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Adolescents' Health Perceptions of Natural American Spirit's On-the-Pack Eco-Friendly Campaign

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A B S T R A C T

Purpose: Natural American Spirit (NAS) cigarettes, which have recently grown in popularity, are marketed as eco-friendly and natural. The present study examined whether NAS's on-the-pack messaging influences adolescents' health perceptions of the brand.
Methods: In a mixed-factor design, adolescent participants (N = 1,003, ages 13–17, 75% female) were randomized to one of the six exposure conditions. All viewed images of an NAS and a Pall Mall (comparison brand) cigarette pack, but differed in pack color (blue, green, or gold/orange) and brand viewed first. Perceptions of pack logos, addictiveness, harms to the smoker, others, and the environment were assessed directly after viewing pack images for each brand.
Results: Adolescents who perceived NAS as more pro-environment tended to perceive NAS cigarettes to be less addictive, $r = -.19$, $p < .01$. NAS cigarettes also were perceived as less addictive and better for the environment than Pall Mall. Most (90%) participants provided nature-friendly words (e.g., environment, recycle) when asked to describe logos on the NAS packs. In adjusted models, relative to Pall Mall, NAS was perceived as healthier for smokers, healthier for smokers' family and friends, and safer for the environment. Findings did not differ by pack color and ever tobacco use.
Conclusions: Adolescents perceived a health advantage for NAS cigarettes with its on-the-pack, eco-friendly and pro-health marketing. The findings are consistent with prior research with adults. Given the accumulating evidence of consumer misperceptions, eco-friendly messaging on cigarettes is a public health concern that warrants further consideration for regulatory intervention.

IMPLICATIONS AND CONTRIBUTION

Cigarettes marketed as eco-friendly are popular, counter to the well-documented harms of tobacco, and may be perceived as safer compared to traditional cigarettes. This study found that adolescents rated cigarettes with pro-environment marketing on the packs as less addictive and healthier for smokers, others, and the environment.

Most tobacco use starts before the age of 18, delivering nicotine to the developing brain, making nicotine addiction a pediatric disease [1]. During a time of declining U.S. smoking prevalence, the Natural American Spirit (NAS) cigarette brand, marketed as a natural alternative, has gained in overall U.S. market share [2], and is currently the fourth most popular brand among youth aged 12–17 years [3]. The tobacco industry has a

Conflicts of interest: J. Prochaska has provided consultation to pharmaceutical and technology companies that make medications and other treatments for quitting smoking and has served as an expert witness in lawsuits against the tobacco companies. The other authors declared that they have no financial relationships relevant to this article to disclose.

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well-documented history of using marketing efforts to reassure the public against growing concerns about the health harms of smoking, starting in the 1940s with physicians in cigarette ad campaigns [4]. The focus of the industry has been to decrease negative perceptions of cigarettes, encouraging initiation and for smokers, continued use. In truth, all cigarettes are harmful to health. NAS cigarettes have higher levels of ammonia, arsenic, and cadmium compared to other cigarette brands [5,6] and a higher nicotine concentration [7,8].

Recognizing the potential for consumer deception and public health harm, the U.S. Food and Drug Administration (FDA) restricts the use of modified risk claims in tobacco marketing (Family Smoking Prevention and Tobacco Control Act. U.S.C. 21 Sec 911). In an agreement between FDA and three tobacco companies, including the company that produces NAS, the descriptors "natural" and "additive-free" were removed from packages and advertising. An exception, however, was made allowing NAS to retain "natural" in its brand name.[9] The company replaced "additive-free" with the text "ingredients = tobacco & water," conveying that there are no chemical ingredients [10].

