Attitudes as Mediators of the Longitudinal Association Between Alcohol Advertising and Youth Drinking

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Objective: To test the hypothesis that changes in alcohol-related attitudes and expectancies mediate the effect of alcohol advertising on youth drinking.

Design: Longitudinal survey with a 9-month interval.

Setting: Twenty-nine public schools in 3 German states.

Participants: A total of 2130 sixth- to eighth-grade students (age range, 11-17 years; mean, 12.2 years) who were nondrinkers at baseline.

Main Exposures: Exposure to alcohol and nonalcohol advertising was measured at baseline with masked images of 17 commercial advertisements with all brand information digitally removed; students indicated contact frequency and brand names.

Outcome Measures: Positive attitudes toward alcohol, current alcohol use, lifetime binge drinking.

Results: A total of 581 of the students (28%) started to drink alcohol during the observation period. Alcohol use initiation was positively related to baseline alcohol advertisement exposure. This effect of alcohol advertisement exposure on alcohol use was partially mediated by a change in alcohol-related attitudes, which explained about 35% of the total effect after controlling for baseline covariates and exposure to other advertising contents. The analysis revealed similar results for binge-drinking initiation.

Conclusion: More favorable attitudes about alcohol may be one path through which alcohol advertising exerts behavioral influence.


EXPOSURE TO ALCOHOL MARKETING and advertising is one factor that might encourage young people to consume alcoholic beverages. Despite growing evidence in support of the association between exposure to alcohol advertising and drinking behaviors,1,2 there have been few studies of the psychological mechanisms that underlie the association.2-4 Knowledge about these mechanisms is not merely of theoretical value. Studies on the intermediate cognitive steps that recipients of advertising pass through can help identify the key components of advertising and support the development of intervention programs, for example, media literacy training.5,6

Most psychological theories of advertising effects are termed hierarchy of effects models.3,7,8 These theories share the assumption that advertising must have some intermediate type of response, consciously or unconsciously, that has some mental effect before it can influence behavior. The 2 major intermediate responses relate to cognition (thinking) and affect (feeling); this is also shared by most theories.8 Some theoretical and empirical debate surrounds the sequence of cognition and affect, ie, if thinking comes before feeling or vice versa, and whether there is a hierarchy at all that is measurable in a temporal sequence. However, on a general level, there seems to be consensus that one of the mental effects of advertising is a change in attitude toward the product and the brand, in the broadest sense defined as a change in object valence.9

With the present study, we do not aim to solve any of the fundamental theoretical issues (eg, if attitudes should be seen as affective rather than cognitive). We aim to apply the concept of intermediate responses to the study of alcohol advertising effects literature and to empirically test...
a simple path model that conceptualizes attitude toward alcohol as a mediator of the effect of alcohol advertising on behavior.

### STUDY METHODS

In May 2008 we invited 120 randomly selected schools from 3 states in Germany (Brandenburg, Hamburg, and Schleswig-Holstein) to participate in a school-based survey. The German school system has different types of schools (Hauptschule, Realschule, Oberschule, Gemeinschaftsschule, and Gymnasium) that differ regarding the academic skills of their students. The selection was stratified by region and type of school, assuring a balanced representation of all school types in the respective states. Twenty-nine schools with 176 classes participated, and 4195 sixth- to eighth-grade students agreed to participate in the respective states. Twenty-nine schools with 176 classes participated, and 4195 sixth- to eighth-grade students agreed to participate after a 4-week recruitment interval. School type of participation and, irrespective of parental consent, all students were invited to participate. After completion of tasks for students who did not participate. After completion of tasks for students who did not participate. After completion of tasks for students who did not participate. After completion of tasks for students who did not participate. After completion of tasks for students who did not participate.

