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Cross-Lagged Associations Between Substance Use-Related Media Exposure and Alcohol Use During Middle School

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Abstract

Purpose—This study examines the reciprocal longitudinal associations between alcohol or other drug (AOD)-related media exposure and alcohol use among middle school students, and explores whether these associations differ by ethnicity or gender.

Methods—The analytic sample is 7th grade students who were recruited from 16 California middle schools and surveyed in the spring semester of two academic years. Students reported on their background characteristics, exposure to seven types of AOD-related media content (internet videos, social networking sites, movies, television, magazine advertisements, songs, and video games) in the past 3 months, and alcohol use in the past 30 days. Structural equation modeling was used to examine cross-lagged associations between media exposure and alcohol use.

Results—Greater AOD-related media exposure in 7th grade was significantly associated with a higher probability of alcohol use in 8th grade ($p=.02$), and alcohol use in 7th grade was marginally associated with greater AOD-related media exposure in 8th grade ($p=.07$). These cross-lagged associations did not statistically differ by ethnicity (Hispanic vs. non-Hispanic white) or gender. Further, there was no evidence that certain types of media exposure were more strongly associated with alcohol use than others.

Conclusions—Results from this study suggest that AOD-related media effects and media selectively form a reciprocal, mutually influencing process that may escalate adolescent alcohol use over time. Addressing adolescents' exposure to AOD-related media content and its effects on behavior, such as through media literacy education, may hold promise for improving the efficacy of alcohol prevention efforts for middle school students.

Keywords

media; alcohol; adolescent; longitudinal; middle school; cross-lagged

INTRODUCTION

In a typical day, 11–14 year olds spend more than 8 hours engaged with media content from sources such as TV, movies, music, computer, video games, and print [1]. This media exposure provides middle school students with a steady flow of messages on a wide range of topics, including alcohol use. For example, an analysis of MySpace profiles of 17–20 year

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olds found that 56% of profiles contained references to alcohol, most commonly text or photographs depicting the profile owner drinking alcohol [2]. Descriptive norms for alcohol use portrayed in the online profiles of older siblings and peers, and likely through other types of media as well, can significantly affect the alcohol-related attitudes of younger adolescents such as their willingness to use, attitudes towards use, and perceived vulnerability to use [3]. Over the past decade there has been growing concern that exposure to positive media portrayals of substance use plays a role in encouraging youth to experiment with alcohol, a concern that seems all the more urgent given that one in three youth initiate drinking by 8th grade [4]. Better understanding how media exposure is related to drinking, including whether certain subpopulations are particularly susceptible, can help inform alcohol prevention efforts for middle school students.

Most studies have conceptualized media exposure as an exogenous variable, focusing on media effects on adolescent risk behavior. However, individuals seek out certain media content based on a host of individual and social factors. According to the ‘reinforcing spirals’ model of media exposure and risk behavior [5], media effects and media selectivity can form a mutually influencing process that serves to escalate engagement in risk behavior over time. For example, exposure to positive AOD-related media content may encourage adolescents to drink alcohol, and their drinking may in turn increase their tendency to seek out alcohol-glorifying media content because it is consistent with their existing or developing social identity as a “drinker.” Some support for this model has been found for exposure to violent media content and adolescent aggression [6], but less is known about its potential relevance to understanding adolescent substance use.

There is growing evidence that exposure to alcohol messages via various types of media is a risk factor for future adolescent drinking. For example, exposure to alcohol cues in movies has been associated with increased alcohol use over an 8-month period in a national U.S. sample of 10–14 year olds [7], and with alcohol initiation and heavy drinking over a 12-month period in a German sample of 10–16 year olds [8]. Further, alcohol use is commonly depicted in music videos, particularly in the rap genre [9], and greater exposure to rap music videos has been longitudinally associated with alcohol use, at least among high school aged African American females [10]. In the case of alcohol advertising, one study found that 6th graders in the 75th percentile of alcohol advertising exposure had a 50% greater predicted probability of drinking in 7th grade compared to students in the 25th percentile of exposure [11]. Compared to studies of media exposure via movies, music and advertising, there is less published research on the effects of exposure through social networking sites (SNS; e.g., Facebook), despite the fact that 42% of 11–14 year olds visit SNS and spend an average of nearly 70 minutes per day on this activity [1]. Younger adolescents tend to interpret peer references to alcohol use on SNS as evidence of real use [12]. Further, a national survey of middle and high school aged youth (13–17 years old) found that lifetime drinkers used SNS more frequently than never drinkers [13]. Thus, greater exposure via SNS may be a particularly important risk factor for future drinking among middle school youth. As noted above, however, less is known about whether young drinkers are more likely than nondrinkers to seek out these types of AOD-related media content.

