

Cigarette Advertising and Adolescent Smoking

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Background: Although most agree that the association between tobacco marketing and youth smoking is causal, few studies have assessed the specificity of this association.

Purpose: This study aims to examine the specificity of the association between cigarette advertising and teen smoking.

Methods: A cross-sectional survey of 3415 German schoolchildren aged 10–17 years was conducted using masked images of six cigarette brands and eight other commercial products in 2008. The exposure variable was a combination of contact frequency (recognition) and brand names (cued recall). Sample quartile (Q) exposure to advertisement exposure was calculated in 2009. Outcome variables were ever tried and current (monthly) smoking, and susceptibility to smoking among never smokers.

Results: The prevalence of ever smoking was 31.1% and that of current smoking was 7.4%, and 35.3% of never smokers were susceptible to smoking. Ad recognition rates ranged from 15% for a regionally advertised cigarette brand to 99% for a sweet. Lucky Strike and Marlboro were the most highly recognized cigarette brands (with ad recognition rates of 55% and 34%, respectively). After controlling for a range of established influences on smoking behaviors, the adjusted ORs for having tried smoking were 1.97 (95% CI=1.40, 2.77) for Q4 exposure to cigarette ads compared with adolescents in Q1, 2.90 (95% CI=1.48, 5.66) for current smoking, and 1.79 (95% CI=1.32, 2.43) for susceptibility to smoking among never smokers. Exposure to ads for commercial products other than cigarettes was significantly associated with smoking in crude but not multivariate models.

Conclusions: This study underlines the specificity of the relationship between tobacco marketing and youth smoking, with exposure to cigarette ads, but not other ads, being associated with smoking behavior and intentions to smoke. This finding suggests a content-related effect of tobacco advertisements.

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Introduction

Smoking typically begins during childhood¹ and will be responsible for more than 1 billion deaths worldwide during the 21st century if current patterns of smoking continue.² One way of controlling the smoking epidemic is to prevent youth from taking up the behavior. Adolescents initiate smoking primarily for social reasons.³ Tobacco marketing is one socializing agent linked with youth smoking, and this serves as the basis for con-

trols on smoking marketing contained in the WHO Framework Convention on Tobacco Control,⁴ in which Article 13 recognizes that a comprehensive ban on tobacco marketing would reduce consumption.

After the Second World War, Germany was a “paradise” for the tobacco industry, with few effective tobacco control measures in place.⁵ The extent of the influence of the tobacco industry over German politics and scientists was profound.^{6,7} For example, on two occasions, and partnering with multinational tobacco companies, the German government challenged European Union directives on tobacco advertising and sponsorship in the European Court of Justice in Luxembourg.⁸ Nevertheless, advertising restrictions were implemented gradually, beginning with a partial ban on tobacco marketing on TV and radio in 1975 and a ban on the distribution of promotional packages in 2004. On December 12, 2006, the

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Court of Justice dismissed the case, the result being a tobacco advertising ban in newspapers and magazines in Germany. Currently, tobacco advertising is allowed (1) at point of sale, (2) on billboards, and (3) in cinemas prior to movies that show after 6:00PM. Brand stretching is also legally possible.

The current study was conducted to assess the influence of tobacco advertising on smoking behavior among young people in a country with partial advertising restrictions. The association between tobacco advertising and promotion has been the subject of a substantial number of studies,⁹⁻¹¹ but few have tested the effect of tobacco advertising compared with ads for other commercial products.^{12,13} Thus, the relationship, although considered causal,^{10,14} lacks evidence for specificity. The finding of an association between tobacco advertising and youth smoking behavior in a study that also included exposure measures for other products would make a strong case for the conclusion that it is exposure to tobacco advertising content, not general advertising receptivity, that prompts youth smoking behavior.

