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Movie Exposure to Alcohol Cues and Adolescent Alcohol Problems: A Longitudinal Analysis in a National Sample

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Abstract

The authors tested a theoretical model of how exposure to alcohol cues in movies predicts level of alcohol use (ever use plus ever and recent binge drinking) and alcohol-related problems. A national sample of younger adolescents was interviewed by telephone with 4 repeated assessments spaced at 8-month intervals. A structural equation modeling analysis performed for ever-drinkers at Time 3 ($N = 961$) indicated that, controlling for a number of covariates, movie alcohol exposure at Time 1 was related to increases in peer alcohol use and adolescent alcohol use at Time 2. Movie exposure had indirect effects to alcohol use and problems at Times 3 and 4 through these pathways, with direct effects to problems from Time 1 rebelliousness and Time 2 movie exposure also found. Prospective risk-promoting effects were also found for alcohol expectancies, peer alcohol use, and availability of alcohol in the home; protective effects were found for mother's responsiveness and for adolescent's school performance and self-control. Theoretical and practical implications are discussed.

Keywords

alcohol use; alcohol problems; adolescents; movies; structural modeling

Movie Exposure and Adolescent Alcohol Use

Early onset of drinking poses a risk for alcohol abuse and dependence at later ages (e.g., Anthony, Warner, & Kessler, 1994; Grant & Dawson, 1997; Hawkins et al., 1997). Adolescent drinking may be implicated in fighting, school problems, and reckless driving (Ellickson,

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Tucker, & Klein, 2003; Hingson, Heeren, Zakocs, Winter, & Wechsler, 2003), and problems associated with alcohol use have an appreciable prevalence in adolescence (Harrison, Fulkerson, & Beebe, 1998; Kilpatrick et al., 2000). These alcohol-related problems pose a hazard to the adolescent and to others through injuries, accidents, and school and police records (Hingson, Heeren, Jamanka, & Howland, 2000; Hingson, Heeren, Winter, & Wechsler, 2003). Thus obtaining a better understanding of risk and protective factors for adolescent alcohol problems, particularly those related to drinking early in adolescence, is an important question for addictions research.

Several types of factors including family history and affective characteristics have been linked to adolescent alcohol problems (Pandina & Johnson, 1999; Simons & Carey, 2006; Windle, 1999) but recent research has drawn attention to media exposures as a factor in promoting onset and possible escalation of substance use (Charlesworth & Glantz, 2005; Grube & Waiters, 2005). Exposure to tobacco industry promotions and to smoking cues in movies has been linked to adolescent smoking onset in several studies (Dalton et al., 2003; Distefan et al., 2004; Pierce, Lee, & Gilpin, 1994; Pierce, Choi, Gilpin, Farkas, & Berry, 1998). With regard to alcohol, exposure to alcohol cues in television advertising and music videos has been found related to adolescent alcohol use in the US and elsewhere (Austin, Chen, & Grube, 2006; Ellickson, Collins, Hambarsoomians, & McCaffrey, 2005; Snyder, Milici, Slater, Sun, & Strizhakova, 2006; Stacy, Zogg, Unger, & Dent, 2004; Van Den Bulck & Buellens, 2005). In addition, exposure to alcohol use in movies has been linked to onset of drinking among adolescents both in the US (Sargent, Wills, Stoolmiller, Gibson, & Gibbons, 2006) and in other countries (Hanewinkel, Tanski, & Sargent, 2007). Though these investigations have mostly studied onset of use, movie smoking exposure has been related to the incidence of established smoking (Sargent et al., 2007), an effect that goes beyond onset and suggests movie exposure as a possible factor in escalation of alcohol use.

Conceptual Model of Movie Effects on Alcohol Use and Problems

This research was based on theoretical models of alcohol problems in adolescence (Newcomb, 1992; Simons & Carey, 2006; Wills, Sandy, & Yaeger, 2002). These posit that alcohol-related problems span a range of consequences including accidents or injuries, relationship problems, or difficulties in school (Bailey & Rachal, 1993; Smith, McCarthy, & Goldman, 1995). Alcohol problems are correlated with level of alcohol use, but the relation between level of use and number of alcohol-related problems is empirically a moderate one (Stacy & Newcomb, 1999; Wills, Sandy, & Shinar, 1999). A primary contributor to experiencing alcohol problems is an elevated level of use, and environmental exposures have been suggested as contributing to alcohol problems in this manner (Simons & Carey, 2006).

Discussions of movie content have emphasized the frequency and favorability of exposure as a factor that may be relevant for promoting alcohol use among viewers. Content analyses have shown that alcohol use is common in movies; in addition, alcohol use is depicted in movies in a generally positive context, with little portrayal of negative consequences (Everett, Shnuth, & Tribble, 1998; Roberts, Henriksen, & Christenson, 1999; Roberts, Henriksen, & Foehr, 2004). It has been suggested that the frequency of exposure to alcohol cues in media, together with the cumulative exposure that derives from viewing such cues consistently over time, is a predisposing factor for using alcohol (Grube & Waiters, 2005; Sargent et al., 2006).

Our conceptual model of exposure to alcohol cues posits that both cognitive and social processes are involved in the relation of movie exposure to drinking behavior. One possible pathway is through an effect on alcohol expectancies. Expectancies about effects of tobacco and alcohol show developmental changes in adolescence and young adulthood (e.g., Fromme & D'Amico, 2000; O'Connor, Fite, Nowlin, & Colder, 2007; Schell, Martino, Ellickson, Collins, & McCaffrey, 2005) and expectancies predict change in alcohol use (Cable & Sacker,

2008; Goldman, Del Boca, & Darkes, 1999) particularly at younger ages (Leigh & Stacy, 2004). It is plausible that positive media portrayals of substance use influence perceptions of users and expectancies about use (Fleming, Thorson, & Atkin, 2004; Gibbons, Gerrard, & Lane, 2003) hence we hypothesized that expectancies would be a partial mediator in the impact of movie exposure on adolescent drinking. Regarding social processes there is reason to believe that seeing attractive persons drinking in movies affects perceptions of drinkers and perhaps generates more interest in the behavior itself, both among adolescents and among the friends they hang out with. Affiliation with peer users is known to be influential for substance use in adolescence (Henry, Slater, & Oetting, 2005; Hoffman, Sussman, Unger, & Valente, 2006; Steving, Perry, & Williams, 2000; Wills & Cleary, 1999) and some evidence has suggested that movie exposure has an impact on affiliation with peer smokers (Wills et al., 2007). Thus we hypothesized that exposure to alcohol cues in movies influences affiliation with peers who use alcohol, and this will be part of the mechanism of the effect of movie exposure on adolescent alcohol use.

Present Research

To test the stated hypotheses, we investigated the relation of movie exposure to adolescent alcohol use and alcohol problems in a longitudinal study in which movie exposure was assessed with an objective method together with measures for a broad range of covariates, most of which have not been included in previous studies of media effects. The research was conducted with a national sample of adolescents and the analyses controlled for demographic characteristics as well as individual and familial covariates. The covariates, variables that could be related to movie exposure and to adolescent alcohol use, were included to rule out alternative explanations of the effect, for example that adolescents who are already prone to deviance, or live in families with little parental monitoring, are more likely to view movies portraying alcohol use. A structural equation modeling analysis included two hypothesized mediators of movie effects, adolescents' expectancies about alcohol and perceptions of their friends' alcohol use. The measures on level of alcohol use tapped several aspects, from onset to recent binge drinking.

