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Tobacco advertising features that may contribute to product appeal among US adolescents and young adults

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ABSTRACT

Introduction: Cigarette advertising is a causal agent of smoking uptake among young people. To mitigate this adverse influence, it is critical to identify specific advertising tactics that appeal to youth and young adults.

Methods: A national sample of adolescents (N=2,619) and young adults (N=2,625) in the United States participated in an online survey in 2018. To assess advertising appeal, participants were shown a cigarette ad, randomly assigned from a pool of 50 advertisements, and asked to report how much they liked the ad, were curious about the advertised product, and interested in using the product. All 50 advertisements were content analyzed for a variety of product descriptors, claims, imagery and appeals (e.g., sweepstakes). Data from the survey and content analysis were merged and mixed effects analyses used to identify the features associated with increased liking, curiosity, and interest in purchasing, referred to collectively as product appeal.

Results: The presence of a sweepstakes offer was associated with increased liking, curiosity and interest among both youth and young adults. Outdoors settings, flora imagery, natural descriptors (e.g., organic), and environmental themes were also associated with increased appeal. The presence of price reductions (e.g., coupons) was associated with decreased appeal among youth, while advertisements featuring people partying were associated with decreased appeal among young adults.

Conclusions: This study identified several advertising tactics associated with increased appeal among youth and young adults. If additional research confirms these findings, the U.S. Food and Drug Association should consider restricting use of these tactics in tobacco advertising.

IMPLICATIONS (93/50-100 words)

This study’s findings provide insight into features of cigarette ads that appeal to youth and young adults. Overall, the presence of sweepstakes appealed to youth and young adults and outdoors and environmental themes were particularly appealing to young adults. Such tactics could serve to further brand engagement, improve brand image and lead to initiation or escalation of use. If confirmatory studies further demonstrate the effects of the tactics identified in this study on youth product appeal, U.S. Food and Drug Administration should consider using its authority to restrict the use of youth-appealing tactics.

INTRODUCTION

Despite declines in cigarette use,[1] 8% of high schoolers[2] and 22% of young adults[3] report smoking in the past 30-days. Tobacco advertising is a key causal contributor to tobacco use.[4,5] Research demonstrates that as young people are exposed to higher levels of tobacco advertising, the likelihood of product initiation and escalation to established use increases.[4,6-9] Moreover, receptivity to – or liking of – tobacco advertising is similarly associated with increased risk of use.[7,8,10-12] This work shows that as receptivity to tobacco advertising increases, youth are more likely to be curious about and interested in using the advertised product.

Despite the effect of tobacco advertising on youth, little work has explored the extent to which specific advertising features and appeals contribute to advertising receptivity and risk of using the product. Analyses of tobacco advertising materials have documented a wide range of advertising tactics used by the tobacco industry that could appeal to youth, such as themes of adventure, rebellion and independence.[4,13,14] However, less is known about how these and other tactics affect adolescents and young adults' progression to product use.

To address this gap, the current study sought to identify features of cigarette ads associated with three outcomes along the continuum of advertising exposure to product susceptibility:[10,12] (1) liking of the ad, (2) curiosity about the advertised product, and (3) interest in using the product among adolescents and young adults. Given the U.S. Food and Drug Administration's ability to regulate youth-appealing advertising, this study's findings can provide insight as to specific advertising features that appeal to young people.

METHODS

Sample/recruitment. We conducted an online survey of 2,619 12-17 year-olds (adolescents) and 2,625 18-24 year-olds (young adults) residing in the US in summer 2017. Participants were recruited from an online national panel using the research firm SSRS (ssrs.org). Individuals on these panels receive invitations to participate in research and are compensated via points, which are deposited into an account and can be cashed out for money.