Methods

Sample Selection

The study sample was recruited in three states of Germany, in Schleswig-Holstein, Hamburg, and Brandenburg, and covers rural and urban as well as the eastern and western parts of Germany. From the official lists with a total of 744 schools, 120 schools were randomly drawn and invited for participation in May 2008 (Figure 1). The drawing was stratified by type of school, ensuring a balanced representation of all German school types. All sixth- to eighth-grade students of the respective schools were eligible for participation. Twenty-nine schools with altogether 176 classes and 4195 sixth- to eighth-grade students agreed to participate. When

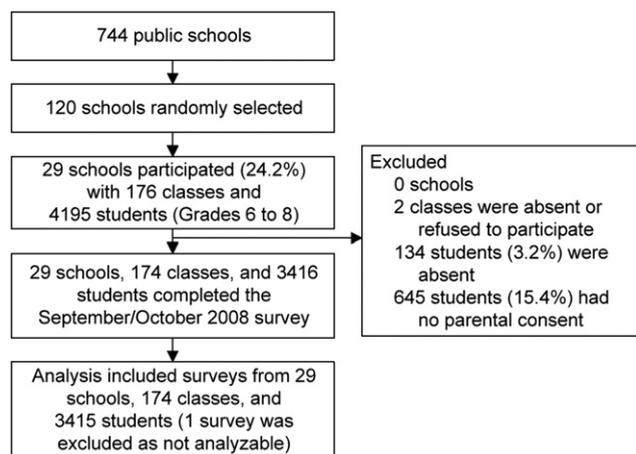


Figure 1. Study participation flow chart

stratified by type of school, recruited schools did not differ in their composition from the official school statistics ($\chi^2(3)=0.74$, not significant). Six hundred forty-five students had to be excluded in advance as they did not provide parental written permission; 134 students were absent on the day of the survey; and one questionnaire was not analyzable because of unreadable or inconsistent data, resulting in a final sample of 3415 students (81.4%).

Study Approval and Data Assessment

Study implementation was approved by the ministries of cultural affairs of the three involved states. Ethical approval was obtained from the ethical committee of the medical faculty of the University of Kiel. Data were collected through self-completed questionnaires, administered by trained research staff. Teachers of all classes were requested to stay seated at the front desk during data collection to emphasize confidentiality of responses and facilitate honest reporting of cigarette use. After completion of the survey, the questionnaires were placed in an envelope and sealed in front of the class. Students were assured that their individual information would not be seen by parents or school administrators.

Measures

Student self-reports included (1) demographic data (age and gender); (2) advertising exposure measures; (3) outcome measures (smoking-related intentions and behavior); and (4) potential covariates.

Advertising exposure. Measuring advertising exposure is a challenging task and has been operationalized in numerous ways across studies. The method used in the present study is drawn from an earlier work.¹⁵ It is based on psychological theories of attention and memory and operationalizes ad exposure as ad recognition and brand recall performance. Students were provided with masked colored images of different advertisements (fixed images of billboard images for cigarette ads and mostly TV commercials for the other ads), with all brand information digitally removed (Figure 2).

The images included six cigarette brands, and eight “control” ads for products that included sweets, clothes, mobile phones, and cars. The following cigarette brands were included in the survey (with ad theme or cue in parentheses): (1) Marlboro (cowboy, horses); (2) F6 (sunrise); (3) Gauloises (couple); (4) Pall Mall (Empire State Building); (5) L&M (couple); and (6) Lucky Strike (cigarette packs). These six are among the eight most popular cigarette brands in Germany.¹⁶ For other commercial products, the following ads were included in the survey (with product type and ad theme or cue in parentheses): (1) Jack Wolfskin (trekking-clothing; climber); (2) Volkswagen (car; the performer Seal); (3) Tic Tac (candy; elevator); (4) Dr. Best (toothbrush; tomato); (5) Kinder Pingui (sweet; pen-

F2



Figure 2. Example of masked stimulus material
Masked ad for Marlboro (left); masked ad for Tic Tac (a candy) (right)

guins); (6) T-Mobile (mobile phone; dog); (7) Spee (detergent; fox); and (8) Toyota (car).

For each ad image, students were asked to rate how often they had seen the ad extract (on a 4-point scale with scale points 0=Never, 1=1 to 4 times, 2=5 to 10 times, and 3=More than 10 times) and which brand was advertised (open format). Correct brand names were postcoded as 1 and all other answers as 0 (misspellings of brands were counted as correct). Because contact frequency and cued brand recall were highly internally consistent, the two measures were combined into a single scale that was labeled “ad exposure.” Cronbach alpha was 0.74 for both the cigarette ads and the other ads.