In addition to level of use, the structural model analyzed relations of predictor variables to a composite measure of alcohol-related problems (Miller, Tonigan, & Longabaugh, 1995; White & Labouvie, 1989). The focus of the present research was on alcohol problems because it has previously been shown that movie exposure predicts initiation of alcohol use (Sargent et al., 2005) but there is little evidence on how media exposures are related to problem use. This is an open question because of the moderate relation between level of alcohol use and the extent of problem use in adolescence (Wills, Sandy, & Yaeger, 2002). Because of the focus on alcohol problems the analysis was restricted to persons who had used alcohol, because from a logical standpoint nondrinkers are not at risk for alcohol problems (cf. Neal, Corbin, & Fromme, 2006; Smith et al., 1995). In addition, the questions on alcohol problems in the present study were specifically worded to address problems that occurred in conjunction with alcohol use, hence could not be asked of nondrinkers. We conducted a longitudinal structural equation modeling analysis to test the prediction that movie exposure would be related to alcohol problems in part through its relation to level of alcohol use, though direct effects to problems were also tested (Stacy & Newcomb, 1999; Wills et al., 2002). Other variables that have been theoretically linked to alcohol problems including self-control, parental supportiveness, and sensation seeking (Brody & Ge, 2001; Donohew et al., 1999; Wills et al., 2001) were also included in the model.

Method

Participants and Procedure

The participants were a national sample of US adolescents. The baseline sample ($N = 6,522$) was 49% female; ethnic distribution was 11% African-American, 2% Asian/Pacific Islander, 62% Caucasian, 19% Hispanic, 0.4% Native American/Alaska Native, 6% multiple ethnicity, and 0.3% other ethnicity. The participants were 10 to 14 years of age at baseline ($M = 12.05$, $SD = 1.39$). Data on family structure indicated 20% of the participants lived in a single-parent family, 8% were in a blended family (biological parent and stepparent), and 72% were in an intact family. For parental education, 40% of the participants had parents with education through high school graduate, 29% had parents with some college education, and 31% had parents who were college graduates. On a 6-point scale for household income the mean income level was 4.23 ($SD 1.60$), representing a household income in the range from \$30,000 to \$50,000. Census data indicated that 31% of the participants were inner-city residents in a Standard Metropolitan Statistical Area (SMSA), 48% were suburban, and 21% were rural.

A detailed description of the recruitment methods for study participants is available in Sargent et al. (2005). Briefly, between June and October 2003, a telephone survey of U.S. adolescents aged 10–14 years was conducted. All aspects of the survey were approved by the institutional review boards at Dartmouth Medical School and the survey research firm (Westat, Rockville MD). Through a random-digit dial screening process, households in the 50 states with an adolescent in the appropriate age range were identified, and persons in 9,849 eligible households were recruited for the study, of whom 6,522 (66%) completed the interview. Distributions of age, gender, ethnicity, household income, and census region in the unweighted sample were almost identical with those of the 2000 U.S. Census (Sargent et al., 2005).

Parental consent and adolescent assent were obtained prior to interviewing each respondent. Participants were surveyed on the telephone by trained personnel using a computer-assisted telephone-interviewing (CATI) procedure. The interview lasted approximately 20 minutes and contained questions about media exposures, alcohol use, and other variables. To maximize confidentiality of the interview, participants responded to potentially sensitive questions (e.g., about alcohol use) by pressing numbers on their telephone keypad. A DHHS Certificate of Confidentiality was obtained for the study and participants were informed about the legal protection provided by the certificate. Research has shown that when participants are assured of confidentiality, self-reports of substance use have good validity (Patrick et al., 1994).

After the baseline interview, three follow-up surveys were conducted at 8-month intervals. The sample of interviewed respondents at Time 2 was 5,503, at Time 3 was 5,019, and at Time 4 was 4,574. Univariate analyses indicated evidence of differential attrition for several variables (Sargent et al., 2007). The nature of the attrition was similar to that typically noted in longitudinal studies of adolescents (Wills, Walker, & Resko, 2005). Unique effects indicated that adolescents lost to follow-up from baseline to the 24-month survey were more likely to be of non-white ethnicity (Black, Hispanic, or other); were from families with lower parental education and income, rented vs. owned their residence; had lower school performance; and were higher on sensation seeking. Baseline drinking status did not predict attrition.

Measures

Measures were derived from previous studies of smoking and alcohol use in large samples of adolescents (Sargent et al., 2001; Wills et al., 2001).¹ Reliability in the present research was

¹The research was originally focused on cigarette smoking. Simple measures of adolescent alcohol use, peer drinking, and alcohol expectancy were included at Times 1 and 2, and movies were coded for alcohol use as well as smoking. The study was subsequently expanded with funding to include additional measures relevant to alcohol use and problems in Times 3 and 4.

determined with internal consistency analysis (Cronbach's alpha). Variables were coded such that a higher score indicates more of the named quantity.

Demographics—Demographic characteristics of participants were assessed at baseline with items on gender (0 = male, 1 = female) and ethnicity (8 options). Family characteristics were indexed with questions about parental education, family structure, and family income, reported by parents during the first telephone interview. Census tract data indexed urbanicity and region.

Movie alcohol exposure—Exposure to movie alcohol cues was assessed using methods previously developed for smoking (Dalton et al., 2003; Sargent et al., 2001). We selected the top 100 US box-office hits per year for each of the 5 years preceding the baseline survey (1998–2002, $N = 500$), and 34 movies that earned at least \$15 million in gross U.S. box-office revenues during the first four months of 2003. (Older movies were included because adolescents often watch these movies on videotapes or DVDs.) The CATI procedure was programmed to randomly select 50 movie titles from the larger pool of 532 movies for each adolescent interview. Movie selection was stratified by the Motion Picture Association of America (MPAA) rating so that the distribution of movies in each list of 50 reflected the distribution in the full sample of movies (19% G/PG, 41% PG-13, 40% R). Respondents were asked (No/Yes) whether they had seen each movie title on their unique list. Reliability of these reports was demonstrated through high test-retest reliability for identifying movies seen and low rates of false-positive reports for fictitious or unavailable movie titles that were included in the individual movie lists (Sargent et al., 2001). Reliability of the coding procedure was indexed for a subsample of 69 movies by concordance between two independent coders, based on agreement about on-screen alcohol use at 1-second intervals; the mean kappa of 0.81 ($SD = 0.12$, range .54 to 1.0) indicated good coding reliability.