The current study uses longitudinal data from a large, diverse sample of middle school students to address gaps in the literature by testing the reinforcing spirals model in the context of adolescent drinking. Specifically, we examine whether the association between AOD-related media exposure and alcohol use is unidirectional or reciprocal during the middle school years. This is also the first study to examine whether these associations differ by ethnicity or gender among middle school students. Hispanics have an average of 3 more hours per day of media use compared to non-Hispanic whites [1] and thus are likely to receive greater exposure to AOD-related media content. In the case of gender, at least one

type of media exposure – beer advertisement awareness – is much higher among adolescent males than females [14] and is prospectively associated with greater beer consumption among males only [15]. However, little is known about whether associations between AOD-related media exposure and adolescent drinking are moderated by ethnicity or gender. One of the few studies to examine demographic moderators of media effects on adolescent drinking focused on racial differences, finding greater susceptibility to media influence among White than Black adolescents [16]. Better understanding the associations between media exposure and alcohol use has important implications for the design of media-focused alcohol prevention efforts for middle school students, including whether targeted programming is needed for subgroups most susceptible to (or likely to seek out) AOD-related media messages.

METHODS

Participants

Participants were part of the evaluation of CHOICE [17], a voluntary after-school substance use prevention program. Students in 6–8th grades from 16 Southern California middle schools completed five in-school surveys over a 2–1/2 year period. Items on AOD-related media exposure were added to the final two surveys: spring 2010 (T1) and spring 2011 (T2). Analyses are based on $n=2,321$ students who were in 7th grade in 2010, completed the 2010 and/or 2011 surveys, and were not missing demographic information (see Table 1). Study procedures were approved by the schools, the school districts, and the institution's Internal Review Board.

Measures

Covariates—Analyses controlled for age (in years), gender, race/ethnicity [coded: Asian, non-Hispanic white, non-Hispanic black, Hispanic, multi-ethnic/other], academic performance (1=*mostly F's* to 8=*mostly A's*), parental education (1=*either parent completed college*, otherwise 0), and how often the student was around kids who drink (1=*never* to 4=*often*). Additional covariates included whether the student had an older sibling (and if so, whether that sibling consumed alcohol), an intact nuclear family (lived with both parents), and a most important adult in their life who consumed alcohol.

Alcohol use—Students were asked the number of days they had at least one drink of alcohol during the past month [18,19]. Due to rare responses at higher levels of use, we dichotomized this measure to *any use* (=1) versus *no use* (see Table 2).

AOD-related media exposure—Separate items asked how often in the past 3 months students had seen/heard the following (1=*not at all* to 7=*every day*): (a) videos on the internet showing someone who is drunk or high; (b) pictures or comments on a social networking site (like Facebook or MySpace) showing or talking about someone who is drunk or high; (c) movies in movie theaters or rental videos/DVDs showing someone who is drunk or high; (d) television programs showing someone who is drunk or high; (e) alcohol advertisements in magazines; (f) songs that talk about getting drunk or high; and (g) video games that show someone getting drunk or high, or selling drugs (see Table 2).

Data Analysis

We employed cross-lagged correlation analysis to determine the temporal association between past month drinking and AOD-related media exposure. We considered media exposure as a latent variable model, indicated by the seven media exposure items; alcohol consumption was treated as a single measured variable. Our general modeling approach involved the implementation of cross-lagged path analysis [20,21] using the Mplus 6.11

software program [22]. First we developed a measurement model of media exposure to determine whether a single factor of media exposure was appropriate, and whether any additional parameters or a two factor model would improve model fit. Then the two variables of alcohol use and media exposure (the latter being latent) at Grade 8 were regressed on the same variables measured at Grade 7. Both variables of interest, at both waves, were regressed on all covariates. Figure 1 shows the path diagram representation of the model. This modeling technique is widely used to assess causal models in data derived from non-experimental, longitudinal research designs [20]. We used the weighted least squares with mean and variance adjustment (WLSMV) estimator in Mplus. We adjusted for school using the cluster option in Mplus, which implements a sandwich estimator to correct for clustering of individuals in schools. To account for attrition, we conducted analyses using full information estimation [23,24]. This technique avoids sample biases that can occur when one excludes from the analyses those participants who missed the follow-up survey, as well as provides an unbiased method for increasing inferential power when data are missing at random or completely at random [25]. Secondary analyses used a multiple group approach to test whether the cross-lagged regression parameters (i.e. the path from alcohol consumption at T1 to media exposure at T2, and from media exposure at T1 to alcohol consumption at T2) differed across ethnicity or gender groups using a Wald test [26].