Smoking-related intentions and behavior. Whether a participant had ever tried smoking was determined through the question *How many cigarettes have you smoked in your life?* The response *none* was categorized as *never smoked*, and all other responses (i.e., *just a few puffs*, *1–19 cigarettes*, *20–100 cigarettes*, and *>100 cigarettes*) as *tried smoking*.¹⁷ Current smoking was assessed by asking, *How often do you smoke at present?* to which respondents could answer *I don’t smoke*, *less than once a month*, *at least once a month*, *but not weekly*, *at least once a week*, *but not daily*, or *every day*. Those who reported smoking at least once a month are defined as current smokers.

Following the susceptibility concept of Pierce, attitudinal susceptibility to smoking among never smokers¹⁸ was assessed with the following items: *Do you think you will try a cigarette soon?* and *If one of your friends offered you a cigarette, would you smoke it?* Response categories for both items were *definitely not*, *probably not*, *probably yes*, and *definitely yes*. Only those who responded with *definitely not* to both questions were categorized as not susceptible to smoking.

Covariates. Covariates were included to assess the independent association between exposure to tobacco advertising and

adolescent smoking. The following factors were included as covariates because they were, based on previous research,^{19,20} associated with exposure to tobacco advertising and adolescent smoking and not considered to be part of the causal pathway between the exposure and the behavioral outcome. Sociodemographic factors included age, gender, and SES. Socioeconomic status of the students was approximated with three items of the Programme for International Student

Assessment (PISA) cultural and social capital assessment,²¹ asking for the number of books in the household (on a 5-point scale from 0=*none* to 4=*more than 100*) and parenting characteristics: *My parents always know where I am* and *My parents know other parents from my school*, with the following response categories: *not at all true*, *a little true*, *pretty much true*, or *very much true*.

Covariates that were used to assess social influences on smoking included the smoking status of parents (*Does one of your parents smoke?* 0=*no*, 1=*yes*) and the smoking status of peers (*How many of your friends smoke?* 0=*none*, 1=*some*, 2=*most*, 3=*all*). The analysis controlled for personality characteristics that might prompt adolescents to be more attentive to tobacco advertising. Rebelliousness and sensation seeking were assessed using four items combined into a single index, with higher scores indicating greater propensity for rebelliousness and sensation seeking (Cronbach alpha=0.76)²²: *I get in trouble in school*, *I do things my parents wouldn’t want me to do*, *I like scary things*, and *I like to do dangerous things*. Response categories were *not at all like me*, *a little like me*, *pretty much like me*, or *exactly like me*. Also included as covariates were self-reported school performance (*How would you describe your grades last year?* with the response categories of *excellent*, *good*, *average*, or *below average*) and average TV screen time (*How many hours do you usually watch TV in your leisure time?* with the following scale points: *none*, *about half an hour*, *about an hour*, *about two hours*, *about three hours*, *about four hours*, or *more than four hours a day*).

Statistical Analysis

All data analyses were conducted in August 2009 with Stata, version 10.0. Lowess (locally weighted scatter plot) smoothed

methods were used to graph the form of the relationship between exposure to advertisements and adolescent smoking.²³ The multivariate associations between amount of advertising exposure and smoking behavior were analyzed with multilevel mixed-effects logistic regressions using Stata's "xtmelogit" command. The dichotomized outcome variables lifetime and current smoking were regressed on advertising exposure (which was parsed into quartiles) with random effects for school and class. In a first step, unadjusted models were specified, with cigarette advertising, other advertising exposure, or covariates entered as a fixed effect. In the more complex models, all covariates were entered, with the two advertising exposure types (cigarette vs. other commercial products) as fixed effects. In each model, the first (lowest) quartile of exposure to advertising served as the reference category. The multivariate associations between advertising exposure and smoking susceptibility were modeled in the same way, but for only the subsample of adolescents who had never smoked a cigarette.