Procedure. Participants first read an information sheet about the survey and indicated agreement to participate in the study. A waiver of parental consent for adolescent participants was obtained from the Johns Hopkins Bloomberg School of Public Health Institutional Review Board (Protocol #000794). Participants provided sociodemographic information and answered questions about their tobacco use. They were then shown one cigarette ad randomly selected from a pool of 50 cigarette advertisements. The pool of advertisements was derived from a separate study analyzing the content of over 200 cigarette advertisements that ran across media platforms (e.g., print, digital) in the United States during 2016 [see Moran et al. for details].[15] Ads were obtained from two separate sources: Competitrack, a market research firm that monitors and aggregates advertisements from over 10,000 media outlets, including outdoor print, mobile and online sources and Trinkets and Trash (trinketsandtrash.org), a tobacco marketing surveillance system hosted at Rutgers University. The 50 advertisements included in this study represented 7 brands – American Spirit, Camel, Marlboro, Nat Sherman, Newport,

Red Sun and Winston. Ads were selected to encompass more and less popular brands and to represent a variety of advertising strategies. Participants could view the ad for as long as they liked and then report their perceptions while the ad image remained on the screen. Each ad was viewed by 38-65 participants (median = 52 participants).

Outcome measures. The primary outcomes of interest were specific components of product appeal: liking of the ad (referred to as *ad liking*), curiosity about the product in the ad (referred to as *product curiosity*) and interest in using the product (referred to as *use interest*). Ad liking was assessed using a measure adapted from the Population Assessment of Tobacco and Health (PATH) study,[16,17] in which participants were asked how much they liked the ad on a 5-point scale ranging from dislike very much (0), dislike (1), neither dislike nor like (2), like (3) and like very much (4). Product curiosity was assessed by asking participants to indicate how much they agreed with the statement, "This ad made me curious about the product." Use interest was assessed by asking participants to indicate how much agreed with the statement, "This ad made me want to use the product." Agreement for both statements was assessed on a 7-point scale ranging from strongly disagree (0), disagree (1), somewhat disagree (2), neither agree nor disagree (3), somewhat agree (4), agree (5), and strongly agree (6). All three outcome measures were positively skewed and dichotomized. Any positive response toward liking, curiosity or use interest (e.g., agree, like) were combined in a 'yes' category and all neutral responses (e.g., neither agree nor disagree, neither dislike nor like) and negative responses (e.g., disagree; dislike) were combined to create a 'no' category.

Coding of ad features. Each ad viewed by participants was coded for the presence of advertising tactics across nine main dimensions (see Supplemental Table 1): promotions (e.g., sweepstakes, price reductions), web/social media links, use cues, descriptors, claims, activities (e.g., dancing, relaxing), setting, imagery (e.g., flora, fruit), and theme (e.g., masculinity, sociability, environmental). All ads were double coded by two trained coders and discrepancies reconciled through discussion. Full details regarding coding procedures and results of the coding are available in Moran et al.[15]

Analysis. We focused our analysis on features contained in 5% or more of the ads. Ad-level data from the content analysis were merged with participant-level data to produce a dataset that contained individual-level participant demographic and tobacco use information, participant perceptions of the assigned ad (i.e., liking, product curiosity, use interest) and ad-level data on the features present. Analyses were conducted separately for youth and young adults.

We first calculated the percentage of participants who liked the ad, were curious about and interested in using the advertised product by the presence or absence of each advertising feature. Bivariate analyses were used to test significant differences ($p<0.05$) in outcomes by presence of advertising features. Next, we used a series of mixed effects models to better isolate the contribution of any individual ad feature to each outcome. This approach took into account the likelihood that the presence of advertising features may vary by brand (e.g., Marlboro may be more likely to use outdoors themes or masculinity appeals), and potentially co-occur in specific patterns (e.g., activities of manual labor or hunting may be more likely to co-occur