#### SURVEY

Data were collected using self-completed anonymous questionnaires during one school hour (a 45-minute period) administered by trained research staff. Only students with written parental consent were qualified for participation; consent forms were disseminated by teachers 3 weeks prior to the baseline assessment. Students did not receive incentives for participation and, irrespective of parental consent, all students were free to refuse participation (none refused). Teachers assigned tasks for students who did not participate. After completion of the survey, questionnaires were placed in an envelope and sealed in front of the class. Students were assured that their information would not be seen by parents or teachers. To permit linking of individuals’ information to subsequent surveys, each questionnaire was labeled with a 7-digit code generated by the student, a procedure that had been tested in previous studies and was slightly modified for this trial. Study implementation was approved by all Ministries of Cultural Affairs of the 3 states, and ethical approval was obtained from the ethical committee of the medical faculty of the University of Kiel (Reference No. D 417/08).

### MEASURES

#### Advertising Exposure

Advertising exposure has been operationalized in numerous ways across studies. Researchers have measured advertising exposure both in terms of the physical presence of advertisements in individuals’ environments and in terms of psychological processes underlying individuals’ memories of these advertisements. The method used in our study is nearer to the second interpretation of exposure and operationalizes advertising exposure as contact frequency and brand recall performance, a procedure that has been successfully used in other studies. Students were provided with masked colored images of different advertisements (fixed images of television commercials) with all brand information digitally removed. Advertising selection was based on a pilot study of 34 alcohol and nonalcohol television advertisements (110 students aged 11 to 16 years; mean age, 13.6 years), selecting the half of the advertisements that revealed neither ceiling nor floor effects and had corrected item-test correlations greater than $r_{w^2}=0.40$. The final sample of 17 images used in the main study included 9 alcohol advertisements, mostly for beer or mixed beer drinks, and 8 control advertisements for other products (Table 1, eFigure 1, and eFigure 2; http://www.archpediatrics.com).

We assessed advertising exposure to other products to control for receptiveness to advertising in general, which could confound the relationship between alcohol-specific advertising exposure and drinking behavior. For each advertising image, students were asked to rate how often they had seen the respective advertisement (on a 4-point scale: 0 indicates never; 1, 1-4 times; 2, 5-10 times; and 3, more than 10 times) and which brand was advertised (open format). Correct brand names were

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<tr>
<th>Table 1. Description of Stimulus Material Contact Frequencies and Cued Brand Recall for Students Who Were Nondrinkers at Baseline (n=2130)</th>
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<td>Jack Wolfskin</td>
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post-coded as 1 and all other answers as 0. Contact frequency and cued brand recall for the 2 sets of advertising items were combined into scales labeled “alcohol ad exposure” and “other ad exposure.” The scales were internally consistent with Cronbach α values of .82 and .75 for the alcohol and the nonalcohol advertising scales, respectively.

Alcohol-Related Attitude and Outcome Expectancies

As a prebehavioral outcome measure, we asked students to rate alcohol as (1) being relaxing, (2) making you more outgoing, (3) putting you in a good mood, and (4) being something positive (rating scale from 0, not true at all, to 3, totally true). Because these 4 items were highly internally consistent (Cronbach α = .83) and loaded all on a single factor, we decided to skip the differentiation of attitudes and expectancies and summed the 4 items up to build the “positive attitudes towards alcohol” index (range, 0 to 3).

Alcohol Use

The alcohol use measures were derived from the European School Survey Project on Alcohol and Other Drugs study" and the Exchange on Drug Demand Reduction Action data bank. Current alcohol use was measured with the question, “How often do you currently drink alcohol?” (on a 5-point scale with scale points 0, never; 1, less than once a month; 2, at least once a month but not every week; 3, at least once a week but not daily; and 4, daily) and lifetime binge drinking with, “How often have you had 5 or more drinks on one occasion?” (0, never; 1, once; 2, 2-5 times; and 3, more than 5 times). Students with a value of 0 on the current use and binge drinking measures were classified as nondrinkers and never-bingers, respectively.