For the baseline movie exposure variable, trained coders viewed each movie and recorded the number of seconds of alcohol use in each of the 532 movies. Alcohol use was defined as a character's actual consumption of a beverage that was clearly alcoholic, implied possession of such a beverage (e.g., a character sitting in a bar with a filled beer glass), or purchasing of alcohol. Excluded were occasions when a character was in possession of an empty alcoholic beverage container (e.g., empty beer bottle or wine glass) or when alcohol beverage containers were displayed but were not implied as being consumed (e.g., an array of liquor bottles shown above the bar in a drinking establishment). An index of movie alcohol exposure was obtained by summing the seconds of alcohol use in the films each participant had seen from his/her unique list of 50 movies. Dividing this number by the seconds of alcohol use the adolescent would have viewed from all 50 movies in the unique list and multiplying by the seconds of alcohol use in the parent sample of 532 movies provided a score for the expected alcohol exposure an individual would receive given his/her viewing habits (cf. Dalton et al., 2003; Sargent et al., 2001).

Similarly at Time 2 and Time 3 the respondent was presented with a list of 50 new movies and asked (No/Yes) whether he/she had seen each one. The individual lists were randomly drawn from a population of approximately 150 movies that had been newly released to theaters or DVD during the previous 8 months. The interview program checked each movie in the individual lists and if a respondent indicated in a previous interview that he/she had already seen the film, then another recent movie was substituted; this could happen for example because a participant initially saw a movie in a theater but the film was subsequently released on DVD. The new movies in the Time 2 and Time 3 lists were coded for alcohol content using the same procedures.

Covariates—In addition to demographics, covariates in the study were chosen on the basis of likely being correlated with movie exposure and with adolescent alcohol use. Measures were

adapted from previous research on adolescent substance use (Sargent et al., 2001; Wills et al., 2001). Unless otherwise noted, responses were on 4-point Likert scales with anchor points worded (with variations) “Not At All True for You” and “Very True for You,” and data were recoded if appropriate such that a higher score reflects more of the named quantity. Measures of parenting were a 9-item scale tapping mother’s warmth and responsiveness (e.g., “she listens to what I have to say”, “she makes me feel better when I’m upset,” $\alpha = 0.71$) and a 7-item scale on mother’s structure for and monitoring of the adolescent (e.g., “she checks to see if I do my homework,” “she has rules for what I can do,” “she knows where I am after school,” $\alpha = 0.59$). Adolescent personality characteristics were a 6-item scale on rebelliousness (Sargent et al., 2001) which tapped tendency toward antisocial behavior (e.g., “I like to break the rules,” “I argue a lot with other kids,” $\alpha = .73$) and a 4-item scale on sensation seeking (Stephenson, Hoyle, Slater, & Palmgreen, 2003), which had items such as “I like to do scary things,” and “I like loud music” ($\alpha = .59$). Self-regulation (Wills et al., 2001) was assessed with items reflecting delay of gratification (“I get my homework done first so I can have fun later”) versus distractibility (“I have to be reminded several times to do things”); a 4-item scale had $\alpha = .46$. School performance was indexed with the question “How would you describe your grades last year?” Response points were excellent, good, average, and below average. Because of a small cell frequency at the latter point, this measure was collapsed to a 3-point scale and was recoded so that a higher score meant better performance. Availability of alcohol at home was indexed with the question, “If you wanted to, could you get alcohol at home without your parents knowing?” Response options were definitely yes, probably yes, probably no, and definitely no. For analysis this variable was recoded so that a higher score meant more availability of alcohol in the home.

Friends’ use of alcohol—Questions about alcohol use followed the lead-in statement: “The next few questions are about alcohol. By alcohol we mean beer, wine, wine coolers or liquor, like whisky, vodka, or gin.” The measure of friends’ alcohol use asked, “How many of your friends drink alcohol?” Response points were none, some, or most.

Expectancy about alcohol—The measure of expectancy about alcohol asked, “Please tell me how you feel about the following statement: ‘I think I would enjoy drinking alcohol.’” Response points were strongly agree, agree, disagree, and strongly disagree. For analysis this variable was recoded such that a higher score meant a more positive expectancy about alcohol use.

Parental use of alcohol—The measure of parental alcohol use followed the lead-in statement, “Which of the following statements best describes how often your parents drink alcohol.” The response options were never, once a year, once a month, once a week, and every day. This measure was included beginning at Time 3.

Adolescent alcohol use—Assessment of level of alcohol use was based on the following questions: “Have you ever drunk alcohol that your parents did not know about?”, “Have you ever had 5 or more drinks of alcohol in a row, that is, within a couple of hours?”, and “Did you have 5 or more drinks of alcohol in a row during the past month?” For each assessment these items were combined in a 0–3 composite score such that 0 indicated never drank, 1 indicated lifetime use but no binge drinking, 2 indicated lifetime use and lifetime but not recent binge drinking, and 3 indicated lifetime use plus lifetime and recent binge drinking.

Alcohol problems—Alcohol problems were assessed at Time 3 for those who said they had ever used alcohol ($N = 961$). The same measure was administered at Time 4. At each point the items followed the statement, “The next set of questions is about things that may happen when someone drinks alcohol. Please tell me if any of these have ever happened to you.” The items,

administered with No/Yes responses, were based on the Rutgers Alcohol Problem Index (White & Labouvie, 1989) and the Drinking Inventory of Consequences (Miller et al., 1995). The 10 items are as follows, with the rate of yes responses at Times 3 and 4, respectively, in parentheses: “You didn’t do as well in school because of your drinking” (7%, 6%), “Your family or friends have said that they were worried about your drinking” (8%, 7%), “You have gotten into a physical fight while drinking” (9%, 10%), “You were drinking while riding in a car” (11%, 15%), “You were suspended from school because of your drinking” (1%, 1%), “You did something while drinking that you later regretted” (24%, 28%), “You got hurt while you were drinking” (9%, 10%), “You have damaged or vandalized property while drinking” (7%, 7%), “You were arrested or taken to a police station while drinking” (3%, 3%), and “You fought with a knife or a gun while drinking” (1%, 1%). In item response analyses, a single-factor model had reasonable fit but two items (didn’t do as well in school and family/friends worried about drinking) had relatively poor parameters compared with the others. Moreover, these items had nonsignificant correlations with adolescents’ alcohol use at Time 3 whereas all the other items had strong correlations with alcohol use. Accordingly, eight items were used to index alcohol problems and a latent construct of alcohol problems at each time point was based on randomly parceling the items to three indicators as follows: Indicator 1 (got into physical fight, drank while in car), Indicator 2 (did something regretted, suspended from school, used knife or gun), and Indicator 3 (damaged property, hurt while drinking, taken to police).²

Results

Descriptive Statistics

Prevalence rates for the alcohol use indices for each of the age groups in the study are presented in Table 1. The prevalence of alcohol use was lower, but not zero, among the younger participants and overall rates of use increased with age. Within each age group the prevalence of alcohol use increased steadily over time (cf. Johnston, O’Malley, & Bachman, 2002). Increases over time were noted both for rates of ever use (i.e., initiation) and for rates of ever and recent binge drinking (i.e., escalation). Thus even though rates of use were initially low among younger members of the sample there were detectable rates of alcohol use and binge drinking at later assessment points in all age groups, hence the sample as a whole was considered at risk for alcohol problems (cf. Harrison et al., 1998; Kandel et al., 1997).