Finally, we tested whether the effect of any individual type of media exposure was a significantly better predictor of use than would be expected given its relationship with the latent variable, or whether use predicted one type of exposure to a greater degree than would be expected given its relationship with the latent variable. We did this by examining the differential effect of individual items; we repeatedly estimated the same model, but each time we added one additional direct path from each item at T1 to use at T2, and the repeated this to estimate the path from use at T1 to the item at T2. For 7 items we therefore estimated 7 ‘cause’ paths, and 7 ‘effect’ paths. We used Bonferroni correction to avoid an inflated type I error rate.

RESULTS

Following recommended procedures [27,28], we first developed a latent variable model of media exposure. We estimated a confirmatory factor analysis model with one factor at each time point, and a model with two factors at each time point (factors were indicated by social media items, or mass media items), with a correlation in the unique variance of each variable and its equivalent at T2. Equivalent loadings were constrained to equality across time (to test for longitudinal invariance). In both models modification indices and examination of the items suggested a correlated error should be added between the unique variances of items A and B (see Table 2; both relating to social networking) and A and G (both relating to video), at both time points. The single factor model ($\chi^2(71)=251, p<0.001; RMSEA=0.032; CFI=0.996$) fit better than the two factor model ($\chi^2(65)=266, p<0.001; RMSEA=0.035; CFI=0.996$). Given that the single factor provided the better fit, we chose to conceptualize media exposure as a single latent variable.

Having developed a measurement model for media exposure, we added alcohol use at T1 and T2 to the model, and the covariates (described above) in a cross-lagged model (Figure 1). The model provided a good fit to the data ($\chi^2(280)=577, p<0.001; RMSEA=0.021; CFI=0.97$). Examination of the parameter estimates showed that the effect from alcohol consumption at T1 to media exposure at T2 was marginally significant (estimate=0.10; $SE=0.05; p=0.07$; standardized estimate=0.11). The effect from media exposure at T1 to alcohol use at T2 was statistically significant (estimate=0.17; $SE=0.07; p=0.02$, standardized estimate=0.13).

Next, we tested for differences between Hispanics and non-Hispanic whites (note that these were the only two racial/ethnic groups with sufficient individuals to fit the model). The effect from alcohol consumption at T1 to media exposure at T2 among Hispanics was 0.16 ($SE=0.09$, $p=0.07$), and among non-Hispanic whites was 0.22 ($SE=0.11$, $p=0.05$); the difference between these two effects was 0.06 and non-significant ($SE=0.14$, $p=0.67$). Next considering the effect from media exposure at T1 to alcohol consumption at T2, in the Hispanic group the effect was 0.20 ($SE=0.09$, $p=0.03$), and in the non-Hispanic white group the effect was 0.09 ($SE=0.13$, $p=0.50$); the difference was 0.11 and non-significant ($SE=0.16$, $p=0.50$).

The final secondary analysis involved testing for gender differences. The effect from alcohol consumption at T1 to media exposure at T2 was 0.11 ($SE=0.07$, $p=0.08$) for females, and 0.14 ($SE=0.10$, $p=0.17$) for males; the difference between these two estimates was 0.03 and non-significant ($SE=0.12$, $p=0.84$). The effect from media exposure at T1 to alcohol consumption at T2 was 0.24 ($SE=0.13$, $p=0.08$) for females, and 0.07 ($SE=0.14$; $p=0.63$) for males; the difference between these two estimates was 0.17 and non-significant ($SE=0.19$, $p=0.38$).

Finally, no media items were found to be significantly better (or worse) predictors of alcohol use at T2, and no item was predicted by use at T2 significantly differently (even before correcting p-values with Bonferroni correction to control for multiple testing).

DISCUSSION

Depictions of substance use are pervasive on the internet and in movies, songs, video games, and other media. More than half of the 7th grade students in our sample reported exposure during the past 3 months to one or more of the AOD-related media content that we examined, such as alcohol advertising and media references to someone who was drunk or high. Although exposure to positive media depictions of drinking is known to increase the risk of adolescent alcohol use [7–11], this study significantly extends the existing literature by providing some support for the reinforcing spirals model of media exposure and risk behavior. [5] Our findings suggest that a positive feedback loop may serve to escalate adolescent drinking over time: Viewing positive portrayals of AOD use in the media encourages young adolescents to experiment with alcohol. In turn, experimenting with alcohol may encourage adolescents to seek out more AOD-related media content as a way to reinforce their emerging social identity as a drinker. This is the first study to demonstrate this type of reciprocal process for adolescent substance use (see [29]). However, given that the media selectivity pathway from alcohol use to media exposure was marginally significant, further research is needed to determine the robustness of this finding.