with masculinity themes versus femininity themes) Separate models were used for each outcome. We first ran models of each ad feature individually, with the brand entered as a fixed effect and the ad identifier entered as a random effect to account for the heterogeneity across ads (Model 1). Any variable associated with the outcome at p <.10 in Model 1 was then entered into a model (Model 2) with ad identifier entered as a random effect and brand, participant gender, race/ethnicity, prior exposure to the ad, smoking status (committed never smoker; susceptible never smoker; ever, not past 30 day smoker; past 30 days smoker),[16] and ever use of non-cigarette tobacco products (electronic cigarettes, little cigars/cigarillos, snus and chewing tobacco; entered as a single variable ranging from 0 (used none of these items) to 4 (used all of these items)) as fixed effects. Committed never smokers were those who reported they were “not at all curious” to try cigarettes, would “definitely not” smoke cigarettes in the next year, and would “definitely not” smoke if one of their best friends offered them a cigarette; while, susceptible, never smokers were those who reported any curiosity about trying cigarettes or likelihood that they might try a cigarettes within the next year or smoke if one of their best friends offered them a cigarette.[16] All variables associated with the outcome in Model 2 at p <.05 were entered into a third model together, with ad identifier as a random effect and the same variables from Model 2 as fixed effects.

Finally, to provide additional insight into which advertisements participants found most appealing, we created an overall appeal score by averaging the percentage of participants who liked, were curious about, and interested in using the product for each ad. We report the top five most appealing and least appealing ads to youth and young adults, respectively (see Figure 1).

RESULTS

Participant characteristics are reported in Table 1. Just over half the sample of youth and young adults was female. Approximately two-thirds of the youth sample was non-Hispanic white, while just over half of the young adult sample was non-Hispanic white. About 76% of the youth sample and half of the young adult sample had never tried cigarettes. Similarly, about three-fourths of the youth sample and one-half of the young adult sample had not tried any non-cigarette tobacco products. Most participants (88.2% of youth and 87.0% of young adults) reported they had not previously seen the ad they were exposed to in the study. Overall, 16.2% of youth and 26.1% of young adults liked the cigarette ad they viewed. A greater proportion of young adults were curious about (33.1%) and interested in using (20.3%) the cigarette product featured in the ad. In contrast, a slightly smaller proportion of youth were curious about (20.0%) or interested in using (10.2%) the advertised product.

Specific rates of liking, curiosity, and use interest by the presence or absence of ad features are available in Supplemental Table 2. These analyses indicate several features common to ads with higher levels of liking, curiosity and/or use interest. Among youth, ads containing sweepstakes, giveaways, outdoors settings, flora imagery and everyman themes generated significantly higher use interest, while ads containing price reductions and sociability themes generated significantly lower use interest. Among young adults, ads containing sweepstakes, featuring the product price, sports activities, vacationing, city, farm/ranch or outdoor settings, animal or flora imagery, using the descriptor natural, making claims about the

product's uniqueness, and using environmental, outdoors and everyman themes were generally more appealing, while ads showing the product, featuring the product in use, featuring partying or alcohol use, using the descriptor bold, making claims that the product is fun and using sociability themes were generally less appealing.

To account for potential factors that could confound the relationship between study outcomes and advertising feature, we ran a series of mixed effects models. Table 2 presents results from the mixed effects models for each study outcome among youth. The presence of sweepstakes was associated with greater odds of liking the ad (all models), being curious about the product (all models), and interest in using the product (Models 1 and 2 only). Flora imagery and outdoors settings were associated with greater odds of liking the product (Model 2 only). Discounts were associated with lower odds of liking the ad (all models), being curious about the product (Models 1 and 2 only), and interest in using the product (all models). Animal imagery was associated with lower odds of being curious about the product (Model 1 only) and interest in using the product (Model 1 only), while claims of high quality were associated with lower odds of liking the ad (Model 1 only).

Table 3 presents results from the mixed effects models among young adults. The presence of sweepstakes was associated with greater odds of liking the ad (all models), being curious about the product (all models), and interest in using the product (Models 1 and 2 only). Presence of an outdoors setting was associated with greater odds of liking the ad (Models 1 and 2 only), while city settings were associated with greater odds of being curious about the product (Models 1 and 2 only) and interest in using the product (Models 1 and 2 only). Flora imagery (Models 1 and 2 only) and environmental themes (all models) were associated with greater odds of liking the ad, while natural descriptors were associated with greater odds of product curiosity (all models) and use interest (Model 1 only). Presence of sports activities was associated with greater odds of use interest (Models 1 and 2 only), and partying was associated with lower odds of product curiosity (Models 1 and 2 only) and use interest (all models). Descriptors that highlighted that a product was new were associated with lower odds of product use interest (Models 2 and 3 only).