Data for peer use at Time 1 indicated that 77% of the participants reported none of their friends used alcohol, 19% said some friends used, and 4% said most friends used; comparable figures for Time 2 were 67%, 26%, and 7%, respectively. Data for Time 1 expectancies indicated 74% of the participants rejected any expectation about enjoying alcohol, 21% endorsed a mildly positive expectancy, and 5% had a more positive expectancy; comparable figures for Time 2 were 66%, 25%, and 9%, respectively. Thus overall the social and attitudinal context for alcohol use in the sample was not strongly positive, but the data showed that rates of adolescent use, along with peer use and positive expectancies, all increased over time.

Regarding movie alcohol exposure, data from the content coding indicated that 83% of the 532 movies covered at baseline contained at least one occurrence of alcohol use. From their individual random lists of 50 movies the participants had seen an average of 12.8 (*SD* 7.3) at Time 1; comparable figures were $M = 11.5$ (*SD* 6.7) for Time 2 and $M = 11.4$ (*SD* 6.6) at Time

²The fit for a one-factor model, analyzed in Mplus 4.1, was chi-square (998) = 553.28 in Time 3 data and chi-square (1001) = 606.78 in Time 4 data. For the two items in question, factor loadings and discrimination parameters were relatively low and difficulties were high compared to the other items; complete data are available from the first author. Note that the study did not include items typically used to index alcohol dependence (e.g., tolerance, withdrawal, wakeup drinking), so the alcohol problems measure should be construed as an index of alcohol abuse rather than an inventory to assess both abuse and dependence.

3. In the movies they had viewed, participants at Time 1 had seen an average of 31.1 minutes of alcohol use (SD 25.3); comparable figures for Time 2 were $M = 34.9$ minutes (SD 23.9) and for Time 3 were $M = 30.2$ minutes (SD 21.4). Thus consistent with prior content analyses (Grube & Waiters, 2005; Roberts et al., 1999), exposure to alcohol use in movies was common and the present data showed there was considerable variability within the sample. Content coding data on typical exposure by movie type indicated the mean minutes of alcohol exposure was 0.42 (SD 0.85) in G movies (5% of the sample), was 1.77 (SD 2.89) in PG movies (13% of the sample), was 3.53 (SD 3.24) in PG13 movies (41% of the sample), and was 3.84 (SD 3.53) in R-rated movies (40% of the sample). Alcohol exposure was significantly lower in G and PG movies compared with PG13 and R-rated movies but exposure was not significantly different for PG13 and R movies, which were the predominant source of exposure to alcohol cues. Thus consistent with data from a prior study with a regional sample (Sargent et al., 2006), we found that alcohol content was not confounded with movie rating for the majority of movies we assessed.

Data for alcohol problems at Time 3 indicated that of the 961 ever drinkers, 64% experienced no problems, 20% had experienced one problem, 8% had two problems, 4% had three problems, 3% had four problems, and 1% had experienced five or more problems. Comparable rates at Time 4 were 59%, 22%, 11%, 5%, 3%, and 1%, respectively. Thus the majority of drinkers in the sample had not experienced any of the listed alcohol-related problems, but a substantial minority had one or more. The correlation between level of alcohol use and score for alcohol-related problems was .40 at Time 3 and was .52 at Time 4, comparable to data found in other studies with the Rutgers Index (Neal et al., 2006; Wills et al., 1999).

Structural Model for Movie Exposure

Prior to multivariate analysis the correlations of the exogenous variables were determined through an analysis computed in Mplus 4.1 (Muthén & Muthén, 2005) based on the subsample of 961 participants who reported at Time 3 that they had ever used alcohol. Analyses were performed using maximum likelihood estimation with the EM algorithm to model missing data. For analysis the movie alcohol exposure variables were censored at the 99th percentile to reduce the influence of some high-leverage outliers. Skewness for the movie alcohol exposure variables was moderate (skewnesses were 0.92, 0.81, and 0.93 for Time 1 through Time 3, respectively) so transformations were not used. Several demographic variables (income, owner vs. rental status) were not correlated with movie exposure and were excluded from the analysis. The correlations of parental alcohol use with Time 1 variables were included in the structural model so these are included in the table. Results (Table 2) indicated that several of the demographic variables were correlated with amount of exposure to movie alcohol use, and these were retained as controls. Most of the behavioral covariates were correlated with movie exposure. Exposure to alcohol in movies was lower when parents scored higher on responsiveness and monitoring. Movie alcohol exposure was higher for adolescents with higher scores on rebelliousness and sensation seeking, easy availability of alcohol in the home, several friends who used alcohol, and more positive alcohol expectancies, as well as those with a higher baseline level of alcohol use. The behavioral variables and some of the demographics had significant correlations with adolescent alcohol use, as did the movie exposure measure. Because these correlations represent possible confounds for the effect of movie exposure, these variables were all included in the structural model.

The hypotheses suggested that movie exposure would predict changes in peer use and expectancies from Time 1 and Time 2, thence having effects on adolescent alcohol use, and that prior variables including adolescents' alcohol use would predict alcohol problems at Times 3 and 4. For the structural equation modeling analysis, Time 1 movie exposure and the covariates were specified as exogenous and Time 2 measures for alcohol expectancies, friends'

alcohol use, and adolescent alcohol use were specified as endogenous; baseline covariates were included for the latter variables so any effects to these variables represent changes in expectancies, friends' use, or adolescent use. Residual covariances of the Time 2 variables were included in the model. Adolescent alcohol use at Times 3 and 4 was included in the model together with paths from prior assessments. The measures of alcohol problems at Time 3 and Time 4 were regressed on current alcohol use because the items in the alcohol problems inventory specifically indicated that the problems were a consequence of drinking. It should be noted that in the analytic sample of 961 participants, 333 (35%) had used alcohol at Time 1 and an additional 194 (20%) initiated use by Time 2, so the analytic model addresses a combination of initiation and escalation of use.

Measures of new movie alcohol exposure at Times 2 and 3 were included as time-varying predictors. Paths to current alcohol use and subsequent alcohol problems were specified at each time point. We tested for reciprocal effects from alcohol use to movie exposure but these were nonsignificant, hence the model specifies directional effects from movie exposure to adolescent alcohol use. Autoregressive paths were included for movie alcohol exposure, adolescent alcohol use, and alcohol problems. Parental alcohol use was specified as a Time 3 variable with paths to subsequent variables, but covariances with Time 1 movie alcohol exposure and the other covariates were included in the model and a covariance with Time 3 adolescent alcohol use was included. In the measurement model, alcohol problems was a latent construct measured by three indicators; the other constructs in the model were manifest variables. Three autocorrelated errors were included in the model for the indicators of alcohol problems (i.e., the correlation of a given Time 3 indicator with the comparable Time 4 indicator).