Results

Description of the Sample

The final sample consisted of 3415 students, of whom 51.6% were girls. The mean age was 12.5 years (SD=1.06), with a range of 10–17 years and a median of 12 years. Forty-four percent of the students attended Gymnasium schools, which recruit students with higher academic skills and from higher-SES backgrounds; 56% attended other school types with lower academic requirements and lower-SES backgrounds.

Exposure to Advertisements

T1 Table 1 gives recognition (how often the student had seen the ad) and cued recall (how often the student correctly identified the brand) rates for all advertised products. In general and for all products, at least one-time recognition rates are higher than cued recall rates. The two most highly recalled cigarette brands were Lucky Strike and Marlboro, for which cued recall rates were 22% and 24%, respectively. The lowest ad recognition rate was found for F6, a regional German cigarette brand sold mainly in the former German Democratic Republic. Ad recognition for other products was generally much higher than for cigarette brands. For example, 89% reported ever seeing an ad for Tic Tac candy and 77% correctly identified the brand.

Association Between Exposure to Advertisements and Adolescent Smoking

The prevalence of ever tried smoking was 0.311, of current smoking 0.074, and of susceptibility to smoking among never smokers 0.353. The smoothed lowess curves

Table 1. Recognition and cued recall rates, %

Brand	Recognition		Cued recall of brand
	At least 1 time	>10 times	
Cigarettes			
Lucky Strike	55	18	22
Marlboro	34	7	24
Pall Mall	31	10	8
L&M	24	7	4
Gauloises	20	2	0
F6	15	2	4
Other products			
Kinder Pingui	99	76	89
Tic Tac	89	49	77
Dr. Best	87	43	36
T-Mobile	86	39	33
Spee	80	31	36
Volkswagen	55	17	13
Toyota	55	13	10
Jack Wolfskin	42	9	27

in Figure 3 illustrate a positive curvilinear association between exposure to cigarette ads (as a continuous variable) and adolescent ever smoking as well as current smoking. Graphs depicting the relationship between cigarette ad exposure and having ever tried smoking show that the prevalence rises from between 0.1 and 0.2 for low-exposure adolescents to include almost all of the high-exposure adolescents, for whom the prevalence is upwards of 0.9. Similarly, whereas the proportion of current smokers among low-exposure adolescents is about 0.05, the proportion of current smokers in the high-exposure range exceeds 0.60. Further, the shape of the curves is different for cigarette ads versus those for other ads. Whereas the dose response attenuates with higher levels of exposure to other ads, it appears to strengthen with higher levels of exposure to cigarette ads. Figure 3 also illustrates that the crude association between exposure to other commercial ads and youth smoking is weaker than that for cigarette ads.

Multivariate Analysis

Table 2 gives crude and adjusted ORs for the relationship between advertising exposure and smoking for the full sample and for susceptibility to smoking among never smokers. As described in the Methods section, exposure

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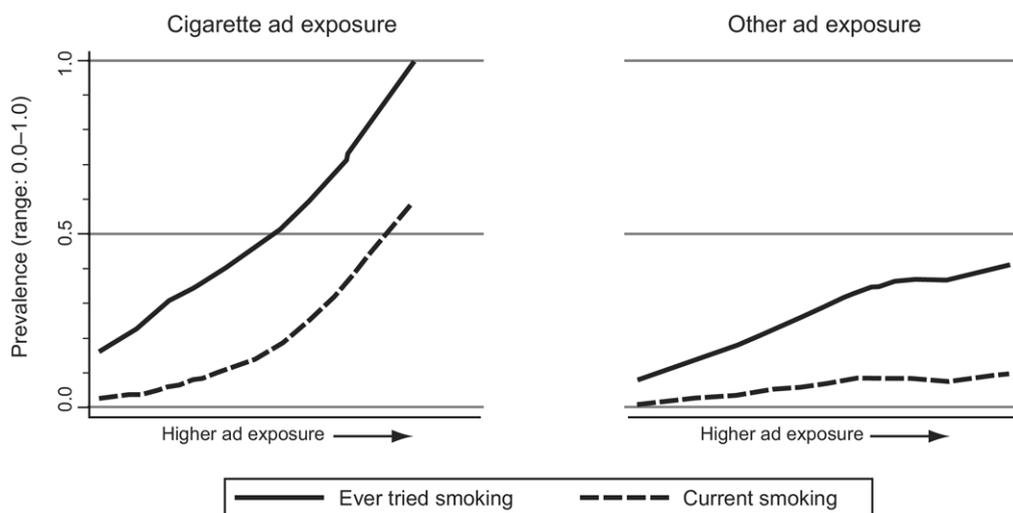