A recent meta-analysis of media exposure and risk behavior by Fischer and colleagues [30] found weaker associations for certain types of media (e.g., music) than others (e.g., video games, advertisements, film and TV) on a range of risk behaviors. We were able to compare different media in the present study, finding no evidence that certain types of media have a stronger or weaker impact on behavior, at least in the case of alcohol use among middle school students. This finding is somewhat surprising as one might expect that media messages from familiar sources that are often interpreted by young adolescents as evidence of actual use, such as pictures or comments on SNS [12], would have a particularly strong influence on behavior. That exposure to AOD-related content via internet videos, SNS, movies, song lyrics, and video games were similarly predictive of future alcohol use suggests that media-focused alcohol prevention efforts need to have a broad focus and address exposure to positive AOD content across multiple mediums. Seemingly innocuous messages, such as song lyrics that glorify partying, may have as much of an impact on

drinking behavior during middle school as seeing references to substance use on SNS profiles.

Media literacy education has been advocated as a strategy for preventing adolescent substance use by prominent national health organizations such as the American Academy of Pediatrics [31]. Although the field is still in its infancy, several substance use-related media literacy programs have demonstrated promising results [32]. Media literacy education targeting AOD use has been successfully implemented in schools, either integrated within a broader school-based drug prevention curriculum (e.g., [17,33]) or offered as a stand-alone program (e.g., [34]). Brief office-based counseling by a pediatrician has also been found to reduce media use among children [35] and may be a useful approach for young adolescents as well. To be maximally effective in reducing youth alcohol use, our results suggest that media literacy programs must: (1) break the reciprocal cycle of ‘media exposure adolescent drinking media exposure’ by reducing both the effects of media exposure on adolescent drinking and the extent to which at-risk adolescents seek out media content that normalizes and glamorizes alcohol use; and (2) focus not only on countering advertising techniques, a main target of existing efforts, but on mitigating the effects of positive AOD messages found on the internet and in television shows, movies, video games, and song lyrics. In addition, our results indicate that the associations between media exposure and alcohol use are similar across ethnic and gender subgroups, suggesting that targeted intervention approaches are not needed.

Limitations of this study include not having more detailed information on each type of media exposure, including separate items on alcohol- and drug-related media messages, due to time constraints on the survey. Associations with alcohol use might have been even stronger if the media items asked specifically about alcohol-related exposures. In addition, it would have been informative to collect information on how youth decoded the media messages and what meaning they assigned to them, rather than simply asking how often they were exposed to these messages. Finally, a third wave of data for the cross-lagged analyses would have provided a more thorough understanding of how media exposure is related to alcohol use over time.

Results from this study suggest that effective strategies are needed to both mitigate the negative effects of viewing AOD-related media content on adolescent behavior, as well as encourage young adolescents to make better choices in their selection of media content. Media literacy programs implemented in a wide array of settings provide one approach, but few rigorous evaluations have been conducted on literacy programs targeting AOD use. Further research is needed to identify the most efficacious approaches for this younger age group, as well as to better understand the mechanisms through which media exposure influences adolescent alcohol use and vice versa.