The structural model was estimated in Mplus version 4.1 with the EM algorithm (Muthen & Muthen, 2005) using maximum likelihood estimation with robust estimates of standard errors. An initial model was estimated with all paths from Time 1 variables to Time 2 variables and theoretically specified paths from Time 2 variables to subsequent variables. From the initial model a number of nonsignificant paths were dropped. A criterion of $p < .05$ was used for retaining paths in the model, and modification indices > 10 (approximately $p < .01$) were used for including additional paths. The final model had chi-square (268, $N = 961$) of 383.36, Comparative Fit Index of .97, and Root Mean Square Error of Approximation of .021, indicating good fit to the data. The measurement model for alcohol problems was good, as indicated by factor loadings $> .50$ for indicators on constructs. The results are indicated in Figure 1 with standardized coefficients.³ Correlations among the exogenous variables, included in the model but omitted from the figure for graphical simplicity, are in Table 2. Demographics were included as exogenous variables in the model as indicated in Table 2; their effects are omitted from the figure for graphical simplicity.⁴ The exogenous variables accounted for 23% to 28% of the variance in the hypothesized mediators. Prior variables in the model accounted for 26% of the variance in Time 3 adolescent alcohol use and 37% of the variance in Time 4 adolescent alcohol use. Together the variables in the model accounted for 33% of the variance in adolescent alcohol problems at Time 3; considering paths from prior variables, alcohol use, and problems, 66% of the variance in alcohol problems was accounted for at Time 4.

Longitudinal stability coefficients, indicated by dashed lines in the figure, were observed for adolescent alcohol use, alcohol problems, and movie alcohol exposure. Adolescent alcohol use

³Correlations of Time 2 residual terms were .18 for peer and adolescent use, .25 for expectancy and adolescent use, and .24 for expectancy and peer use. The correlation of parental use and adolescent use at Time 3, partialling its correlations with Time 1 variables, was .00.

⁴Effects for demographic variables indicated that age had a significant relation to adolescent alcohol use at Time 2 ($\beta = .09, p < .001$), to expectancies at Time 2 ($\beta = .09, p < .001$), and to friends alcohol use at Time 2 ($\beta = .16, p < .0001$). Gender had an effect to friends alcohol use at Time 2 ($\beta = .11, p < .0001$). There were significant inverse effects of nonwhite ethnicity to change in alcohol use by Time 3, with effects found for Black ethnicity ($\beta = -.14, p < .0001$) and Hispanic ethnicity ($\beta = -.07, p < .01$).

at Time 1 had a significant lagged effect to increased use at Time 3, and adolescent alcohol use at Time 2 had a significant direct effect to alcohol problems at Time 3, net of its path to Time 3 alcohol use. Thus adolescents' early use of alcohol contributed to an increased level of drinking over time, and this contributed to alcohol problems independent of current level of alcohol use.

The level of an adolescent's alcohol use had a substantial relation to number of alcohol-related problems, both at Time 3 and Time 4. This supports the role of level of use as a risk factor for development of alcohol-related problems (Smith et al., 1995; Wills et al., 2002). A path from alcohol problems at Time 3 to alcohol use at Time 4, added because of a modification index, indicated that having alcohol problems contributes to a pattern of increased drinking over time. There were no significant modification indices for concurrent paths from problems to use.

Structural Results for Study Variables

The hypothesized results for movie alcohol exposure that were the focus of the present research are indicated with bold lines in the figure and represent two types of effects. It should be noted that the results for movie exposure and other variables are all independent effects, that is, they are controlled for other variables in the model. Effects reported here are assumed to have positive coefficients unless otherwise noted.

Movie exposure—As predicted, movie alcohol exposure at Time 1 was related to increases in friends' alcohol use and adolescent alcohol use from Time 1 to Time 2. The effect for change in expectancy was nonsignificant.⁵ Thus initial movie exposure was related to increases over time in friends' drinking and in adolescents' own alcohol use. These effects were independent of the correlation of Time 1 movie exposure with demographics, personality characteristics, parenting characteristics, expectancies, and friends' use. Movie exposure at Time 2 did not have a significant effect to Time 2 alcohol use (the partialled effect, net of Time 1 exposure, changed sign from the zero-order correlation of $r = .10$) but movie exposure at Time 3 had a significant effect to Time 3 alcohol use, consistent in sign with the zero-order correlation (also $r = .10$).

Intermediate effects—Change in friends' alcohol use from Time 1 to Time 2 had a path to increased adolescent use at Time 3 and also had a direct effect to increased use at Time 4. Change in positive expectancies from Time 1 to Time 2 had a path to increased adolescent alcohol use at Time 3; in addition, movie alcohol exposure at Time 2 had a significant lagged effect to Time 3 alcohol problems. These prospective and lagged effects represent "downstream" effects of the initial exposures and support the hypothesized role of peer alcohol use as a mediator for the effect of movie alcohol exposure.

Effects for covariates—The covariates had a number of effects to variables at Time 2 and subsequently. Risk-promoting effects were found for rebelliousness at Time 1, which had a direct effect to alcohol problems at Time 3, and for sensation seeking at Time 1, which had a direct effect to increase in alcohol use by Time 4. These effects were independent of the correlation of rebelliousness and sensation seeking with parenting and demographic variables. Availability of alcohol in the home was related to increased positive expectancies about alcohol use, independent of initial drinking level and other exogenous variables, and parental alcohol use at Time 3 had a significant path to increased adolescent alcohol use at Time 4. Protective effects were found for school performance at Time 1, which was inversely related to change

⁵In a preliminary analysis that included all participants the effect of movie exposure on expectancy change was significant, consistent with the suggestion (Sargent et al., 2006) that movie exposures have greater effects for lower-risk adolescents compared with the higher-risk, early onset drinkers who are the focus of the present analysis.

in adolescent alcohol use over time, and self-control at Time 1, which had inverse paths to alcohol use at Time 2 and Time 3 (again, independent of correlations with other exogenous variables). Maternal responsiveness at Time 1 had two effects, with inverse paths to change in expectancies and friends' alcohol use at Time 2.

Indirect Effects for Movie Exposure and Alcohol Problems

The relation of movie exposure to alcohol problems can be summarized as a set of indirect effects through tracing pathways from movie exposure to alcohol problems in the structural model. The indirect effects for Time 3 alcohol problems are presented in Table 3. The effects of Time 1 movie exposure were all indirect and the total indirect effect was significant ($p < .0001$). The specific indirect effects were through initial movie exposure to Time 2 adolescent alcohol use and its path to Time 3 adolescent use, an effect to increased friends' alcohol use at Time 2 and its path to Time 3 adolescent use, and a marginal effect of movie exposure through Time 2 adolescent alcohol use and its direct effect to problems at Time 3. Included in this total effect was a path from initial movie alcohol exposure to Time 2 and Time 3 movie exposure and the direct and indirect effects of these variables on alcohol problems. The total effect for Time 2 movie exposure was significant because of a direct effect to Time 3 problems ($p < .001$); the indirect effect through Time 2 adolescent alcohol use was nonsignificant. For Time 3 movie exposure the indirect effect to Time 3 problems was significant ($p < .01$), involving the path from movie exposure to Time 3 adolescent use and thence to Time 3 problems.

Considering effects from Time 1 exposure to Time 4 problems, all the effect was mediated and the total indirect effect was significant (standardized effect = $.07$, $t = 4.32$, $p < .0001$). Similarly for Time 2 movie exposure the effects were all indirect and the total indirect effect was significant (effect = $.10$, $t = 3.17$, $p < .01$), and for Time 3 movie exposure the effects were all indirect and the total indirect effect was significant (effect = $.03$, $t = 2.63$, $p < .01$). For Time 4 problems there were a total of 38 indirect effects and 58% were significant. These involved essentially the same pathways from movie exposure to alcohol use at Time 2 and to alcohol use and problems at Time 3 and Time 4, so detailed results are not reported here. (Complete results are available from the first author.)

