whether the MRI or its components work better amongst relatively higher risk groups, which would have caused us to underestimate its predictive validity. Also, future research should consider whether results would generalize to older adolescents.

The results suggest that the MRI may be useful for future research on the effects of tobacco marketing on smoking-related perceptions and behavior amongst youth, including in efforts to provide support for comprehensive bans that covers advertising and pack displays at PoS. While associations between PoS promotion and key smoking outcomes have been found across a range of studies (Robertson et al., 2016; Robertson, McGee, Marsh, et al., 2015) our protocol integrated a novel element that is increasingly important in tobacco control: package-based marketing. The masked brand recall task we used is similar to protocols from more traditional advertising studies. This assessment approach, including assessment of the willingness to try the product, may be useful in countries, like Argentina, where cigarettes packaging displays dominate PoS and where packaging is a fundamental vehicle for marketing. This index can be useful for future research on the effects of tobacco marketing on smoking-related perceptions and behavior amongst youth, including in efforts to provide evidence to policymakers to support marketing bans, including comprehensive bans that covers PoS and eliminate the tobacco packaging.

Contributorship statement

SB led the development of the paper. ENAV conducted the analysis and helped draft the paper. IB and RM provided substantial feedback on paper drafts. JDS contributed to the conceptualization of the research idea, advised the data analyses and helped draft the paper. JFT designed the study, conceptualized the research idea and helped draft the paper. All authors helped revise the paper and approved the final manuscript.

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