Figure 3. Crude association between exposure to advertisements and youth smoking

to cigarette and other ads was parsed into quartiles, and Quartile-1 (Q1) category of exposure served as the referent category. Adolescents in Q2–Q4 for cigarette ad and other ad exposure were significantly more likely to (1) have tried smoking, (2) to smoke currently, and (3) to be susceptible to smoking. Cigarette ad exposure retained a significant relationship with all three outcomes in the multivariate analysis. In contrast, advertisements for other commercial products had no significant association with youth smoking or susceptibility to smoking. The strength of the adjusted relationship between cigarette ads and current smoking was somewhat weaker than for ever smoking, with the adjusted ORs for Q2 and Q3 not retaining significance. No interaction effect was found of general receptiveness to advertising with the relationship between tobacco ad exposure and attitudes/behavior.

Discussion

The current study focuses primarily on specificity of the finding of an association between cigarette advertising and teen smoking. The question considered here is whether the advertising effect is simply a marker of an adolescent who is generally receptive to many forms of advertising or whether the effect is attributable to cigarette ad content specifically. An advertisement exposure measure was applied that involves ad recognition as well as cued brand recall in order to parse exposure to cigarette content from advertising content for other products. The study shows that there is a dose–response relationship between both types of exposure and behavioral smoking outcomes, but that only specific tobacco marketing content retains a significant relationship with youth smoking in a multivariate analysis. Study results suggest that the association between tobacco advertising and

youth smoking is specific to tobacco advertising content and not simply a marker of an adolescent who is generally receptive to marketing.

Numerous studies have investigated the effect of tobacco advertising on youth smoking initiation. Much of this research is epidemiologic in nature. In a landmark paper,²⁴ Sir Austin Bradford Hill defined criteria for determining causality from epidemio-

logic study designs. A recent systematic review¹⁰ applied the Hill criteria to determine whether there is evidence of a causal link between exposure to tobacco promotion and tobacco use in children. The authors came to the conclusion that exposure to tobacco promotion causes children to initiate tobacco use, but the review did not mention the Hill criterion of specificity. The present study contributes to the already large literature on tobacco advertising and youth smoking by addressing the specificity issue.

Several study limitations should be addressed, the most important one being the cross-sectional design, which makes it impossible to determine the temporal sequence of events. However, previous longitudinal studies have shown that advertising exposure predicts behavior among never smokers. Given the plethora of previous longitudinal work,^{9,10} cross-sectional designs such as the present one are good ways to explore new aspects of the relationship. In addition, cross-sectional designs can partially allay the reverse-causality argument by focusing on attitudes among never smokers. The current finding of a significant association between exposure to cigarette advertisements and susceptibility to smoking among never smokers suggests that the findings are not simply explained by smokers being more likely to notice cigarette ads. The present study is not able to distinguish how contextual features of the media environment (where on a bus is an ad placed, before what movie is an ad shown, what friends are present with the target adolescent at the movie) affect response to advertising images. This area may be an important theme for future experimental research.