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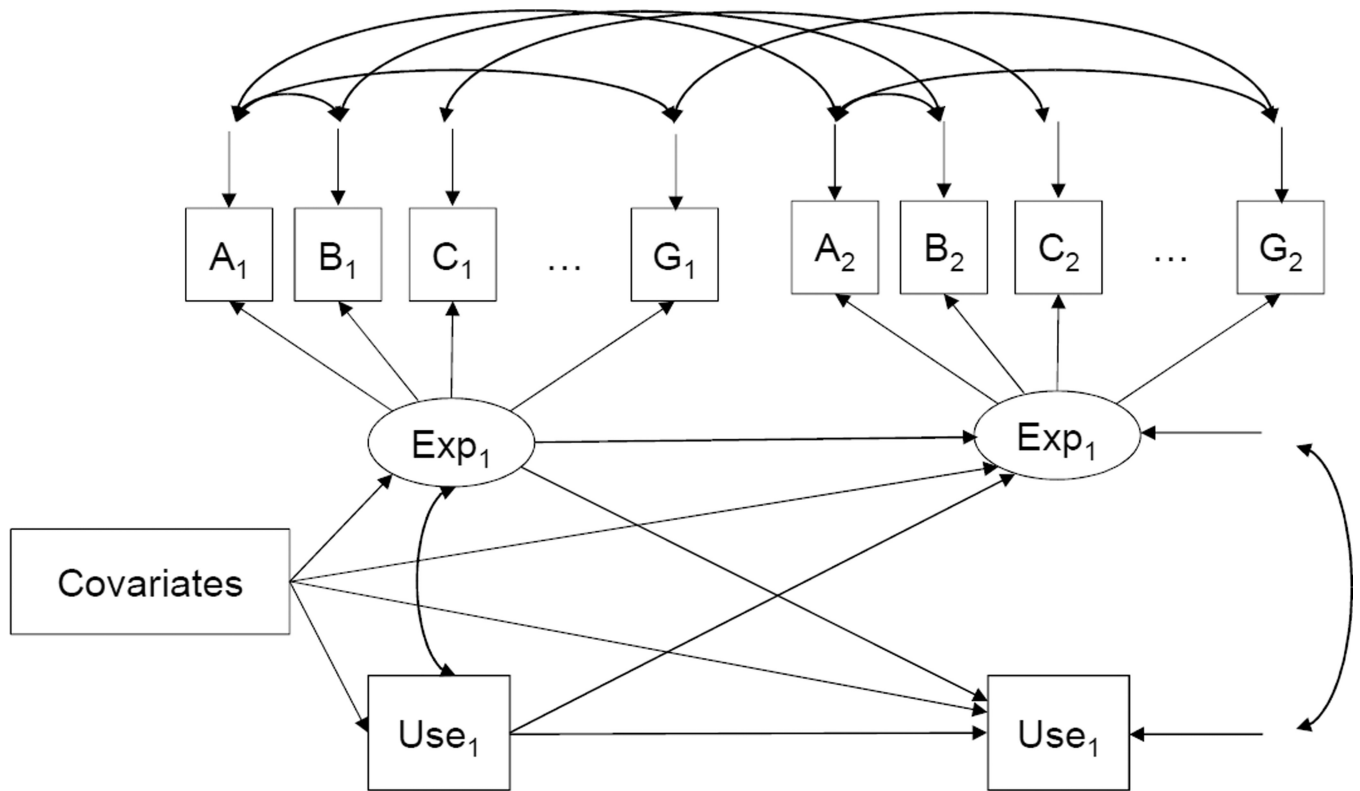


Figure 1. Conceptual cross-lagged path model of AOD-related media exposure and alcohol consumption.

TABLE 1

Descriptives of Background Variables at T1

Variable	N (%) or Mean (SD)	
Age	12.6	0.51
Male	1114	(48%)
Female	1207	(52%)
Asian	426	(18%)
Black	75	(3%)
Hispanic	1198	(52%)
Multi-ethnic / other	298	(13%)
White	324	(14%)
Nuclear family	1320	(57%)
Have older sibling	1557	(67%)
Have older sibling who drinks alcohol	368	(16%)
Important adult consumes alcohol	1.57	(0.88)
Academic Performance	6.15	(1.77)
How often around teens who were drinking alcohol	1.37	(0.78)
At least one parent completed college	1226	(53%)

TABLE 2

Descriptives of Alcohol Consumption and AOD-Related Media Exposure at T1 and T2

	T1 (N=2079)	T2 (N=1787)
% of students who consumed alcohol, past 30 days	4.7%	7.7%
A. Videos on the internet showing someone drunk or high		
Mean (SD) frequency of exposure	1.51 (1.33)	1.81 (1.60)
% of students with any exposure	19.2%	29.1%
B. Pictures or comments on a social networking site showing or talking about someone who is drunk or high		
Mean (SD) frequency of exposure	1.57 (1.42)	1.96 (1.74)
% of students with any exposure	21.5%	32.4%
C. Movies in movie theaters or rental videos/DVDs showing someone drunk or high		
Mean (SD) frequency of exposure	1.94 (1.53)	2.43 (1.78)
% of students with any exposure	39.5%	55.3%
D. Television programs showing someone drunk or high		
Mean (SD) frequency of exposure	1.95 (1.63)	2.42 (1.85)
% of students with any exposure	36.4%	51.1%
E. Advertisements for alcohol in magazines		
Mean (SD) frequency of exposure	1.93 (1.66)	2.36 (1.92)
% of students with any exposure	33.6%	45.0%
F. Songs that talk about getting drunk or high		
Mean (SD) frequency of exposure	1.62 (1.47)	2.96 (2.27)
% of students with any exposure	38.5%	55.4%
G. Video games that show someone drunk or high or selling drugs		
Mean (SD) frequency of exposure	1.81 (1.60)	1.89 (1.67)
% of students with any exposure	22.1%	30.8%