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## Bidirectional Relationships between Alcohol-Specific Parental Socialization Behaviors and Adolescent Alcohol Misuse

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### Abstract

**Background:** Although numerous studies have examined parental influence on adolescent alcohol misuse, few have examined how adolescents impact parental behavior or the reciprocal nature of parent-adolescent behavior relative to alcohol misuse.

**Objectives:** This study assessed bidirectional relationships between adolescent alcohol misuse and three alcohol-specific parenting behaviors (substance-specific monitoring, permissive communication messages about alcohol, and cautionary communication messages about alcohol).

**Methods:** Data were from 1645 parent-adolescent dyads drawn from a longitudinal study spanning grades 6 through 10. A multivariate latent curve model with structured residuals was used to test study hypotheses.

**Results:** One marginally significant result emerged (increased alcohol misuse leads to greater substance-specific monitoring) after accounting for underlying developmental processes.

**Conclusions:** Though practical implications are limited based on the results of the study, further directions for research regarding study design and measurement are provided to more fully examine dynamic processes between parents and adolescents relative to alcohol use.

### Keywords

adolescent alcohol misuse; socialization; alcohol-specific parenting; transactional models of development; structural equation modeling

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Adolescent alcohol misuse describes a pattern of risky drinking behavior and associated consequences that is harmful for a range of health outcomes, as well as interpersonal relationships and social responsibilities (Ellickson et al., 1996; Foxcroft et al., 2002). Thus,

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preventing alcohol misuse during adolescence is an important public health goal. To inform prevention strategies, research on the etiology of adolescent alcohol use has often focused on the family context, in particular, parental influences (e.g., modeling of alcohol use, monitoring of child's activities; see van der Vorst et al, 2005; van der Zwaluw et al, 2008) on adolescent alcohol use. This research has largely centered on how parents shape the behaviors of their children, with little regard for how adolescents affect parental behavior, or the dynamic associations between parent and adolescent behaviors. A more thorough understanding of the interactions between parents and adolescents regarding alcohol use would inform family-based prevention strategies. By specifying how and when adolescent and parental behaviors are linked, prevention strategies can aim to modify negative interchanges and emphasize protective interactions during critical developmental periods.

## Parental Socialization of Adolescent Alcohol Misuse

Parents play a critical role in socializing their children to the use of alcohol, a culturally accepted substance used by most adults in the United States. Parents shape their children's alcohol use in two ways: through their general socialization behaviors and through their alcohol-specific parenting practices (Barnes et al., 1986; Darling and Steinberg, 1993). Much of the literature regarding parental socialization of alcohol use examines general parenting behaviors, namely parental support and behavioral control, which impact a range of adolescent behaviors (e.g. Barnes et al, 1986; Stice & Barrera, 1995; Jackson et al, 1998). Contrastingly, alcohol-specific parenting practices are enacted with the targeted, specific goal of influencing youth alcohol involvement. Alcohol-specific parenting practices have produced unique effects on substance use above and beyond the effects of general parenting behaviors (Handley and Chassin, 2013; Kerr et al., 2010; van der Zwaluw et al., 2008).

Alcohol-specific parenting practices include setting rules about alcohol use (van der Vorst et al 2005), monitoring for child alcohol use (Jackson et al 1999; van der Zwaluw et al., 2008), and communicating about alcohol (Ennett et al., 2001; Koning et al., 2012). When parents set boundaries and enforce rules about alcohol use, their child is less likely to be involved with alcohol (Mares et al., 2012; van der Vorst et al., 2006; van der Vorst et al., 2007). Parental monitoring specific to alcohol use, for example asking a child whether their friends drink alcohol, is related to lower drinking levels among early adolescents (van der Zwaluw et al., 2008). In addition to what parents do relative to alcohol use, what parents say also matters. Cautionary messages that relay the harms and consequences of drinking are associated with reductions in drinking (Andrews et al., 1993), while permissive messages that demonstrate a level of acceptance of youth alcohol use are associated with higher levels of alcohol use and misuse (Jackson et al., 1999; Wood et al., 2004).

## Transactional Models of Adolescent Alcohol Misuse: Reciprocity of Parent-Adolescent Behavior

The majority of studies on parental socialization and adolescent alcohol use have examined how parents influence their children's alcohol use. Socialization theories, and specifically transactional models of development, however, posit that individuals are engaged in a continual process of mutual influence with their significant others (Bell, 1968; Oetting and

Donnermeyer, 1998; Sameroff, 1975). That is, the individual is developing in response to the changing environment, which in turn develops based on the changing individual. Applied to the parent-child dynamic regarding alcohol use, transactional theories suggest that an adolescent's misuse of alcohol and parental socialization behaviors are responsive to each other.