Finally, we identified the five ads that were the most appealing and the five ads that were the least appealing to participants across the three measures of liking, curiosity, and use interest. Figure 1 presents these ads by overall average appeal score and individual rates of liking, curiosity and product interest. The most appealing ads among youth and young adults were advertisements for Marlboro and Camel. The least appealing ads among youth and young adults included several advertisements for Newport and Red Sun, along with one Camel ad (among youth only) and one American Spirt ad (among young adults only).

DISCUSSION

There are several key findings from this study. First, our results indicate that the presence of sweepstakes is associated with increased ad liking, product curiosity and interest in using the advertised product among both youth and young adults. This is concerning for several reasons. First, sweepstakes are widely used in tobacco advertisements,[15] and youth of lower socioeconomic status and non-Hispanic white youth – two groups who smoke at higher rates[18,19] – report higher

rates of exposure to advertisements with sweepstakes.[20] Second, sweepstakes represent a way for cigarette companies to obtain information about existing and potential consumers.[21] To enter a sweepstakes, individuals provide information about themselves to the company, including contact information that could be used to further direct targeted advertising. Additionally, it is not clear the extent to which individuals in this study understood that a given sweepstakes was in support of a cigarette product. This may be because some ads, while featuring the product's brand name, did not contain product imagery or use. For example, one of the well-liked Marlboro ads (see Figure 1.c, image 1) featured a sweepstakes for a river rafting trip. While this ad used Marlboro's brand name and colors, it only featured a small image of a Marlboro Red cigarette pack and was dominated by the image of a man navigating rapids in a river. The possibility that young people may not have understood that sweepstakes ads were for cigarettes is particularly concerning because the enticing imagery could foster the development of positive brand associations and could lead young people to provide information to cigarette companies, leaving them vulnerable to targeted cigarette marketing.

Several features that could convey a natural or eco-friendly product image, such as environmental themes, natural descriptors, flora imagery and outdoors settings, were also associated with increased ad appeal, particularly among young adults. Natural American Spirit is the cigarette brand most commonly identified with these techniques.[22-27] Although the brand has entered into an agreement with the U.S. Food and Drug Administration to cease use of the terms 'additive-free' and 'natural' in its advertising and labelling, they still engage in a multitude of other techniques to convey a natural product image, including those identified in this analysis.[26-28] Importantly, other brands may use these tactics, as well. In fact, the most liked ad among both youth and young adults was a Marlboro ad touting a project to "protect the forests." Techniques such as these are associated with perceptions of product health and may suggest less risk.[29-35] Additionally, corporate social responsibility appeals, such as environmental stewardship, may be particularly appealing to youth and young adults who are more likely to engage with environmental and social issues compared to older adults.[36] Thus, it is critical to understand the extent to which these advertising features can inaccurately convey reduced product risk for cigarettes or serve to improve the image of a brand or company among young people.

These findings also have implications for policy that focuses on specific advertising features that are broadly considered appealing to youth and young adults. Features that intuitively seem appealing to youth, such as partying and nightlife settings did not emerge as associated with liking, curiosity, or product interest among the youth sample and partying was actually associated with decreased product interest among young adults. On the other hand, outdoors settings, which are not necessarily thought of as youth appealing, were associated with increased liking among youth and young adults. This underscores the complexity of advertising as well as the complexity of youth opinions; future qualitative research with youth and young adults could offer insight into why some advertising features are more or less appealing.