NAS sells "organic" varieties, and its advertisements depict plants, farms, and water to communicate an unadulterated and "whole leaf" product [11,12]. On cigarette packs, NAS features a "Respect for the Earth" marketing campaign with a claim of a zero-waste-to-landfill facility, a re-purposed tobacco leaf recycle logo, and a logo for the Programme for the Endorsement of Forest Certification (PEFC). Yet there is well-established evidence that tobacco is harmful for the environment [13,14]. Production of tobacco involves significant environmental costs, including deforestation in several countries, both for tobacco farming and to provide the wood for fire-curing tobacco [15]. Tobacco growing also uses large amounts of chemicals (e.g., fertilizers) that may harm local drinking water. Emissions from cigarettes when smoked release significant masses of toxicants into the environment [16]. Cigarette butt waste is the leading form of litter globally [17], both on land and in oceans. Disposed cigarette butts also release toxic chemicals into the soil and water supply [13].

Pro-environmental messaging in advertisements is especially attractive to youth and young adults, and NAS smokers tend to be younger [18]. Young people actively search for brands with environmentally responsible business practices, demanding ethical awareness from manufacturers of consumer goods [19–21]. Children as young as 7 years demonstrate an understanding of green purchasing behavior, a depth of environmental knowledge, and a genuine care for the environment [22,23]. Eco-friendly marketing appears particularly salient now relative to previous generations. Over 10 million social media followers of 17-year-old Greta Thunberg's global climate youth movement is a case in point [24].

Of concern is that the tobacco industry's use of eco-friendly marketing elements may communicate health assurance to consumers [25]. On cigarette packs and other advertising, the terms "natural" and "tobacco & water" have been found to produce favorable beliefs about the composition, safety, and health effects of NAS cigarettes among adults [10,26–30] and youth [31–33]. On real and modified images of cigarette packs, adolescents perceived "natural" to be more appealing and less harmful than packs without this terminology [31,32]. In one study, NAS cigarettes were specifically rated as less likely to cause disease than Camel cigarettes [31], and in another, youth were less likely to recall the cigarette pack warning when shown NAS cigarette ads compared to other brands [33]. Eco-friendly marketing from NAS is one of the first examples of on-the-pack, eco-friendly messages for cigarettes. Our research with adults found that, regardless of smoking status, adults perceived NAS as a healthier cigarette brand for self, others, and the environment relative to a comparison brand (Pall Mall) without eco-friendly messaging, that was matched on pack color [34]. Worth testing, is whether the findings replicate and/or are stronger among adolescents, the tobacco industry's future "replacement smokers" [35].

This is the first study of adolescents' brand perceptions of a cigarette pack with eco-friendly marketing descriptors. In an online experiment, the present study evaluated NAS's cigarette pack labeling with adolescents and examined perceptions of the addictiveness and physical and environmental harms of smoking the brand. Pall Mall, which does not have an eco-friendly campaign or use organic and natural language and imagery on its cigarette packs, was used as the comparison brand. NAS and Pall Mall share the same parent company (Reynolds American) and have similar pack colors to allow matching on color. Like all brands of cigarettes, Pall Mall and NAS are addictive and harmful to human and environmental health. Based on our previous research with adults [34], we hypothesized that adolescents would perceive/rate NAS cigarettes to be healthier than Pall Mall cigarettes for smokers, smokers' family and friends, and less harmful for the environment. Because nicotine addiction starts in adolescence for most smokers, we further sought to examine how perceptions of NAS's eco-friendly campaign related to adolescents' perceptions of the addictive nature of the cigarette brand.

Methods

Study design

This online experiment used a mixed-factor design and randomized participants to one of six different exposure conditions. All participants viewed both an NAS and a Pall Mall cigarette pack, but they differed in the brand that was viewed first (NAS or Pall Mall) and the color (blue, green, or gold/orange for both brands). Participants were first exposed to an image of a commercially available, unaltered NAS or Pall Mall pack. The images included the front, back, and both sides of the pack, and participants were able to view the images for as long as they wished (see Supplemental Figure). Outcomes were assessed directly after viewing each brand's pack (NAS or Pall Mall).