Limited research has examined reciprocal effects between parenting and adolescent substance use, and those studies that have largely focus on general parenting behaviors. For example, research suggests reciprocal effects between adolescent alcohol use and parental monitoring (van der Vorst et al., 2006), and between substance use more broadly and effective parental discipline (Elkins et al., 2014), parental knowledge and family activities (Coley et al., 2008), as well as parental support and control (Stice & Barrera, 1995). Only one study has examined reciprocal effects between adolescent alcohol use and alcohol-specific parenting behaviors, finding full reciprocal effects between alcohol use and alcohol-specific behavioral control (van der Zwaluw et al., 2008). Collectively, these studies indicate that increases in adolescent substance use correspond to decreases in positive parenting, which in turn increases adolescent substance use. It may be that decreases in positive parenting practices following adolescent substance use indicate a corrective response on the part of the parents to address their adolescent's behavior. Such corrective responses might include increased efforts to restrict autonomy and increased discipline (including ineffective discipline), which may in turn lead an adolescent to rebel against such behaviors they perceive as infringing on their independence.

Transactional models imply that not only are the relationships between parental socialization behaviors and adolescent behaviors reciprocal in nature, they are also subject to developmental changes that occur as an adolescent matures. Physical and cognitive maturation impact adolescents' perceptions of themselves and their relationships with others. With increasing age, adolescents' sense of self and personal autonomy develop with exposure to new experiences within and outside the family (Steinberg and Morris, 2001). These maturation processes can destabilize the parent-adolescent bond that is fundamental to the interactions parents and children have with one another (Steinberg, 1988), and reshape the relationship adolescents have with their parents. For example, adolescents may rebel if they feel their parents are encroaching on the expanded independence they seek (Kakihara and Tilton-Weaver, 2009; Kerr and Stattin, 2000). Because of these developmental changes, research regarding behavioral interactions between parents and adolescents should account for stability and change in reciprocal relationships across adolescence.

Transactional models of development thus specify dynamic relations between parental behaviors and adolescent alcohol misuse over time. Transactional models assess how two behaviors *jointly* change over time- in this case, how an adolescent's misuse of alcohol subsequently affects their parents' socialization behaviors, and vice versa. Such an inquiry requires an analytical approach that appropriately captures time-specific relations that link the behaviors of each parent-adolescent dyad. Doing so investigates how a change in adolescent or parent behavior at one point in time may be meaningfully related to change in the behavior of the other person at a following point in time, thereby elucidating how parents and teens respond to one another. These time-specific effects must be distinguished from

time-stable processes that occur across persons and reflect overall levels and rates of change based on characteristics of individuals (e.g., adolescents whose parents, on average, monitor their whereabouts are less likely to drink alcohol than those whose parents do not). To date, studies of reciprocal relations between parental socialization and adolescent alcohol use, as described previously, have not adequately distinguished time-specific and time-stable effects. Results from these studies confound time-specific and time-stable mechanisms of effects that are often the basis of prevention programs designed to induce behavior change over time.

## Current Study

The current study examined bidirectional relationships between adolescent alcohol misuse and three alcohol-specific parenting practices (substance-specific monitoring, permissive communication messages indicating situations in which drinking is acceptable, and cautionary communication messages about the harms and consequences of drinking). We expected that at times when the parent exhibits weaker parenting behaviors (lower levels of substance-specific monitoring and cautionary communication messages, and higher levels of permissive communication messages), the adolescent will subsequently exhibit higher levels of alcohol misuse than typical. In the other direction, we expected that at times when the adolescent misuses alcohol more than his/her average level, the parent will consequently exhibit weaker parenting behaviors.

To account for developmental change processes, we investigated the extent to which bidirectional effects between adolescent alcohol misuse and each of the three parenting behaviors changed across grades 6–10. We hypothesized that parental influence on adolescent alcohol misuse would decrease over time. We did not make a directional hypothesis for adolescent influence on parenting over time given the lack of previous research on these relationships; however, we did hypothesize that the influence of adolescent alcohol misuse on each of the three parenting behaviors would change across grades 6–10.