A primary strength of this analysis is that it uses a large stimulus set to assess appeal, which can help separate effects of message content (e.g., advertising

features) from message heterogeneity. A key challenge in studying effects of specific features or appeals in communication stimuli such as advertisements is that every ad is slightly different (i.e., heterogeneous).[37] A feature that is appealing in one ad may be seen as out of place or disruptive when placed in a different ad. For example, prior work has found that features that convey reduced risk in American Spirit ads did not produce the same effect when used in Marlboro ads [Moran, Brown et al]. Thus, when using randomized controlled experiments to test the effects of specific advertising features, it is possible that any found effects may not apply equally across all brands or advertisements. This study used an approach recommended by Slater and colleagues to overcome this limitation.[37] Using a large stimulus set of varied ads, capturing the ways in which those ads vary via content analysis, and then accounting for those potential differences analytically allows for findings to emerge that account for the effect of brand, co-occurring advertising features, as well as unmeasured ad heterogeneity. Despite this strength, this study did not use a controlled experiment to test for the effect of each ad feature (i.e., by comparing identical versions of ads containing or not containing the feature). Confirmatory research using such randomized controlled approaches should further examine this study's findings. Additional limitations are that, while participants were drawn from a national panel, findings may not be representative of all youth and young adults in the United States. It was also beyond the scope of the current paper to conduct analyses by specific sub-groups (e.g., smoking status, gender, race/ethnicity). Because tobacco companies target marketing to specific groups of consumers, these sub-groups are a priority for future analyses.

Conclusion

This study's findings provide insight into the advertising features that appeal to youth and young adults. Under the Family Smoking Prevention and Tobacco Control Act, the U.S. Food and Drug Administration (FDA) has the authority to prevent tobacco companies from marketing in a way that appeals to youth. If confirmatory studies further demonstrate the effects of the tactics identified in this study on youth product appeal, FDA should consider restricting use of those tactics.

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DECLARATION OF INTERESTS

MM serves as a paid expert witness in litigation sponsored by the Public Health Advocacy Institute against RJ Reynolds Tobacco Company. This arrangement has been reviewed and approved by the Johns Hopkins University in accordance with its

conflict of interest policies. The remaining authors have no other conflicts of interest to declare.

Table 1. Demographic characteristics, tobacco use behavior, and exposure outcomes relate
experimental viewing of a cigarette ad[a] among youth (12-17-years old) and young adult (18
old) survey participants (n=5,244)

	Youth (n=2,619)		Youn (n=
	%	n	%
Gender			
Male	45.7	1,198	44.8
Female	52.9	1,385	53.7
Transgender/Genderqueer/Nonconforming/Another gender	1.4	36	1.6
Race			
Non-Hispanic White	60.6	1,587	53.9
Non-Hispanic Black	12.6	330	13.5
Non-Hispanic Asian	5.1	133	7.2
Non-Hispanic Native Hawaiian/Pacific Islander	1.6	43	2.2
Non-Hispanic American Indian/Alaskan Native	2.3	61	1.6
Hispanic	17.2	451	21.1
Missing	0.5	14	0.4
Smoking status			
Committed, never smoker	52.0	1,363	35.7
Susceptible, never smoker	24.4	638	15.7
Ever, not past 30-day smoker	16.5	432	30.1
Past 30-day smoker	6.8	178	17.9
Missing	0.3	8	0.5
# of non-cigarette tobacco products ever used[b]			
0	77.5	2,029	48.0
1	15.3	401	24.8
2	4.6	120	17.4
3	1.2	30	5.8
4	0.6	15	2.4
Missing	0.9	24	1.5
Previously seen the cigarette ad in the last 12 months			
No	88.2	2,310	87.0
Yes	8.5	223	10.1
Missing	3.3	86	2.9
Liked the cigarette ad[c]			
Yes	16.2	423	26.1
No	83.7	2,193	73.8
Missing	0.1	3	0.1
Curious about product advertised in cigarette ad[d]			
Yes	20.0	523	33.1
No	78.6	2,059	65.7
Missing	1.4	37	1.2
Interested in using product advertised in cigarette ad[d]			
Yes	10.2	266	20.3
No	88.8	2,325	78.5
Missing	1.1	28	1.1

[a] Each participant was shown one cigarette ad from a pool of 50 possible cigarette advertisements and

Table 2. Adjusted logistic regression models of liking, curiosity and use interest among youth (12-17-years old) survey participants.