Participants

Participants (N = 1,003) were recruited from an online research panel hosted by Qualtrics. Participants were aged 13–17 years, English literate, and U.S. residents (because NAS packs differ in non-U.S. countries; e.g., in Japan, the packs still have "additive-free" and "light"). Approximately 6,398 individuals were invited to participate. Once 1,000 participants were enrolled, the survey was closed. Participants received compensation from Qualtrics for completing the survey in the form of e-rewards money or points exchangeable for gift cards. Data were collected in 13 days in February 2019. The median survey completion time was 13 minutes (interquartile range 7 minutes). Prior parental consent and adolescent assent were obtained by

Qualtrics, and an additional assent was included at study start. The Institutional Review Board at Stanford University's School of Medicine approved the study procedures.

Measures

Study assessments included participant demographics (age, gender, race/ethnicity, sexual orientation), tobacco use history, and product perceptions. Most study measures were used prior with adults with demonstrated psychometrics [34]. Where relevant, Cronbach's alphas are reported below for the current sample.

Brand characteristics: pro-environment and addiction. Participants rated each displayed pack brand (NAS and Pall Mall) on 18 key features related to environment ("natural," "supports clean water," "supports forests," "supports recycling"), addiction/harm ("addictive," "nicotine," "harmful to health"), smoking experience (e.g., "quality for the price," "taste," "help someone quit"), and other aspects (e.g., "tar," "additives"). The items were informed by the PATH Survey [36]. Response options were less (−1), no different (0), or more (1) than other cigarette brands. For the present study, the focus was on the environment and addiction related items. The four environmentally focused items were averaged as a scale, with a possible range from −1 to 1 (Cronbach's alphas: .77 for NAS, .79 for Pall Mall). The three addiction/harm-related items were averaged as a scale, with a possible range from −1 to 1 (Cronbach's alphas: .71 for NAS, .67 for Pall Mall).

Brand health image. Participants responded to three items for each brand the extent to which they strongly disagree (1) to strongly agree (5) that: "Smoking (NAS/Pall Mall) would show that someone cares about…their health/the health of their family and friends/the health of the environment." The items were analyzed individually.

Global brand attitudes. Participants responded to two items for each brand the extent to which they strongly disagree (1) to strongly agree (5) that: "Most people would choose [NAS/Pall Mall] cigarettes to smoke because they are… safer for the environment than other cigarettes/healthier than other cigarettes." The items were analyzed individually.

Corporate social responsibility. Participants answered 11 true/false questions on the social responsibility of the tobacco company behind each brand (e.g., "The company donates profits to replant forests"). Internal consistency was poor (Cronbach's alphas $< .60$) and unimproved with item reduction (e.g., factor analysis); therefore, this measure was omitted from analyses.

Pack image descriptors. After viewing both packs and completing the attitudinal items on brand perceptions, participants were shown logos from the packs and asked "In a word or two, what does this image mean to you? There are no right or wrong answers, we just want to hear what you think." Of interest were the PEFC logo and the three-leaf recycle logo on the NAS packs. For comparison, we examined responses to the Pall Mall logo, a coat of arms held by two regal lions.

Tobacco use. Finally, participants reported if they ever used cigarettes, cigars/cigarillos/little cigars, and/or nicotine vaping products and if they used these products in the past 30 days. Since all participants were minors, tobacco use questions were preceded with the statement, "For this next set of questions, please remember there are no right or wrong answers."

At survey end, participants were provided information about tobacco treatment resources for quitting smoking and/or vaping.

Analyses

Race/ethnicity was categorized as White or other because of small numbers of all other racial/ethnic groups (4.5% missing). Only one participant (.1%) was excluded from model testing due to missing data on the product perception variables. Over 99% provided write-in descriptors for the pack logos with .4%–.6% data missing (i.e., did not provide write-in descriptors for the pack logos).