## METHODS

### Study Design and Participants

The sample included adolescent-parent dyads drawn from a longitudinal cohort sequential study of adolescent alcohol use and other problem behaviors and the contextual factors that influence the development of those behaviors (Ennett et al., 2008). Three cohorts were enrolled in grade 6 (average age = 12.16 years), grade 7 (average age = 13.08 years), and grade 8 (average age = 14.06 years) at baseline. The adolescents attended public schools located in three non-metropolitan counties in North Carolina. Data were collected from adolescents and their parents over a two-and-a-half-year period, with five waves of data collection every six months for adolescents and three annual assessments with parents. Data were collected between the spring of 2002 and the spring of 2005. All adolescents in grades 6–8 were eligible for the study except for those who could not complete the survey in English, were in self-contained special education classrooms, or were out of school for long-term suspension. Parents were given the opportunity to refuse consent for their child to participate in the study. The parent sample was drawn as a simple random sample of parents

of adolescents who completed the wave 1 adolescent questionnaire. Additional eligibility required parents to have only one child in the school-based study and the ability to complete the interview in English. Parents completed annual telephone interviews at waves 1, 3, and 5.

Data from adolescents were collected through a self-administered paper questionnaire facilitated by study staff during school hours in classrooms or other designated school locations. Trained data collectors followed a written protocol to describe the study, obtain assent, and provide directions on completing the questionnaire. To maintain confidentiality, teachers remained at their desks as students completed the questionnaire, which they placed in envelopes upon completion. Trained data collectors conducted the parent interviews via telephone. All study protocols were approved by the university's Institutional Review Board.

At wave 1, 5220 adolescents completed the in-school questionnaire (88.4% of eligible adolescents). A random sample of 2215 parents of these adolescents was identified, of whom 1663 completed the wave 1 telephone interview (79.8%). Adolescent-parent dyads were excluded from the sample if 1) the metric of time for this study (grade) could not be confirmed for the adolescent (n=15) or 2) adolescents were missing data for alcohol misuse across all waves of data collection (n=3), resulting in an analytical sample of 1645 parent-adolescent dyads.

Approximately 52% of adolescents were female and 57% self-reported as White, 36% Black and 7% other races (Hispanic/Latino, American Indian/Native American, Asian/Pacific Islander, multiracial, other). Nineteen percent of adolescents reported living in a household in which there was only one parent at any wave, and 40% reported the highest level of education obtained by either parent was high school or less. By design, for 98% of cases, the responding parent was the mother or mother surrogate, of which 59% self-reported as White, 38% Black and 3% other races.

## Measures

Adolescent alcohol misuse was based on responses from the adolescent in-school questionnaire. All measures of parenting behaviors were derived from parental reports of their own behavior.

**Alcohol misuse.**—Adolescents responded to eight questions related to recent alcohol use, measuring both problematic levels (e.g., ‘how many times have you had 5 or more drinks in a row’) and negative consequences of alcohol use, (e.g., ‘gotten into a sexual situation that you later regretted because you had been drinking’) (National Longitudinal Study on Adolescent to Adult Health, 2001). Responses fell into five categories ranging from 0 to 10 or more occurrences in the past 3 months. We used a previously constructed measure of these items that applied item response theory (IRT; Thissen et al., 2001), which resulted in a measure that was continuously distributed with less skewness and kurtosis than a scale derived from summary scores (Ennett et al., 2008).

**Substance-specific monitoring.**—Parents were asked in reference to their child whether they had ‘checked his/her room or other places for evidence of tobacco, alcohol or

other drug use' and 'looked for signs that he/she might have smoked or used other kinds of tobacco, drank, or used marijuana or other drugs' (National Center on Addiction and Substance Abuse, 2001). The two dichotomous items (1=yes, 0=no) were averaged to create a substance-specific monitoring score (W1: 0.76, W2: 0.77, W3: 0.77; average  $\alpha$  across waves = 0.77).

**Permissive messages about alcohol.**—We used a previously published measure for permissive messages about alcohol identified through factor analysis with this dataset (Reimuller, Hussong, & Ennett, 2011). The measure included three items reflecting parental acceptance of alcohol (permission to drink at special family occasions, drinking in moderation is okay, permission to have sips of alcohol at home). The three dichotomous items (1=yes, 0=no) were averaged to generate a permissive messages score (W1: 0.62, W2: 0.63, W3: 0.66; average  $\alpha$  across waves = 0.64).