	Liking[a]			**Curiosity**[b]			**Use interest**[c]		
	Model 1 (n=2,616)	**Model 2** (n=2,490)	**Model 3** (n=2,490)	**Model 1** (n=2,582)	**Model 2** (n=2,456)	**Model 3** (n=2,456)	**Model 1** (n=2,591)	**Model 2** (n=2,465)	**Model 3** (n=2,465)
	aOR (95% CI)	**aOR (95% CI)**	**aOR (95% CI)**	**aOR (95% CI)**	**aOR (95% CI)**	**aOR (95% CI)**	**aOR (95% CI)**	**aOR (95% CI)**	**aOR (95% CI)**
Sweepstakes	2.03 (1.23-3.34)**	2.16 (1.23-3.80)**	1.81 (1.07-3.05)*	1.78 (1.2-2.65)**	1.88 (1.20-2.93)**	1.68 (1.06-2.65)*	1.72 (1.05-2.80)*	1.79 (1.02-3.15)*	1.45 (0.81-2.58)
Discount	0.58 (0.38-0.87)**	0.56 (0.35-0.90)*	0.64 (0.41-0.98)*	0.64 (0.47-0.87)**	0.67 (0.47-0.95)*	0.76 (0.53-1.08)	0.55 (0.37-0.81)**	0.53 (0.34-0.83)**	0.58 (0.37-0.93)*
Imagery: Animal	0.66 (0.38-1.12)	--	--	0.63 (0.41-0.97)*	0.69 (0.43-1.12)	--	0.60 (0.36-0.98)*	0.69 (0.39-1.24)	--
Imagery: Flora	1.46 (0.98-2.17)†	1.59 (1.02-2.48)*	1.40 (0.94-2.09)	1.30 (0.96-1.76)	--	--	1.25 (0.86-1.81)	--	--
Setting: Outdoors	1.58 (0.98-2.54)†	1.85 (1.09-3.13)*	1.58 (0.98-2.56)	0.91 (0.63-1.34)	--	--	1.37 (0.88-2.14)	--	--
Claim: High quality	0.47 (0.24-0.91)*	0.49 (0.23-1.04)	--	1.05 (0.64-1.71)	--	--	0.81 (0.44-1.50)	--	--
Claim: Unique	0.35 (0.11-1.06)†	0.35 (0.11-1.12)	--	1.48 (0.77-2.86)	--	--	0.91 (0.39-2.13)	--	--
Activity: Drinking alcohol	0.47 (0.22-1.00)†	0.46 (0.20-1.06)	--	0.73 (0.41-1.30)	--	--	0.82 (0.41-1.67)	--	--

aOR= adjusted Odds Ratio; 95% CI=95% Confidence Interval

†p<.10, *p<.05, **p<.01, ***p<.001.

Model 1 included each feature individually, with product brand as a fixed effect and ad identifier as a random effect.

Model 2 included each feature associated with the outcome at p<.10 in Model 1 entered separately along with product brand, gender, race/ethnicity, prior exposure to the ad, smoking status, and ever use of other tobacco products as fixed effects and ad identifier as a random effect.

Model 3 included all ad features associated with the outcome at p<.05 from Model 2 entered together along with product brand, gender, race/ethnicity, prior exposure to the ad, smoking status, and ever use of other tobacco products as fixed effects and ad identifier as a random effect.