Discussion

The purpose of this research was to test whether exposure to alcohol cues in movies is prospectively related to alcohol problems. Analyses considered the association of movie alcohol exposure with a broad range of covariates, and the longitudinal structural modeling analysis tested mediation pathways for the effect of movie exposure. The results showed significant effects for movie exposure, which was related to an increase over time in adolescent alcohol use and an increase in one hypothesized mediator, friends' alcohol use. In turn, increases in friends' use and own use had effects on subsequent alcohol-related problems through several pathways. These findings were based on a subsample of youth who initiated alcohol use relatively early in adolescence and hence are at increased risk for problems with substance use. The results were obtained in a diverse sample with control for demographic characteristics, and the analysis used an estimation method that adjusted for any nonnormality in the study variables.

This research was based on a conceptual model that hypothesized a relation between level of alcohol use and experiencing alcohol problems. This assumption was supported, as the data showed a moderate relation between the level of use and the number of problems associated with use (cf. Smith et al., 1995; Wills et al., 1999). In general the pathways found for movie exposure to alcohol problems were through influencing level of use though a direct effect to problems was also found, suggesting there are aspects of continued movie exposure that may

be related to higher levels of intake and uncontrolled behavior (Grube & Waiters, 2005). A direct effect to problems was also found for rebelliousness, consistent with the suggested role of personality characteristics for contributing to problems independent of level of use (Simons & Carey, 2006). We note that the score for alcohol problems was based on behaviors that fall under the rubric of alcohol abuse (e.g., fighting and disciplinary problems). Other types of variables, such as affective lability or family history of alcohol use, might be more likely to show direct effects to problems (Simons & Carey, 2002; Windle, 1999). However, the present research did find significant indirect effects of movie exposure on alcohol problems through its relation to friends' alcohol use as well as through influencing the adolescent's own level of alcohol use.

Findings of indirect effects were noted for other study variables. Parental warmth and responsiveness had a protective effect through decreasing changes in expectancies about alcohol and affiliation with peer users, and self-control decreased change in adolescents' alcohol use (cf. Brody & Ge, 2001; Wills & Stoolmiller, 2002; Wills, Anette, Stoolmiller, Gibbons, & Shinar, in press). Good school performance at Time 1 also had a protective effect for change in alcohol use, controlling for adolescent personality characteristics and peer use (Bryant, Schulenberg, Bachman, O'Malley, & Johnston, 2003). Alcohol expectancies and friends' use at baseline had risk-promoting effects through increasing level of alcohol use at several time points, and easy availability of alcohol in the home increased expectancies over time, controlling for initial level of use (cf. Cable & Sacker, 2008; Henry et al., 2005; Wills et al., 2004). Sensation seeking had a lagged effect to increased alcohol intake (Brady & Donenberg, 2006; Crawford, Pentz, Chou, Li, & Dwyer, 2003). These data illustrate how alcohol use in adolescence has contributions from a web of influences including environmental exposures, personality characteristics, and social-cognitive influences (Gibbons et al., 2003; Wills et al., 2005; Windle, 1999).

Some possible limitations of the study should be considered for interpretation of the results. The study was conducted over a 2-year period in early adolescence, and while early drinking has theoretical significance, the results need to be extended at older ages, when alcohol problems occur at higher rates. The measures were brief ones designed for the context of a telephone interview; the expectancy measure had only one item and some other measures were relatively low in reliability. Though predicted effects were found in most cases, longer measures of constructs should be obtained where feasible. There was attrition from the panel and this may present some constraint on the generality of the results. Finally, analyses were conducted for the entire sample, and research is needed to study how effects of media exposures vary across demographic subgroups (cf. Gerrard, Gibbons, & Wills, 2006; Gibbons et al., 2008).

Theoretical Issues and Implications for Prevention

We hypothesized that movie exposure would affect intermediate variables predictive of adolescent alcohol use. The results supported the hypothesis through showing that movie alcohol exposure was related to an increase in friends' alcohol use during early adolescence, and this was related to an increase in adolescents' subsequent alcohol use (cf. Dal Cin et al., 2008). However, there was also a direct effect of movie exposure for increasing adolescent alcohol use over time. While the indirect effect through friends' use was consistent with our theoretical model, the direct effect suggests that additional mechanisms are involved in media effects. These could include a modeling influence or a direct cognitive influence (e.g., movie exposure increases the cognitive availability of alcohol cues). Exposure to movie cues could also operate through increasing the perceived normativeness of alcohol use or through reducing the perceived harm associated with use through not observing negative consequences associated with use (Gerrard, Gibbons, & Gano, 2003; Graham, Marks, & Hansen, 1991; Henry

et al., 2005). Because exposure to alcohol cues in movies may combine with exposure from advertising and music videos (Chen, Miller, Grube, & Waiters, 2006; Ellickson et al., 2005; Stacy et al., 2004), further research designed to test such mechanisms could help to increase the understanding of media effects.

The present research was designed to test alternative interpretations of the observed effect of movie exposure through including a range of covariates. The possibility that viewing movies with a lot of alcohol use might simply be a proxy for deviance-prone personality characteristics was not supported because the effect of movie exposure was obtained controlling for the association of exposure with measures of rebelliousness and sensation seeking, each of which had its own effects to alcohol use or problems. It might also be argued that adolescents would be more likely to view movies with high levels of alcohol use if their parents were unresponsive and inattentive. Though there was a correlation of family characteristics with movie exposure, again the impact of movie exposure on adolescent behavior was independent of these associations. Age, gender, and ethnicity were also controlled in the analyses so the impact of movie exposure on adolescents can not easily be interpreted as simply reflecting a tendency of some demographic subgroups to view movies that portray more alcohol use. Thus the effect of movie exposure on adolescent behavior was not attributable to three alternative explanations that have been suggested in the literature (Grube & Waiters, 2005; Wakefield, Flay, Nichter, & Giovino, 2003).

Results from previous research on effects of alcohol advertising have sometimes been characterized as mixed (Grube & Waiters, 2005). However, theory on media effects points to the possibility that some young persons are sensitized to the persuasive intent of advertising (Austin, Chen, Pinkleton, & Johnson, 2006). In contrast, it is likely that there is no perceived commercial intent in movie exposures. As with music videos, the lack of perceived persuasive intent combined with the visual and dramatic craft in movies and the audience engagement in the characters could make this type of exposure a powerful influence because of its subtlety and narrative power (Dal Cin, Zanna, & Fong, 2004; Slater, 2002). Further basic research can explore how adolescents may react differently to advertising and nonadvertising influences.