Descriptive statistics characterized the sample overall and were analyzed by ever/never tobacco use. One-way analysis of covariance (ANCOVA) examined mean (M) differences in ratings of NAS and Pall Mall brand cigarettes. The model intercepts provided the tests for the significance of the mean differences in brand ratings and indicated whether the difference in ratings between NAS and Pall Mall was significantly different from 0. For the within-subject brand comparison, each respondent served as his/her own control. Models controlled for the order of presentation, pack color, and tobacco use. A Bonferroni correction was used for testing brand differences on seven outcomes of interest: (1) brand characteristics (2 scales: environment and addictiveness); (2) brand health image (3 items: smokers, others, the environment); and (3) global brand attitudes (2 items: environmental and human health), where $p < .05/(7 \text{ items}) = .00714$. Post hoc power analysis indicated there was 68%–90% power to detect small (.10) to medium (.25) effects given a sample size of N = 1,003 and Bonferroni correction for type I error with the criterion for statistical significance set at $p < .007$. Additional analyses also were run for ever versus never combusted tobacco users, removing ever nicotine vapers, and the findings (data not shown) were nearly identical to current results for ever versus never overall tobacco users (including nicotine vapers) described in the following section.

Results

Sample characteristics

The sample (N = 1,003) was balanced among the five ages (13–17), 75% identified as female, 22% identified as lesbian, gay, or bisexual, 19% as Hispanic, and 51% as White (Table 1). Approximately 34% of the adolescents reported ever using tobacco products (18% cigarettes, 11% cigars, 30% e-cigarettes) and 20% reported past-month use (6% cigarettes, 6% cigars, 17% e-cigarettes); 24 participants reported having ever smoked NAS (2% of the overall sample, 9% of ever combusted tobacco users, and 3% of current combusted tobacco users). Older adolescents and those who identified as lesbian, gay, or bisexual were more likely to report ever using tobacco/nicotine products ($p < .05$).

Environmental and addictiveness brand characteristics

Compared to the ratings for Pall Mall, participants rated NAS as more pro-environment and less addictive relative to other cigarette brands (Figure 1). Within-subject pairwise comparisons

Table 1
Sample descriptive characteristics overall and by ever tobacco[a] use status (N = 1,003)

Variable	Full sample	Never used tobacco products	Ever used tobacco products
No. (%)	1,003	663 (66%)	340 (34%)
Age, n (%)			
13 years old	200 (20%)	157 (24%)[a]	43 (13%)[b]
14 years old	200 (20%)	150 (23%)[a]	50 (15%)[b]
15 years old	201 (20%)	123 (19%)	78 (23%)
16 years old	200 (20%)	130 (20%)	70 (21%)
17 years old	202 (20%)	103 (16%)[a]	99 (29%)[b]
Gender, n (%)			
Male	229 (23%)	154 (23%)	75 (22%)
Female	753 (75%)	496 (75%)	257 (76%)
Other	21 (2%)	13 (2%)	8 (2%)
Sexual orientation, n (%)			
Heterosexual/straight	726 (72%)	506 (76%)[a]	220 (65%)[b]
Lesbian, gay, or bisexual	220 (22%)	119 (18%)[a]	101 (30%)[b]
Other	57 (6%)	38 (6%)	19 (6%)
Hispanic, n (%)			
Yes	189 (19%)	117 (18%)	72 (21%)
No	814 (81%)	546 (82%)	268 (79%)
Race, n (%)			
White	507 (50.5%)	347 (55.1%)	160 (48.8%)
Other	451 (45.0%)	283 (44.9%)	168 (51.2%)
Missing	45 (4.5%)	33 (5.0%)	12 (3.5%)
Color of pack			
Blue	336 (34%)	227 (34%)	109 (32%)
Green	349 (35%)	218 (33%)	100 (29%)
Orange/gold	318 (32%)	218 (33%)	131 (39%)
Order of pack viewed			
Natural American Spirit	498 (50%)	331 (50%)	167 (49%)
Pall Mall	505 (50%)	332 (50%)	173 (51%)

[a,b]Denote significant group differences by ever use of tobacco products by row per chi-square analyses, $p < .05$.
[a] Ever tobacco use includes cigarettes, cigars, and nicotine vaping/e-cigarettes.

by brand were significant for all characteristics, all p-values <.01. When analyzed as scales, adolescents' pro-environment perception score for NAS was correlated negatively with perceptions of addictiveness/harmfulness to health ($r = -.18$, $p < .001$). The correlation was significant but weaker for Pall Mall ($r = -.07$, $p < .05$).