**Cautionary messages about alcohol.**—The measure for cautionary messages about alcohol, also previously constructed with this dataset, consisted of six items (Reimuller, Hussong, & Ennett, 2011). The six dichotomous items (1=yes, 0=no) reflected whether parents had communicated with adolescents about the harmful consequences of alcohol use (e.g., drinking is not healthy), and parental rules regarding alcohol (e.g., he/she cannot ride with someone who has been drinking). The six items were averaged to create a cautionary messages score (W1: 0.76, W2: 0.75, W3: 0.76; average  $\alpha$  across waves = 0.76).

**Covariates.**—Analyses controlled for the demographic characteristics of adolescent-reported sex, race/ethnicity, age in years, and family structure, and parent-reported parental education. To estimate the unique contribution of each alcohol-specific parenting practice, in each model we included time-stable controls for general parenting behaviors (parental support and behavioral control; both from Jackson et al., 1998), parental alcohol use (quantity by frequency measure), and the two other alcohol-specific parenting practices.

## Analytic Approach

Due to the cohort sequential design of the study, data collected over a two-and-a-half-year period from three cohorts (i.e., cohorts enrolled at grades 6, 7, and 8) were merged to allow accelerated trajectories of adolescent alcohol misuse to be modeled from the spring of 6<sup>th</sup> grade to the spring of 10<sup>th</sup> grade, using one-year intervals, and resulting in five discrete data points. Using conditional growth models, we found no evidence of cohort differences in growth trajectories for alcohol misuse and each of the parenting behaviors (i.e., the interaction between time and cohort for each model was not significant), suggesting that data from each of the cohorts could be combined to estimate a single developmental curve for each behavior across grades 6 through 10.

The goal of the analyses was to model the time-specific, reciprocal relationships between two constructs: adolescent alcohol misuse and a parenting behavior. To simultaneously examine the hypothesized relationships over time, we utilized a latent curve model with structured residuals (LCM-SR; Curran et al., 2013), an extension of the autoregressive latent trajectory (ALT) model (Bollen and Curran, 2004). The LCM-SR was chosen because of its



unique ability to disaggregate time-specific and time-stable effects of the proposed relationship between the constructs over time (Curran et al., 2013; Curran and Bauer, 2011). Figure 1 represents a general LCM-SR for purposes of demonstrating the analytical components of this model. The LCM-SR deviates from the ALT model in that the LCM-SR specifies the autoregressive and prospective paths at the level of the time-specific residuals, rather than the observed variables, as is typical of the ALT model. The LCM-SR's reparameterization allows for the disaggregation of time-stable and time-specific processes, as the inclusion of the time-specific component of the model (indicated in Figure 1 as the cross-lagged pathways among the residuals of the repeated measures for each behavior) does not influence the fixed-effect characteristics (e.g., mean structure; indicated in Figure 1 as the latent factors, and covariances between those factors) of the underlying latent curve.

Due to model complexity, a separate model was estimated between each parenting behavior and adolescent alcohol misuse, controlling for all other parenting behaviors and demographic covariates. Given the annual assessment of parent data, the reciprocal relationships were structured in the analyses with one year intervals between repeated measures. When testing nested models, we used a chi-square difference test to determine improvement in model fit. The comparative fit index (CFI), Tucker-Lewis Index (TLI) and the root mean square error of approximation (RMSEA) were used to assess model fit for all latent curves (Bollen and Curran, 2006). Good fit was denoted as indices greater than 0.95 for the CFI and TLI statistics and less than 0.05 for the RMSEA. Missing data were accommodated using full information maximum likelihood estimation.

We used a model building approach similar to that of Curran et al (2013) to assess increasingly complex models to test study hypotheses. Briefly, we first established a univariate growth curve for adolescent alcohol misuse that was used in all subsequent analyses. After we established the univariate curve for the parenting behavior, we generated a bivariate LCM-SR by allowing the latent variables of the two constructs to covary. The time-specific residuals were allowed to covary within time, and we tested an equality constraint on those time-specific covariances. Next, we added the prospective, cross-lagged regressions in multiple steps, adding the regressions for each direction (parent to child and child to parent) separately and testing equality constraints across time on the regressions (all constrained, sequential increase by fixed amount, all free to vary). All components were then combined into a final model. At each step, the best fitting model was chosen based on parsimony, theoretical inclusion of components, and overall fit. We conducted sensitivity analyses with no covariates and only socio-demographics covariates, and no differences in results were found between these models and the final model described above. All analyses were conducted using MPlus Version 7 (Muthèn & Muthèn, 2012).