The results have several implications for prevention programs. Practical implications flow from the fact that exposure of young persons to alcohol use in movies is a preventable exposure. The present study offers evidence that effects of movie exposure to alcohol are not limited to initiation, and effects to problems may occur through several pathways. Findings from other studies indicate that cumulative exposure to alcohol cues in advertising and music videos may work together to prime early onset and escalation of alcohol use in youth, so reducing the level of exposure could have an effect at several levels of behavior. Policy restrictions may be warranted to reduce exposure to alcohol use in movies rated for youth. Prevention programming aimed at increasing media literacy in young persons is a promising avenue for reducing risk behavior (Austin et al., 2006; Brown, 2006), and media efforts may also be combined with other material in community-based prevention programs (Kelly, Comello, & Slater, 2006; Slater et al., 2006).

While personality characteristics may be less amenable to intervention, parental supportiveness and monitoring, as well as perceived harm and expectancies about alcohol use, are definitely modifiable so these results have implications for prevention programs (Gerrard et al., 2006). Prevention programs may also highlight the fact that movie alcohol exposure is not a coincidence but rather is a covert advertising strategy: Product placement in movies is forbidden for cigarettes but is legal and commonplace for the alcohol industry, which spends considerable amounts of money to place alcohol in films, including ones commonly viewed by teenagers (Roberts et al., 2004). If adolescents were made more aware of the commercial intent in movie exposures, this might reduce the effect of these exposures on their behavior.

Methodological Issues

The effect sizes for movie exposure in the structural model might seem modest ones. However, it should be noted that these results are partialled effects, which control for the correlation of movie exposure with related variables. In absolute terms the observed effects for movie exposure on the mediators and adolescent alcohol use were comparable in size to effects observed for variables typically characterized as significant predictors of adolescent alcohol use (e.g., sensation seeking, positive parenting). The effect sizes should be interpreted in this context and with recognition of the fact that exposure to smoking and alcohol use in movies is common for adolescents, so the population attributable risk may be considerable (Sargent et al., 2005).

The structural model showed lagged effects for movie exposure and for other variables. These effects might partially reflect methodological characteristics, with the 8-month interval between waves being relatively short in relation to the amount of increase in alcohol use over time. However, some effects for movie exposure and other variables were found from Time 1 to Time 2, so the measurement lag was not necessarily inappropriate to the phenomena. This raises the possibility that the lagged effects represent a dynamic process: involvement in the problem behavior builds increasing use over time, and alcohol use has cumulative effects. Also there was some evidence of reciprocal effects. For example, initial expectancies were related to increased adolescent alcohol use over time, but initial alcohol use was also related to increased positive expectancies at Time 2. Attention is needed in further research to studying possible reciprocal processes for media exposure and other variables (cf. Stoolmiller et al., 2008).

The results of the structural modeling analysis showed that initial movie exposure was related to an increase in reports of alcohol use among friends, and change in this variable was related to increases in subsequent alcohol use by the adolescent at two time points. One construal of this result is that viewing alcohol cues in movies results in more affiliation with peers who drink, as the participant comes to view drinkers as more socially attractive and drinking behavior as more normative. However, it is possible that affiliation is stable but drinking among friends increases, for example as adolescents watch movies together and drinking behavior diffuses through the group, eventually including the focal participant him/herself. In addition it is theoretically conceivable that exposure to movies enhances the perception that peers use alcohol, and it is this perception that influences subsequent behavior. Though these processes are not mutually exclusive and could operate in concert, further research is warranted to obtain detailed measures of network structure and behavior from both focal adolescents and their friends, so as to better resolve the operation of social and cognitive processes in peer networks.

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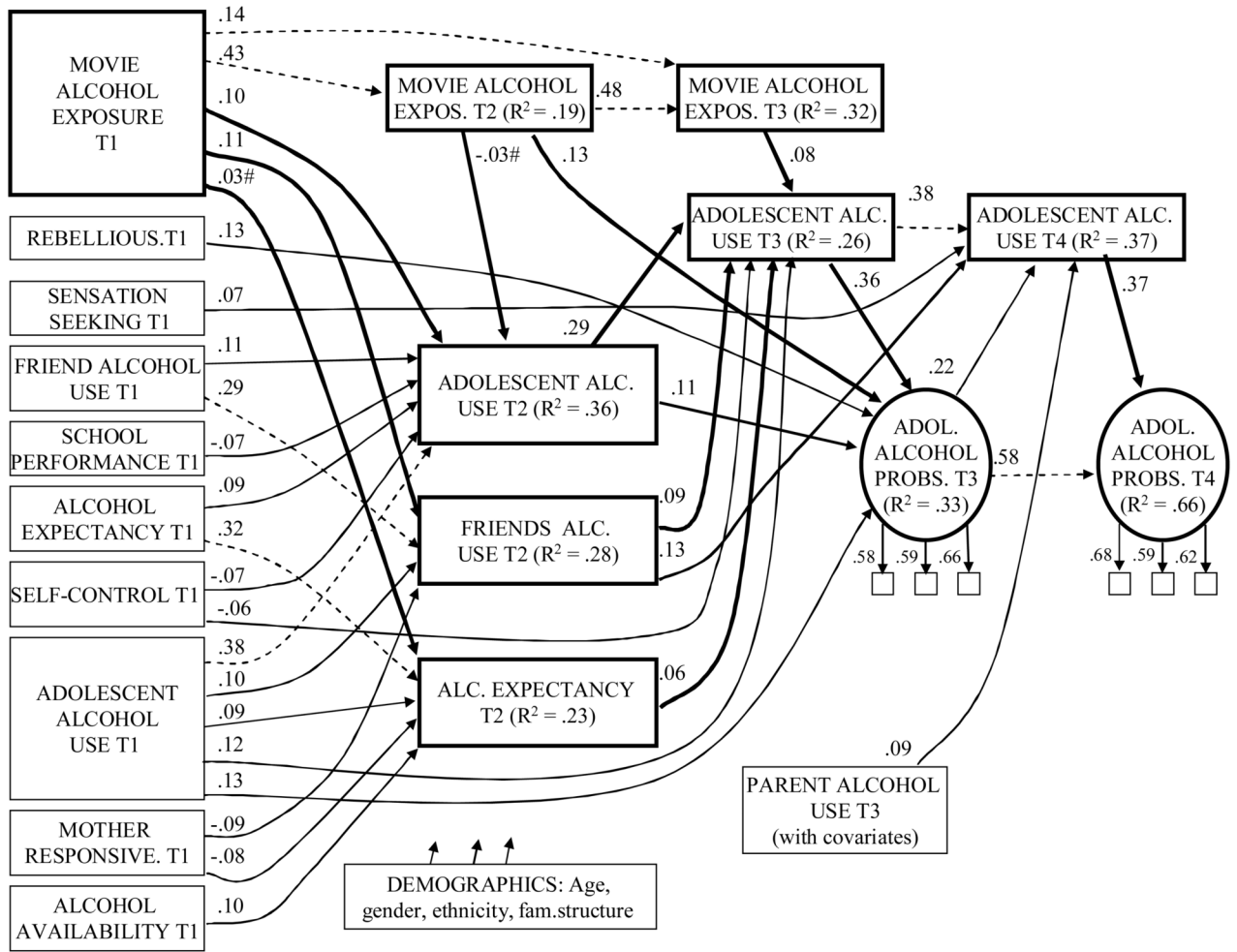


Figure 1. Structural model for effect of movie alcohol exposure on mediators, alcohol use, and alcohol problems. Analytic $N = 961$. Ovals represent latent constructs, rectangles represent manifest variables. Values are standardized coefficients. Coefficients are significant ($p < .05$) unless otherwise noted; # = ns. Bold lines indicate predicted pathways, thin lines indicate pathways for other study variables, dashed lines indicate longitudinal stabilities for variables. Values given with variable names are squared multiple correlations, the variance accounted for in a given construct by all variables to the left of that construct in the model. For correlations among exogenous variables, included in the model but excluded from the figure for graphical simplicity, see Table 2. For demographic effects and residual correlations of endogenous variables, see Footnotes 3 and 4.