Covariates

Covariate measures were derived from studies that focus on risk factors of adolescent alcohol use, to control for confounding variables that would be theoretically related to advertisement exposure and alcohol use measures. Three potential confounders were included. (1) Sociodemographics included age, sex, study region, and socioeconomic status. The socioeconomic status of the students was approximated with a combination of student and teacher ratings; students answered 3 items of the Program for International Student Assessment cultural and social capital assessment, which asked for the number of books in the household (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). Teachers filled out an 11-item school evaluation sheet related to the socioeconomic status of their students (eg, Most students of the school live in families with financial problems, Most students of the school come from underprivileged families, and Our school has a good reputation); the scale ranged from 0, not true at all, to 3, totally true; Cronbach α = .85; student and teacher ratings were positively correlated (r = 0.57; α = 0.72). (2) Personal characteristics included self-reported school performance (How would you describe your grades last year?; scale points: excellent, good, average, and below average); average television screen time (How many hours do you usually watch TV in your leisure time?; scale points: none, about half an hour, about an hour, about 2 hours, about 3 hours, about 4 hours, and more than 4 hours a day); rebelliousness and sensation-seeking, assessed with 4 items combined into a single index, with higher scores indicating greater propensity for rebelliousness and sensation-seeking (3) putting you in a good mood, and (4) being something positive (rating scale from 0, not true at all, to 3, totally true). Because these 4 items were highly internally consistent (Cronbach α = .83) and loaded all on a single factor, we decided to skip the differentiation of attitudes and expectancies and summed the 4 items up to build the “positive attitudes towards alcohol” index (range, 0 to 3).

STATISTICAL ANALYSIS

Stata 11.0 (Stata Corp, College Station, Texas) was used for the initial analyses. The χ-square and t tests were performed to check whether subjects included in the analysis differed systematically from those who were not reached at the second assessment. Indirect (mediated) effects analyses were performed in Mplus 5.1.24 Path estimates were calculated by maximum likelihood estimation. As the students were nested within schools, we used a multilevel mediation approach as described by MacKinnon,25 in which maximum likelihood estimates have standard errors that are adjusted for the nonindependence of observations within clusters. The significance of indirect effects was tested with the delta method (Sobel z test) because Mplus does not yet have the possibility to use the bootstrapping function in a multilevel analysis. We tested for linearity of the direct and indirect advertising relationships and found them to be linear; we thus fit a linear model. The final model included all covariates as exogenous variables. All estimates presented are standardized estimates to be interpreted in terms of standard deviations. For example, an estimate of 0.10 means that each 1-SD increase in 1 variable is associated with a 0.1-SD increase in the other.

ATTENTION ANALYSIS

The sample was restricted to nondrinkers at baseline. Overall, 11.3% of the sample was lost to follow-up. Study dropout was related to 4 variables: those lost to follow-up (n = 228) were older (P < .001), had higher on sensation seeking/rebelliousness (P = .005), reported poorer school performance (P < .001), had higher on sensation seeking/rebelliousness (P = .001), and had more friends who used alcohol (P < .001).

CHARACTERISTICS OF THE STUDY SAMPLE

The final sample for the analysis consisted of 2130 students. Fifty-three percent were female, and the mean age at baseline was 12.2 years (range, 10-17 years). Forty-six percent of the students attended Gymnasium schools, which recruit students with higher academic skills and from higher socioeconomic backgrounds; 54% attended other school types with lower academic requirements and lower socioeconomic status.

EXPOSURE TO ALCOHOL AND NONALCOHOL ADVERTISING AT BASELINE

Table 1 gives contact frequencies (how often the student had seen the advertisement) and cued recall (how often the student correctly identified the brand) performance.
for all advertised products at baseline. There was variation in exposure between advertisements, with some seen by more than 90% and others seen by less than 30%. Whereas few students (n = 45) reported not having seen any of the alcohol advertisements, about 6% (n = 126) had seen all of the advertisements at least once; an average of 5 alcohol advertisements were seen. The most frequently recalled alcohol brand was Jägermeister, a liqueur brand, and the highest brand recall rate for nonalcohol brands was for Kinder Pingui (89%), a milk chocolate bar. Contact frequency and cued brand recall was generally higher for the nonalcohol advertisements (Table 1).