Adolescents' ratings of brand characteristics were analyzed as scales in one-way ANCOVAs, controlling for brand order, color, and ever tobacco use. The model intercept for the pro-environment scale was positive and significant with a medium effect size ($B = .39$, $p < .001$, $\eta^2 = .08$). Participants rated NAS as being more pro-environment than Pall Mall, with an average difference score of .33 (standard deviation [SD] = .61), on a possible range of −1 to 1. The model intercept for the addictiveness scale was not significant with the Bonferroni correction ($B = -.11$, $p = .014$, $\eta^2 = .01$); the effect size was small. Brand order, color, and ever tobacco use were not significant in either model.

Brand health image

Adolescents' ratings of brand health image for the environment correlated significantly with brand health image for human health: NAS (pro-environment correlations of $r = .63$, $p < .001$ for both health of smokers and smokers' family and friends) and Pall Mall (pro-environment correlations of $r = .74$, $p < .001$ for health of smokers and $r = .76$, $p < .001$ for smokers' family and friends). That is, participants who rated a cigarette brand as better for the environment, tended to also rate the brand as better for human health.

In one-way ANCOVA tests, all three items assessing brand health image had significant positive intercept terms indicating that NAS relative to Pall Mall was perceived as healthier for smokers, smokers' family and friends, and the environment; effect sizes were small (Table 2). The within-subject mean difference scores, which could range from −4 to +4, were M = .20, SD = 1.14 for healthier for self, M = .19, SD = 1.14 for family/friends, and M = .51, SD = 1.33 for the environment. Brand order was significant for the environmental health model, with a small effect. Those who viewed NAS first had larger difference scores between the brands (M_{diff} =.63, S = 1.29, $p = .005$) than those who viewed Pall Mall first (M_{diff} =.39, SD = 1.36). Pack color and ever tobacco use were not significant in the models.

Global brand attitudes

When indicating what most people would choose when selecting a cigarette brand, preference for a pro-environment brand was significantly associated with preference for a brand that is "healthier than other cigarettes" (NAS $r = .66$, $p < .001$; Pall Mall $r = .72$, $p < .001$). That is, participants who believed people would prefer a cigarette that provides an advantage for the environment, also tended to believe people would prefer a cigarette that is better for one's health.

Both ANCOVA tests of global brand attitudes had significant positive intercept terms of medium effect size. Relative to Pall Mall, adolescents were more likely to believe people would smoke NAS because they are healthier than other cigarettes and safer for the environment (Table 3). The within-subject mean difference scores were M = .55, SD = 1.31 for safer for the environment and M = .36, SD = 1.26 for healthier. Brand order was significant for both models with small effect sizes. Participants who viewed NAS first had larger brand difference scores ($M_{diff\text{-}healthier}$ =.62, SD = 1.22; $M_{diff\text{-}safer\ environment}$ = .79, SD = 1.29) relative to those who viewed Pall Mall packs first ($M_{diff\text{-}healthier}$ = .10, SD = 1.24; $M_{diff\text{-}safer\ environment}$ = .31, SD = 1.29). Pack color and ever tobacco use were not significant for either model.

Pro-environment pack image descriptors

Nine in ten (90%) of the adolescents wrote in a nature-friendly word for one or both of the NAS pro-environment logos (Figure 2): 73% for the PEFC logo and 84% for the leaf recycle logo. In comparison, only .6% of participants wrote in a nature-friendly word for the Pall Mall logo.