## RESULTS

Table 1 provides the mean values for all items used in the alcohol misuse score at all grades. Results indicate that problematic levels of alcohol use and consequences of drinking increase through the spring of 9<sup>th</sup> grade. Table 2 provides the correlations, means, and standard deviations of all study measures.

## Univariate LCM-SR for Adolescent Alcohol Misuse and Parental Socialization Behaviors

Results for the univariate latent curve model with structured residuals for alcohol misuse and each parental socialization behavior are summarized in Table 3.

**Alcohol misuse.**—The final conditional univariate curve for adolescent alcohol misuse included a random intercept, a linear slope, and equal autoregressive pathways. Similar to previous studies published using this dataset (Ennett et al., 2008), a random slope could not be estimated, thus the variance was fixed to zero for all subsequent analyses. This constraint does not preclude model estimation as the time-varying alcohol misuse measure (net of the effects of the underlying growth process) was the focal outcome for this analysis rather than the underlying growth trajectory itself. The estimated means for the retained latent factors indicate the model-implied mean trajectory for the sample was characterized by an initial adolescent alcohol misuse score of  $-.14$  ( $p<.01$ ) and a significant positive linear growth factor ( $b=.23$ ,  $p<.01$ ). In addition to these fixed effects, there was significant individual variability around the initial level of alcohol misuse ( $b=.07$ ,  $p<.01$ ).

**Substance-specific monitoring.**—The conditional univariate curve for parental substance-specific monitoring included a random intercept and linear slope. The estimated means for the retained latent factors indicate the model-implied mean trajectory for the sample was characterized by an initial substance-specific monitoring score of  $.32$  ( $p<.01$ ) and a significant positive linear growth factor ( $b=.02$ ,  $p<.01$ ). In addition to these fixed effects, there was significant individual variability around the initial level of substance-specific monitoring ( $b=.10$ ,  $p<.01$ ), but not in rates of change of substance-specific monitoring over time. The linear slope variance and intercept-slope covariance were not significantly different from zero, and constraining the slope variance and the intercept-slope covariance to zero did not lead to a significant decrement in model fit ( $\chi^2(2)=1.85$ ,  $p=.40$ ). For parsimony, the linear slope variance and covariance were constrained to zero in all further models. The addition of equal autoregressive pathways among the residuals did not lead to a significant improvement in model fit; however, we retained the equal autoregressive pathways in subsequent analyses because they were theoretically hypothesized to exist.

**Cautionary communication messages.**—The conditional univariate curve for cautionary communication messages included a random intercept, a linear slope with the variance fixed to zero, and significant autoregressive pathways held to be equal across time. The variance of the slope factor in this model was not significantly different from zero, thus we restricted the variance and covariance of the linear slope factor to zero in all subsequent analyses. The estimated means for the retained latent factors indicate the model-implied mean trajectory for the sample was characterized by an initial cautionary messages score of  $0.83$  ( $p<.01$ ) and a significant positive linear growth factor ( $b=.02$ ,  $p<.01$ ). In addition to these fixed effects, there was significant individual variability around the initial level of cautionary messages ( $b=.03$ ,  $p<.01$ ), but not in rates of change of cautionary messages over time.

**Permissive communication messages.**—The conditional univariate curve for permissive messages included a random intercept, linear slope factor, and significant



autoregressive pathways among the residuals held to be equal over time. The estimated means for the retained latent factors indicate the model-implied mean trajectory for the sample was characterized by an initial permissive messages score of 0.19 ( $p < .01$ ) and a significant positive linear growth factor ( $b = .02$ ,  $P < .01$ ). In addition to these fixed effects, there was significant individual variability around the initial level of permissive messages ( $b = .06$ ,  $p < .01$ ), and in the rate of change in permissive messages over time ( $b = .003$ ,  $p < .01$ ).

### **Bivariate LCM-SR between Adolescent Alcohol Misuse and each Parental Socialization Behavior**

Results for the bivariate latent curve model with structured residuals between alcohol misuse and each parental socialization behavior are summarized in Table 4.