ALCOHOL USE AND ALCOHOL-RELATED ATTITUDES

Some 28% (n = 581) of the baseline nondrinkers were current drinkers at the second assessment, and about 13% (n = 276) of the baseline never-bingers reported binge-drinking at least once (Table 2). Alcohol-related attitudes changed from baseline to follow-up in more than half of the students; 13% reported less positive attitudes toward alcohol compared with 46% who had more positive attitudes toward alcohol on follow-up. The remaining 41% of the students had stable attitudes.

ZERO-ORDER RELATIONSHIPS

Table 3 displays the zero-order correlations between the study variables that confirmed significant crude associations between the central constructs. Exposure to alcohol advertising at baseline was positively correlated with alcohol use and binge drinking initiation as well as with more positive attitudes toward alcohol on follow-up (changes in attitudes generated by subtracting baseline attitudes from posttest attitudes). There was also a significant correlation between increases in positive attitudes and alcohol use initiation (r = 0.34) and binge drinking initiation (r = 0.28).

TEST FOR INDIRECT EFFECTS

The results from the path model are presented in Figure. The model shows that alcohol advertising exposure has a significant direct effect on alcohol use on follow-up (standardized β = .061). The indirect associations are drawn through the variable “changes in attitudes.” One can determine the indirect effect of alcohol advertising exposure on alcohol use by multiplying the estimates of the indirect paths: 0.091 × 0.359 = 0.033, which is statistically significant (95% confidence interval, 0.006–0.059; P = .02). The size of the indirect effect suggests that about 35% of the total effect (0.094) between alcohol advertising and alcohol use is mediated through an increase in positive alcohol-related attitudes. Exposure to other advertising content (eg, sweets, cars, or clothes) was not related to alcohol-related attitudes. Exposure to other advertising content had a significant indirect effect of 0.036 (95% confidence interval, 0.006–0.059; P = .02) on alcohol use, which comprised about 51% of the total effect (0.070) of alcohol advertising on binge drinking initiation.
COMMENT

This study explored the assumption that the effect of alcohol advertising on youth drinking is mediated by changes in alcohol-related attitudes. We tested this assumption with longitudinal data of baseline nondrinking German sixth- to eighth-grade students who were surveyed at the beginning and the end of one school year, assessing alcohol use behavior as well as advertising contact and favorable attitudes toward alcohol. Indirect effects analysis revealed a direct (unexplained) effect of alcohol advertising on alcohol use after the test as well as an indirect effect mediated by changes in attitudes.

This analysis contributes to previous work in several aspects. First, to our knowledge, this is one of few attempts to identify a mental mechanism for alcohol advertising exposure and the first using a longitudinal design. A cross-sectional study by Austin and colleagues investigated how persuasive media messages for alcohol influence youth decision making, focusing on the roles of desirability, identification, and skepticism. Within their Message Interpretation Process Model, Austin and colleagues assumed that the formation of alcohol-related expectancies—a construct similar to the attitudinal measure used in the present study—is a later step in the decision chain, indicating that there might be important cognitive or affective precursors left unconsidered in the present study. However, we demonstrated that changes in attitudes can occur over the short term (9 months) and that such changes not only predict drinking behavior but are also related to alcohol-specific advertising. Second, the study highlights the importance of cognitive antecedents of behavior. Positive attitudes toward alcohol were the most powerful predictor of alcohol use, more than personality characteristics, drinking of peers, and even age. Third, the study shows that cued recall of alcohol advertising material predicts behavior.