Table 4. Adjusted logistic regression modes of liking, curiosity, and use interest among young adult (18-24-years-old) survey participants

	Liking			**Curiosity**			**Use interest**		
	Model 1 (n=2,622)	**Model 2** (n=2,490)	**Model 3** (n=2,490)	**Model 1** (n=2,593)	**Model 2** (n=2,465)	**Model 3** (n=2,465)	**Model 1** (n=2,595)	**Model 2** (n=2,465)	**Model 3** (n=2,465)
	aOR (95% CI)	**aOR (95% CI)**	**aOR (95% CI)**	**aOR (95% CI)**	**aOR (95% CI)**	**aOR (95% CI)**	**aOR (95% CI)**	**aOR (95% CI)**	**aOR (95% CI)**
Sweepstakes	1.62 (1.17-2.25)**	1.62 (1.12-2.32)**	1.72 (1.27-2.33)***	1.93 (1.45-2.57)***	2.06 (1.54-2.76)***	1.96 (1.41-2.70)***	1.80 (1.33-2.44)***	1.83 (1.30-2.58)***	1.44 (0.94-2.19)
Discount	--	--	--	0.8 (0.61-1.04)†	0.77 (0.59-1.01)	--	--	--	--
Setting: Outdoors	1.40 (1.02-1.93)*	1.47 (1.04-2.08)*	1.18 (0.86-1.60)	--	--	--	--	--	--
Imagery: Flora	1.41 (1.09-1.82)**	1.57 (1.20-2.05)**	1.19 (0.88-1.62)	--	--	--	--	--	--
Setting: City	--	--	--	1.80 (1.17-2.76)**	1.80 (1.16-2.77)**	1.27 (0.83-1.94)	1.64 (1.10-2.44)*	1.66 (1.03-2.66)*	1.30 (0.77-2.21)
Claim: Quality	--	--	--	1.38 (0.95-2.02)†	1.48 (1.00-2.17)*	1.48 (1.05-2.08)*	--	--	--
Activity: Partying	--	--	--	0.46 (0.26-0.81)**	0.48 (0.27-0.86)*	0.81 (0.45-1.46)	0.36 (0.18-0.72)**	0.36 (0.16-0.79)*	0.39 (0.18-0.84)*
Activity: Drinking	--	--	--	--	--	--	0.64 (0.41-1.00)†	0.62 (0.37-1.05)	
Activity: Sports	--	--	--	--	--	--	1.69 (1.11-2.55)*	1.97 (1.23-3.18)**	1.52 (0.89-2.59)
Descriptor: Natural	--	--	--	2.53 (1.42-4.53)**	2.33 (1.28-3.96)**	1.90 (1.03-3.48)*	2.16 (1.12-4.17)*	1.94 (0.92-4.07)	
Descriptor: New	--	--	--	--	--	--	0.65 (0.40-1.06)†	0.51 (0.29-0.90)*	0.55 (0.32-0.97)*
Theme: Environment	1.87 (1.30-2.69)**	2.19 (1.51-3.19)***	1.85 (1.17-2.91)**	--	--	--	--	--	--

Theme: Masculinity	0.49 (0.22-1.07)†	0.51 (0.22-1.18)	--	--	--	--	0.51 (0.23-1.12)†	0.47 (0.19-1.16)	--

aOR= adjusted Odds Ratio; 95% CI=95% Confidence Interval

†p<.10, *p<.05, **p<.01, ***p<.001.

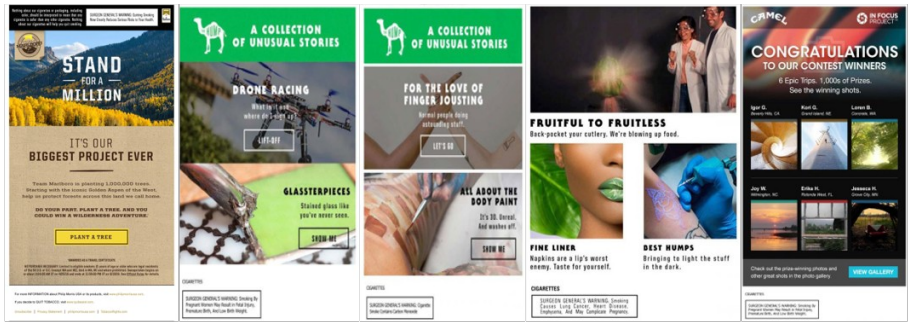
Model 1 included each feature individually, with product brand as a fixed effect and ad identifier as a random effect.