Discussion

With a focus on NAS's pro-environment and health-oriented on-the-pack marketing campaign, the current experiment found that adolescents rated NAS more favorably than Pall Mall, a cigarette brand without pro-environment or health-oriented

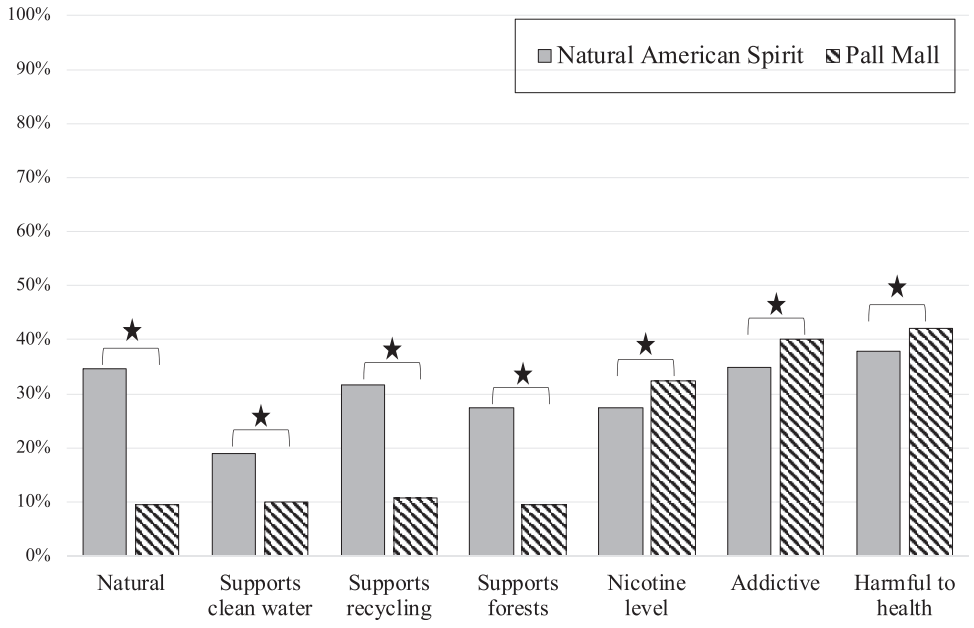

Figure 1. Adolescents' (N = 1,003) brand perceptions of NAS versus Pall Mall, relative to other cigarette brands. Bars denote the percent of participants who reported "more" to the following questions: "How would you rate (Natural American Spirit/Pall Mall) relative to other cigarette brands?": (1) natural; (2) supports clean water; (3) supports recycling; (4) supports forests; (5) nicotine level; (6) addictive or habit-forming; and (7) harmful to health. * Denotes significant within-subject differences in ratings of NAS and Pall Mall per McNemar analysis ($p < .01$).

marketing, on health and environment-related measures. The advantage for NAS on health and environment-related items was significant among ever and never tobacco users and was consistent across pack colors. Differences were found by brand order, where those who viewed NAS first had larger brand difference scores than those who viewed NAS after Pall Mall. Notably, measures assessing perceived benefit to the environment correlated with perceived benefit to human health. That is, what is viewed as good for the environment, is perceived as good for the human body.

When asked to describe two eco-friendly logos on the NAS packs, 90% of the adolescents gave at least one nature-friendly word, whereas, less than 1% did so for the Pall Mall logo. Eco-friendly, on-the-pack marketing may be powerful given that the true environmental harms of tobacco production are not well publicized. Marketing on cigarette packs is a compelling message vector as packs occupy a primary display area near the cash register in many convenience stores [37], a store type at which approximately four million U.S. adolescents (ages 13–16) shop at least weekly [38].