**Substance-specific monitoring.**—The final bivariate LCM-SR between alcohol misuse and substance-specific monitoring fit the data well (CFI=.96, TLI=.96, RMSEA=.02), and included freely varying covariances between time-specific residuals of the two constructs and marginally significant equal prospective pathways from adolescent alcohol misuse at Time T to substance-specific monitoring at Time T+1 ( $b = .03$ ,  $p = .06$ ). No prospective paths from substance-specific monitoring to subsequent alcohol misuse were significant. The covariance between the intercepts of the two constructs was positive and significantly different from zero ( $b = .01$ ,  $p < .01$ ).

**Cautionary communication messages.**—The final bivariate LCM-SR between alcohol misuse and cautionary communication messages fit the data well (CFI=.99, TLI=.99, RMSEA=.01), and included non-significant covariances between time-specific residuals held to be equal across time. No statistically significant prospective pathways between the two constructs were found in either direction, but the covariance between latent intercepts was positive and significantly different from zero ( $b = .01$ ,  $p < .01$ ).

**Permissive communication messages.**—The final bivariate LCM-SR between alcohol misuse and permissive messages fit the data well (CFI=.98, TLI=.98, RMSEA=.02), and included freely varying covariances between time-specific residuals of the two constructs. No statistically significant prospective pathways between the two constructs were found in either direction. The covariance between the intercepts of the two constructs was positive and marginally significant ( $b = .01$ ,  $p < .10$ ), but the covariance between the intercept of alcohol misuse and the linear slope of permissive messages was not statistically significant from zero.

## **DISCUSSION**

This study extends previous research regarding parental socialization and adolescent alcohol misuse by examining the reciprocity between alcohol-specific parenting practices and adolescent alcohol misuse across early and middle adolescence. Specifically, we tested transactional models of development that posit bidirectional processes of influence based on the socialization precept that individuals engage in a mutually reinforcing process with their environment, particularly those individuals closest to them. To do so, we used an innovative analytical technique that delineates time-stable and time-specific sources of influence to

capture the unique prospective relationships between parents and adolescents indicated by the theories.

We expected to find prospective, reciprocal relations between adolescent alcohol misuse and three alcohol-specific parenting practices (substance-specific monitoring, permissive and cautionary messages), as well as changes to the strength of those reciprocal relationships across early and middle adolescence. We found only one marginally significant prospective relationship: higher levels of adolescent alcohol misuse subsequently resulted in greater substance-specific monitoring behaviors by parents across all grades. Although not a robust finding, it provides some evidence that adolescents may influence their parents' behavior, which is the direction of influence often left out of previous research on adolescent alcohol use within the family context.

This study provides the first test of bidirectional relationships between adolescent alcohol misuse and parental communication regarding alcohol. Although we expected there to be reciprocal relationships between both types of communication and adolescent alcohol misuse, this study found no such evidence. It may be that interactions between what parents say about alcohol and their child's drinking depends on the drinking status of the child. Prior research has resulted in conflicting findings about the role of parental communication in adolescent alcohol use, and differences may be due to whether the child has initiated alcohol use. For example, both permissive messages and communication regarding the consequences of drinking have been found to increase alcohol use among those who had already initiated drinking (Ennett et al., 2001; Reimuller et al., 2011). Further, communication is comprised not only of the specific content being discussed, but also the frequency and quality of message delivery. Future research is needed to investigate the extent to which the frequency of messages, and the degree to which those messages are internalized by the adolescent, matter with respect to reciprocal parent-adolescent relationships.

Our findings diverge from previous studies of bidirectional relationships reported in the literature that find full reciprocal effects between general parenting behaviors and adolescent substance use (Stice and Barrera, 1995; van der Vorst et al., 2006), as well as between alcohol use and alcohol-specific behavioral control (van der Zwaluw et al., 2008). The methods of previous studies confound time-stable and time-specific processes regarding parenting and adolescent substance use, whereas conclusions from this study are based solely on the time-specific processes that demonstrate how parents and teens respond to one another regarding alcohol use. Our findings align, however, with recent work that demonstrates no reciprocal effects between parenting and adolescent substance use when using similar methods (Abar et al., 2014; Elkins et al., 2014).

Parental behavior in our sample remained relatively consistent, and highly skewed towards positive behaviors. It may be that parents do reinforce actions and messages that are protective against alcohol misuse, particularly when adolescents are younger. Future research should examine the reciprocity of parent and adolescent behavior during later adolescence, when drinking is more prevalent, and youth are developmentally moving towards independence and autonomy. Further, it may be that parents are unaware of their child's drinking, and therefore do not react in ways posited by the transactional theories. In

addition to knowing about drinking directly there are other behaviors that may signal involvement with alcohol, such as a drop in academic performance (Bryant et al, 2003). However, it may be that parents do not pick up on these signals until drinking has escalated or occurred for a more prolonged period, both of which suggest the need for further study of adolescents at older ages.