The observed dose–response relationship between cigarette advertising exposure and smoking behavior

Table 2. Relationship between exposure to advertisements and adolescent smoking-related intentions and behavior, OR (95% CI)

	Crude	Adjusted ^a
Outcome: ever tried smoking		
Cigarette ad exposure		
Q1	ref	ref
Q2	1.81 (1.41, 2.33)	1.26 (0.94, 1.69)
Q3	3.49 (2.68, 4.54)	1.60 (1.17, 2.18)
Q4	6.17 (4.65, 8.20)	1.97 (1.40, 2.77)
Other ad exposure		
Q1	ref	ref
Q2	1.40 (1.09, 1.79)	1.16 (0.86, 1.57)
Q3	1.88 (1.47, 2.41)	1.29 (0.96, 1.74)
Q4	2.15 (1.65, 2.81)	1.20 (0.87, 1.68)
Outcome: current smoking		
Cigarette ad exposure		
Q1	ref	ref
Q2	1.65 (0.96, 2.83)	1.28 (0.67, 2.47)
Q3	3.16 (1.85, 5.38)	1.29 (0.66, 2.54)
Q4	10.47 (6.31, 17.38)	2.90 (1.48, 5.66)
Other ad exposure		
Q1	ref	ref
Q2	1.05 (0.67, 1.65)	0.73 (0.40, 1.35)
Q3	1.52 (0.99, 2.33)	0.90 (0.50, 1.62)
Q4	1.44 (0.89, 2.33)	0.61 (0.31, 1.23)
Outcome: susceptibility to smoking among never smokers		
Cigarette ad exposure		
Q1	ref	ref
Q2	1.74 (1.33, 2.27)	1.52 (1.15, 2.01)
Q3	2.19 (1.72, 2.77)	1.82 (1.41, 2.36)
Q4	2.44 (1.87, 3.18)	1.79 (1.32, 2.43)
Other ad exposure		
Q1	ref	ref
Q2	1.23 (0.96, 1.56)	1.02 (0.78, 1.32)
Q3	1.50 (1.18, 1.90)	1.13 (0.86, 1.47)
Q4	1.69 (1.30, 2.18)	1.24 (0.92, 1.67)

^aAdjusted for age, gender, parent and friend smoking, school performance, rebelliousness and sensation seeking, TV screen time, SES, state, and cigarette ad exposure with respect to other ad exposure.

Q, quartile

in youth, illustrated in Figure 3, confirms other reports. On the basis of evidence from two prospective^{25,26} and seven cross-sectional studies²⁷⁻³³ that involved more than 25,000 adolescents, the authors of a recent review¹⁰ concluded that “there is a dose-response relationship, with greater exposure resulting in higher risk.” By creating a continuous ad exposure measure from responses to multiple advertising images, the ad exposure measure reported in the current study allows for a more sensitive assessment of dose-response than has been possible so far with three- or four-level advertising receptivity measures.^{34,35}

The findings may have some policy implications for countries with partial advertising bans. For this sample of German adolescents, it is reasonable to suggest that lower general recognition and cued recall rates for cigarette brands compared to other commercial products are due to the advertising restriction for tobacco products in the country. Although most of the nontobacco products are advertised on TV, it is illegal to advertise cigarettes on TV in Germany. However, even with this partial ban, one quarter of young adolescents could identify the brand of two premium cigarette ads just by looking at the masked brand image. The results suggest that the partial ad ban in Germany is not fully effective.

Cross-cultural studies of advertising exposure in countries with different levels of ad bans could also shed light on how restrictive a ban needs to be to effectively shield young adolescents from the tobacco advertising message. Several econometric studies^{36,37} using aggregate data on tobacco consumption generated from from 22 Organization for Economic Cooperation and Development (OECD) countries employing time-series analysis suggested that partial advertising bans would have little or no influence on aggregate consumption, whereas complete bans would significantly reduce consumption at the population level.

In summary, the current study presents an ad exposure measure based on ad image recognition and cued brand recall that allows continuous measurement of exposure to tobacco and other ads. Whereas both measures have a bivariate dose-response association with youth smoking outcomes and susceptibility to smoking, only the variable that measures exposure to tobacco ad content retains a multivariate association. The current study argues that the tobacco ad-youth smoking association is specific to tobacco ad content.

A total ban of tobacco advertising and promotion around the world is one key policy measure of the WHO Framework Convention on Tobacco Control.³⁸ Data from the current study support this measure, because a clear dose-response relationship between exposure to

cigarette ads and smoking intentions and behavior was found even in a country with some tobacco advertising restrictions in place.

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