Table 3. Zero-Order Correlation Matrix

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<th>Variable by No.</th>
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<td>2. Sex (0=female, 1=male)</td>
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<td>3. Socioeconomic status</td>
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<td>4. Region (0=west, 1=east)</td>
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<td>5. School performance</td>
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<td>−.24</td>
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<td>6. Television screen time</td>
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<td>8. Parent drinking</td>
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<td>9. Sensation seeking</td>
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<td>10. Alcohol attitudes baseline</td>
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<td>11. Change in alcohol attitudes</td>
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<td>13. Other advertisement exposure</td>
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The change in attitudes indicates posttest attitudes minus baseline attitudes.

The standardized direct effect of alcohol advertisement exposure on alcohol use initiation was 0.061 (P=.01); standardized indirect effect of alcohol advertisement exposure on alcohol initiation, 0.033 (P=.02). This is a path model of the relationship between alcohol advertising exposure and covariates on alcohol use initiation at the second assessment. All values are standardized estimates. Only significant (P<.05) paths are drawn. Correlations between exogenous variables were included in the model but excluded from the figure for graphical simplicity. The standardized direct effect of alcohol advertisement exposure on alcohol use initiation was 0.061 (P=.01); standardized indirect effect of alcohol advertisement exposure on alcohol initiation, 0.033 (P=.02). The change in attitudes indicates posttest attitudes minus baseline attitudes.

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after controlling for attitudes toward alcohol at baseline. One criticism of cued recall is that it is an imperfect measure of exposure because adolescents with positive attitudes toward alcohol (for other reasons) might be more likely to remember an alcohol advertisement. This study shows that the association is independent of alcohol cognition and attitudes at the time memory of alcohol advertisements was assessed. Lastly, the results suggest specificity, that is, that the alcohol advertising effect has something to do with the content of the alcohol advertisements, not because it reflects adolescents who are generally receptive to advertising of all sorts. While no one study can prove causality, this study increases the plausibility of a causal relation by demonstrating specificity and a mental mechanism through which advertising exposure affects behavior in a longitudinal analysis.20

There are several limitations to our study. Self-selection of schools and loss to follow-up generally affect the generalizability of results. This is cushioned by low loss to follow-up (11%) and lack of differences between dropouts and nondropouts on a key construct—alcohol advertising exposure and attitudes toward alcohol. The alcohol outcome variables were based on self-reports and are therefore only a proxy of actual behavior. This is neither a unique feature of the present study nor is there any likely explanation why those with high alcohol advertising exposure should systematically overreport (or underreport) their drinking behavior; nevertheless, it is a potential source of distortion. As mentioned previously, the memory-based measure of alcohol advertising exposure could be biased by memory effects other than the ones we controlled for. The potential to memorize advertisements (in terms of contact and brand recall) should, however, not be completely independent of actual exposure. The interval between the 2 data assessments was only 9 months. This is a limitation in terms of long-term effects of alcohol advertising, though the fact that we could predict a change in behavior over so short a time represents also a strength. Finally, because the implemented method did not use a representative sample of all broadcasted advertisements, it does not allow for an accurate estimation of the total amount of alcohol and other advertisement exposure or the advertising presence of specific brands. This affects the ability to generalize our results to all alcohol advertising exposure in the German market.

In summary, we have conducted an analysis that suggests that some part of the effect of alcohol advertising on youth drinking is mediated through a change in attitudes toward the product group in general. This supports policy measures to reduce exposure (e.g., through advertising bans) as well as intervention techniques that focus on the processing of advertising contents. Further research is needed to determine the specific types of images that are particularly effective.

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Author Contributions: All authors had full access to all the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.

Study concept and design: Morgenstern, Isensee, and Hanewinkel. Acquisition of data: Morgenstern, Isensee, and Hanewinkel. Analysis and interpretation of data: Morgenstern and Sargent. Drafting of the manuscript: Morgenstern and Sargent. Critical revision of the manuscript for important intellectual content: Morgenstern, Isensee, Sargent, and Hanewinkel. Statistical analysis: Morgenstern. Obtained funding: Hanewinkel. Administrative, technical, and material support: Isensee and Hanewinkel. Study supervision: Morgenstern, Isensee, and Hanewinkel.

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