The findings extend prior research with adults in a similar experiment [34]. Advertising works and particularly so among young people [39]. Strong empirical evidence indicates that even brief exposure to tobacco advertising influences adolescents' attitudes and perceptions about smoking and intentions to smoke [40]. Further, the National Cancer Institute and the U.S. Surgeon General have concluded that exposure to cigarette advertising influences nonsmoking adolescents to initiate smoking and to move toward regular smoking [41]. The tobacco industry has been keenly aware that a successful tobacco brand must attract young smokers through a series of stages leading from experimentation and initiation, to loyalty to a particular brand, to become mature smokers [42,43]. Tobacco companies understand the importance of adolescents' self-image and have

Table 2
Adolescents' health perceptions of the brand image for Natural American Spirit (NAS) relative to Pall Mall

Smoking this brand would show that someone cares about….	Their health				The health of their family/ friends				The health of the environment			
	B	95% CI	β	η^2	B	95% CI	β	η^2	B	95% CI	β	η^2
Intercept[a]	**.28**	**.13, .43**	-	**.01**	**.27**	**.12, .42**	-	**.01**	**.53**	**.36, .71**	-	**.04**
Ever used tobacco products (ref: never used tobacco)	.05	−.10, .20	.02	.00	.15	−.01, .30	.06	.00	.13	−.05, .30	.05	.00
Pall Mall viewed first (ref: NAS viewed first)	−.09	−.23, .05	−.04	.00	−.10	−.24, .04	−.05	.00	**−.24**	**−.40, −.07**	**−.09**	**.01**
Color of pack												
Blue (ref: green)	−.10	−.27, .07	−.04	.00	−.14	−.31, .04	−.06	.00	.14	−.06, .34	.05	.00
Orange/gold (ref: green)	−.08	−.25, .10	−.03	.00	−.10	−.27, .07	−.04	.00	.02	−.18, .22	.01	.00

β = standardized coefficient; η^2 = eta-squared (effect size); CI = confidence interval.

[a] The intercept reflects the difference score for ratings of NAS relative to Pall Mall (NAS - Pall Mall) for each dependent variable of interest in the models. Positive intercepts indicate more favorable ratings of NAS relative to Pall Mall. Bolded effects are significant at $p < .01$ (Bonferroni adjusted). Ever use of tobacco products includes cigarettes, cigars, and vaping products.

Table 3
Adolescents' ratings of global brand attitudes for Natural American Spirit (NAS) relative to Pall Mall cigarettes

Most people would choose this brand because it is…	Healthier				Safer for the environment			
	B	95% CI	β	η^2	B	95% CI	β	η^2
Intercept[a]	**.70**	**.54, .86**	-	**.07**	**.82**	**.65, .99**	-	**.08**
Has ever used tobacco products (ref: never used tobacco)	.18	.02, .34	.07	.01	.13	−.04, .30	.05	.00
Pall Mall viewed first (ref: NAS viewed first)	**−.52**	**−.67, −.37**	**−.21**	**.04**	**−.47**	**−.63, −.31**	**−.18**	**.03**
Color of pack								
Blue (ref: green)	−.19	−.38, −.01	−.07	.00	−.02	−.22, .17	−.01	.00
Orange/gold (ref: green)	−.25	−.44, −.07	−.09	.01	−.22	−.41, −.02	−.08	.01

β = standardized coefficient; η^2 = eta-squared (effect size); CI = confidence interval.
[a] The intercept reflects the difference score for ratings of NAS relative to Pall Mall (NAS - Pall Mall) for each dependent variable of interest in the models. Positive intercepts indicate more favorable ratings of NAS relative to Pall Mall. Bolded effects are significant at $p < .01$ (Bonferroni adjusted). Ever use of tobacco products includes cigarettes, cigars, and vaping products.

targeted the psychological needs of adolescents and created the perception that smoking will satisfy these needs. In a 1973 document, Claude Teague, an executive with RJ Reynolds, wrote: "The fragile, developing self-image of the young person needs all the support and enhancement it can get. Smoking may appear to enhance that self-image in a variety of ways" [44].

Strengths of the present study include a large sample and randomizing participants to view packs matched on one of the three colors and to the order of pack brand viewed first. Rather than modifying packs to isolate responses to individual text or images that are eco-friendly, participants were exposed to images of real-world packs.