Model 2 included each feature associated with the outcome at p<.10 in Model 1 entered separately along with product brand, gender, race/ethnicity, prior exposure to the ad, smoking status, and ever use of other tobacco products as fixed effects and ad identifier as a random effect.

Model 3 included all ad features associated with the outcome at p<.05 from Model 2 entered together along with product brand, gender, race/ethnicity, prior exposure to the ad, smoking status, and ever use of other tobacco products as fixed effects and ad identifier as a random effect.

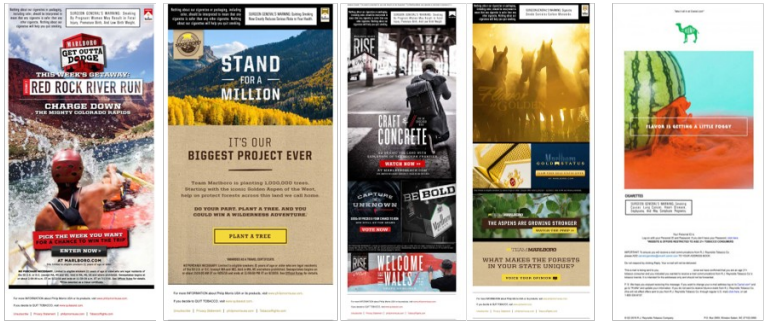
Figure 1. Top five most appealing and least appealing ads based on average appeal score[a] among youth (13-17-years-old) and young adults (18-24-years-old)

a. Youth: Most appealing ads



Appeal: 39.7%	Appeal: 32.6%	Appeal: 30.6%	Appeal: 27.5%	Appeal: 27.0%
Liked: 55.2%	Liked: 35.4%	Liked: 23.1%	Liked: 26.1%	Liked: 28.1%
Curious: 39.7%	Curious: 39.1%	Curious: 47.1%	Curious: 43.5%	Curious: 33.3%
Interested: 24.1%	Interested: 23.4%	Interested: 21.6%	Interested: 13.0%	Interested: 19.6%

c. Young adults: Most appealing ads



Appeal: 45.6%	Appeal: 40.6%	Appeal: 39.2%	Appeal: 36.8%	Appeal: 36.2%
Liked: 47.8%	Liked: 57.5%	Liked: 36.8%	Liked: 36.5%	Liked: 35.6%
Curious: 46.7%	Curious: 40.4%	Curious: 50.9%	Curious: 46.0%	Curious: 49.2%
Interested: 42.2%	Interested: 23.9%	Interested: 29.8%	Interested: 28.0%	Interested: 23.7%

b. Youth: Least appealing ads

Appeal: 3.9%	Appeal: 4.8%	Appeal: 5.6%	Appeal: 6.2%	Appeal: 6.3%
Liked: 1.7%	Liked: 4.1%	Liked: 3.7%	Liked: 3.6%	Liked: 5.2%
Curious: 6.8%	Curious: 8.2%	Curious: 9.3%	Curious: 11.3%	Curious: 13.8%
Interested: 3.3%	Interested: 2.0%	Interested: 3.7%	Interested: 3.8%	Interested: 0.0%

d. Young adults: Least appealing ads

Appeal: 9.4%	Appeal: 12.2%	Appeal: 13.8%	Appeal: 14.3%	Appeal: 15.3%
Liked: 9.4%	Liked: 8.6%	Liked: 17.4%	Liked: 21.3%	Liked: 18.2%
Curious: 9.4%	Curious: 15.8%	Curious: 15.2%	Curious: 15.2%	Curious: 14.8%
Interested: 9.4%	Interested: 12.3%	Interested: 8.7%	Interested: 6.5%	Interested: 13.0%

[a]Appeal score was derived by averaging the prevalence of participants who liked the ad, were curious about, and interested in using the product. For example, the Marlboro ad in the top left column's appeal score of 39.7 = (55.2 (liked) + 39.7 (curious) + 24.1 (interested))/3.

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