### Strengths and Limitations

The strength of this study rests in the application of statistical methods suited to assess the central precept of transactional models of development, namely the bidirectionality of person-environment effects as applied to adolescent alcohol misuse and parenting behaviors. The study used a large longitudinal dataset to examine the hypothesized bidirectional relationships across early and middle adolescence. These are critical developmental periods given that initiation and use of alcohol at early ages puts adolescents at higher risk for detrimental short and long-term consequences (DeWit, 2000; Gruber et al., 2006).

Despite the theoretical and analytical strengths of this study, results should be viewed in the context of several limitations that offer important avenues for future research on the interactions between parental behavior and youth alcohol use. First, the one-year gap between assessments may have been too long as bidirectionality in parental and adolescent behavior around alcohol use may be more immediate in response to specific events; for example, a parent detecting that the adolescent has come home drunk from a party may cause the parent to increase monitoring or communicate more cautionary messages about alcohol use immediately but not in the longer term. Measuring behaviors at shorter time intervals would reduce potential confounding due to other changes during that time that have implications for youth alcohol use (e.g., greater involvement with deviant peers). Future research would benefit from the use of methods that capture behavior in real-time, such as ecological momentary assessment, which enable the assessment of direct and transactional relationships within a short time frame (Hussong et al., 2001; Mohr et al., 2001). Conducting such research in early as well as later adolescence would provide a more nuanced understanding of the reciprocity of parent and adolescent behaviors across development. Alcohol use occurs less often in early adolescence (which may be reflected in the effect size of the stability paths of alcohol use in the models) (Johnston et al., 2016) and thus investigation of interactions between parents and their child as they get older, and alcohol use is more prevalent, is warranted.

Second, in this study, the three alcohol-specific parenting practices were only available via parent report. Parents may have over-reported socially accepted behaviors due to social desirability bias, which in turn may have reduced variability within the construct and weakened our ability to detect associations of the parenting behaviors with adolescent alcohol misuse. Refinement of measures that offer more nuanced aspects of parenting behaviors (e.g., how parents communicate to their child about alcohol, in addition to frequency and content of the messages) would provide greater construct coverage, and potentially increase variability in responses by parents. Child report of perceived parental behaviors is common, and in some cases has been found to be more predictive of adolescent substance use than parental report of the same parenting behavior (Latendresse et al., 2009).

Future research would benefit from multiple-informant reporting of parenting behaviors. Third, the monitoring measure was not specific to alcohol but was measured by items that asked about monitoring of alcohol, tobacco and other drugs, collectively. Finally, the results of this study may not be fully generalizable to the interactions of parents and children today given that the study was implemented between 2002–2005.

## Conclusions

The current study utilized a theoretically informed framework with appropriately matched analytical methods to assess bidirectional relationships between adolescent alcohol misuse and parental socialization behaviors across early and middle adolescence. Though we found limited evidence of reciprocal behaviors between parents and adolescents, the theoretical underpinnings of the study and methodological limitations reviewed suggest the need for continued research on how adolescents and parents interact around alcohol misuse to elucidate processes of behavior change for parents and teens relative to alcohol use.