Study limitations include lack of an unexposed control group, subtle differences in pack color meaning between the brands, and small effect sizes of differences for addictiveness and brand health image items. However, the effects for pro-environment and health-oriented cigarette packaging were statistically significant in a brief-exposure paradigm. While green indicates menthol for both brands, NAS's gold pack is an "organic" variety and Pall Mall's orange pack is their "ultra-light." Pack color was a control variable in all analyses and no differences were found. Most participants identified as female in the sample. Previous research indicates males may be more likely to smoke cigarettes compared to females, and generalizability of the findings is limited. We evaluated pro-environment and health-oriented messaging on actual NAS packs. NAS packs convey multiple pro-environment and health oriented messages. With interest in real-world effects, we did not seek to isolate which messaging has the strongest effects and for whom. Future studies could modify the packs to try to isolate responses to individual pro-environment and/or health-related text or images. Finally, the two items used to evaluate adolescent global brand attitudes could be considered complex (or double-barreled) in that they assessed (1) belief about what most people would choose, in relation to (2) perceptions of the brands as safer/healthier. The intent was to tap normative beliefs [45,46] (i.e., what others are likely to do) in relation to the constructs of interest (i.e., brand perceptions of environmental and human health), and the approach is consistent with previous research of youth pro-environmental behavior [47]. Notably, the associations and brand differences on the global brand attitude items were consistent relative to the other survey items studied in this adolescent sample and similar to that found in prior research with adults [34].

Conclusion

NAS cigarettes are one of the fastest growing cigarette brands [2] with other tobacco brands now running copycat marketing campaigns [48]. Marketed as eco-friendly, NAS are generally perceived as the "healthier" brand among adults and, of particular concern found here, among youth. For nonsmoking adolescents, NAS's on-the-pack eco-friendly and health-oriented campaign may contribute to the message that smoking NAS is safer. For adolescents who smoke, the perceived health and environmental advantages of NAS may encourage "switching" (brands) and continued use. Given the known health harms of smoking to individuals,

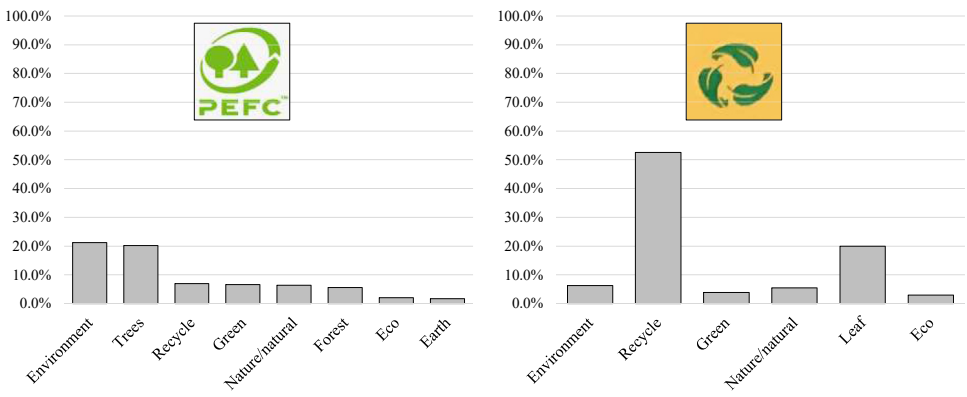

Figure 2. Pack image descriptor responses for the PEFC (left) and leaf recycle logo (right) images on the Natural American Spirit cigarette packs (n = 990 reporting).

those exposed to secondhand smoke, and to the environment, the findings are of public health concern with relevance to regulatory action. Although new graphic warning labels proposed by the FDA would cover 50% of the front and back of cigarette packs in the U.S., none of the messaging addresses the environmental harms of tobacco use [49]. To further address marketing practices that imply reduced risk, the FDA could regulate eco-friendly language and imagery on packaging and advertising for cigarettes, a product with known harms to individuals and the environment.

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Supplementary Data

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