Table 1

Prevalence for Alcohol Use Indices (%), for Four Time Points, by Participant Age

	Time1	Time2	Time3	Time4
<u>Baseline age 10 years (n = 1,186)</u>				
Ever drank	2	3	3	5
Ever binged	1	1	1	2
Binged past mo.	<1	<1	<1	<1
<u>Baseline age 11 years (n = 1,303)</u>				
Ever drank	4	6	7	12
Ever binged	1	2	3	5
Binged past mo.	<1	<1	1	2
<u>Baseline age 12 years (n = 1,338)</u>				
Ever drank	6	11	16	22
Ever binged	1	3	6	10
Binged past mo.	<1	1	2	4
<u>Baseline age 13 years (n = 1,418)</u>				
Ever drank	14	24	30	37
Ever binged	5	9	14	18
Binged past mo.	1	3	6	7
<u>Baseline age 14 years (n = 1,277)</u>				
Ever drank	26	35	40	48
Ever binged	10	16	23	28
Binged past mo.	3	6	10	14

Note. Total baseline sample size is 6,522.

Table 2

Correlations of Exogenous Variables

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1. Movie alc. exposure	---																			
2. Age	.24	---																		
3. Female	.02	-.01	---																	
4. Black ^a	-.04	-.04	-.02	---																
5. Hispanic ^a	-.02	.02	.03	-.13 ^c	---															
6. Other ^a	.04	.00	.02	-.08 ^c	-.12 ^c	---														
7. Single parent ^b	.09	-.01	.05	.13	-.05	.06	.B													
8. Blended family ^b	.00	-.09	.00	.03	-.01	.05	-.09 ^c	.B												
9. Education	.06	.09	.00	-.02	-.31	.05	-.06	-.07	---											
10. Rebelliousness	.13	.04	-.25	-.02	.03	.03	.08	.02	-.02	.B										
11. Sensation seeking	.20	.04	-.12	-.10	-.04	.04	.03	-.03	-.02	.46	---									
12. School performance	-.02	-.05	.15	.00	-.07	.00	-.08	.01	.17	-.34	-.22	---								
13. Self-control	.00	.02	.19	.09	-.03	.00	-.03	.00	.01	-.56	-.29	.33	---							
14. Mo. responsiveness	-.07	-.05	.02	-.01	-.02	-.03	-.05	-.04	.02	-.37	-.22	.15	.29	.B						
15. Mo. monitoring	-.10	-.07	.07	.09	.00	.00	.09	-.02	-.06	.26	-.09	.10	.22	.38	---					
16. Alc. availability	.13	.13	-.03	-.10	-.09	.01	-.09	.02	.20	.12	.09	.06	-.03	-.12	-.17	---				
17. Parental alc. use	.04	-.01	-.02	-.10	-.11	-.03	-.10	.03	.14	-.01	.01	.05	-.03	.00	-.07	.30	---			
18. Alc. expectancy T1	.21	.25	.01	-.11	-.07	.07	.01	-.01	.11	.30	.21	-.03	-.19	-.20	-.18	.28	.12	.B		
19. Friend alc. use T1	.29	.37	.11	-.04	.02	.00	.06	-.02	.00	.28	.22	-.09	-.11	-.18	-.15	.22	.04	.43	---	
20. Adolec. alc. use T1	.28	.26	.01	-.05	-.03	.04	.09	-.02	.07	.36	.26	-.10	-.14	-.19	-.15	.22	.00	.49	.48	---
Range	C	10-14	0-1	0-1	0-1	0-1	0-1	0-1	1-6	6-27	4-16	1-3	4-16	10-36	8-28	1-4	1-5	0-3	1-3	0-3
M	47.2	13.0	0.50	0.08	0.16	0.07	0.26	0.02	3.87	10.1	9.39	1.86	11.3	27.8	21.9	1.94	2.95	0.75	1.64	0.49
SD	25.1	1.0	0.50	0.27	0.37	0.25	0.44	0.15	1.31	3.1	2.44	0.75	2.0	4.7	3.8	1.02	1.25	0.79	0.67	0.76

Note: N = 961. Alc. = alcohol; Mo. = mother; Adolec. = adolescent. Approximate significance levels are as follows: $r > |.06|$, $p < .05$; $r > |.09|$, $p < .001$.

^aReference group is Caucasians.

^bReference group is intact.

^cThese correlations are a consequence of the coding procedure.

Table 3

Summary of Indirect Effects for Movie Alcohol Exposure and Adolescent Alcohol Problems

Effect	value	t
<u>Movie exposure T1 B> Alcohol problems T3, total effect</u>	.090	4.197****
Specific indirect effects (Variable/Time):		
MovExp1 - AlcUse2 - AlcProb3	.011	1.577
MovExp1 - MovExp2 - AlcProb3	.056	3.177**
MovExp1 - MovExp2 - AlcUse2 - AlcProb3	-.001	0.900
MovExp1 - FrndAlc2 - AlcUse3 - AlcProb3	.004	2.158*
MovExp1 - MovExp3 - AlcUse3 - AlcProb3	.004	2.258*
MovExp1 - AlcExpec2 - AlcUse3 - AlcProb3	.001	0.907
MovExp1 - AlcUse2 - AlcUse3 - AlcProb3	.010	2.584**
MovExp1 - MovExp2 - AlcUse2 - AlcUse3 - AlcProb3	-.001	1.004
MovExp1 - MovExp2 - MovExp3 - AlcUse3 - AlcProb3	.006	2.437**
<u>Movie exposure T2 B> Alcohol Problems T3, total effect</u>	.138	3.394***
Direct effect, MovExp2 - AlcProb3	.130	3.24***
Specific indirect effects:		
MovExp2 - AlcUse2 - AlcProb3	-.003	0.900
MovExp2 - AlcUse2 - AlcUse3 - AlcProb3	-.003	1.003
MovExp2 - MovExp3 - AlcUse3 - AlcProb3	.014	2.494**
<u>Movie Exposure T3 B> Alcohol Problems T3, total effect</u>	.029	2.544**
Specific indirect effect:		
MovExp3 - AlcUse3 - AlcProb3	.029	2.544**

Note: Values for effects are in standardized metric. MovExp = movie alcohol exposure; AlcUse = adolescent alcohol use level; AlcProb = adolescent alcohol problems; FrndAlc = friends' alcohol use; AlcExpec = adolescent alcohol expectancies.

* $p < .05$

** $p < .01$

*** $p < .001$

**** $p < .0001$