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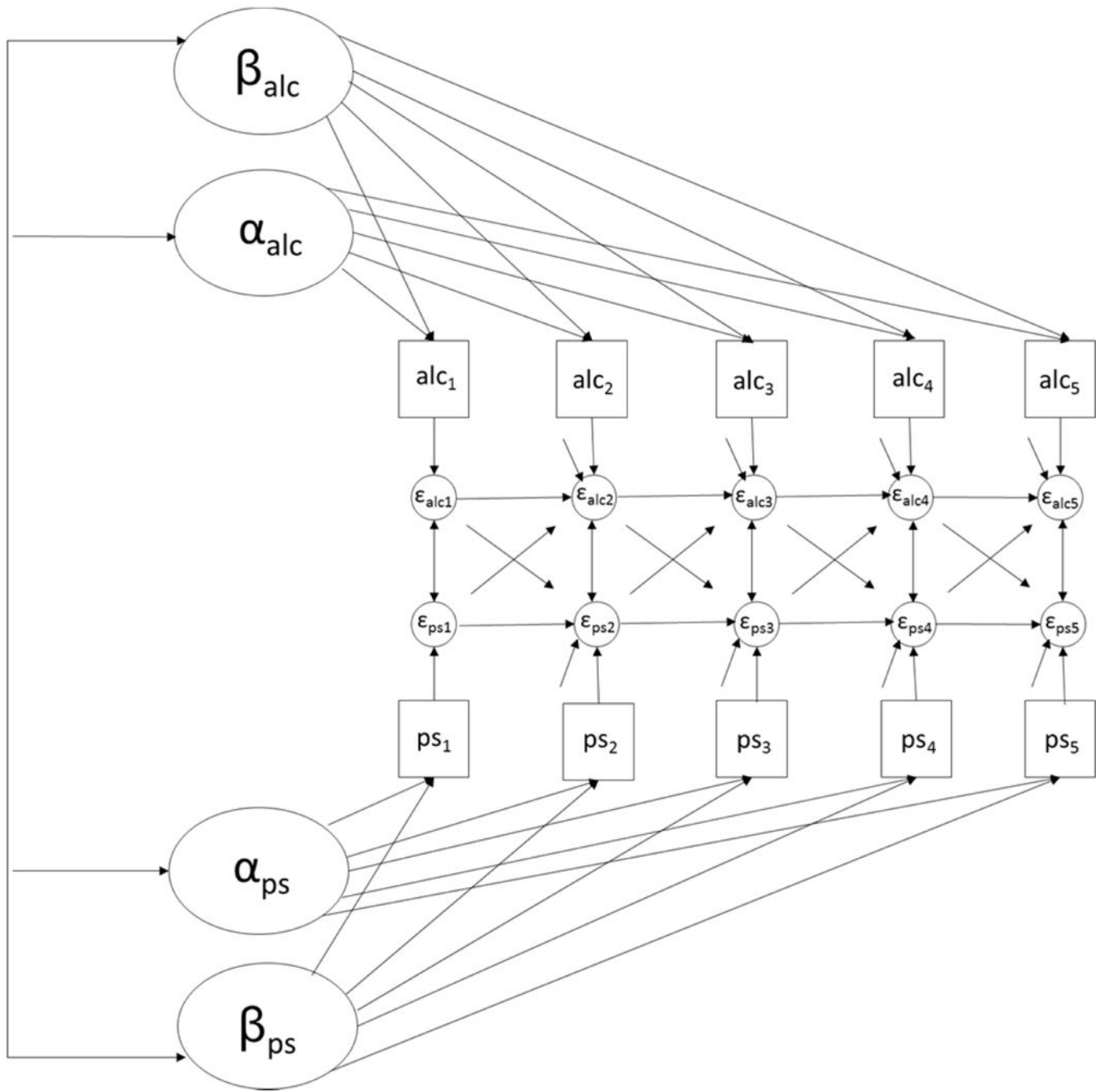


Fig 1: General latent curve model with structured residuals

**Table 1:** Descriptive results for alcohol involvement and drinking consequences across grade

	Spring 6th grade (N=568)	Spring 7th grade (N=1002)	Spring 8th grade (N=1358)	Spring 9th grade (N=813)	Spring 10th grade (N=368)
<b>In the past 3 months, how often have you:</b>					
<b>Mean (SD); Range</b>					
had 3 or 4 drinks in a row?	0.27 (0.74); 0-4	0.66 (1.14); 0-4	0.73 (1.11); 0-4	1.04 (1.27); 0-4	0.90 (1.24); 0-4
had 5 or more drinks in a row?	0.16 (0.61); 0-4	0.52 (1.14); 0-4	0.49 (1.06); 0-4	0.76 (1.28); 0-4	0.69 (1.25); 0-4
gotten drunk?	0.27 (0.87); 0-4	0.72 (1.25); 0-4	0.75 (1.16); 0-4	1.00 (1.33); 0-4	0.83 (1.16); 0-4
<b>In the past 3 months, how often have you:</b>					
<b>Mean (SD)</b>					
gotten in trouble with parents?	0.14 (0.59); 0-2	0.24 (0.81); 0-4	0.25 (0.80); 0-4	0.27 (0.85); 0-4	0.27 (0.77); 0-4
had problems with someone you were dating?	0.13 (0.46); 0-3	0.27 (0.86); 0-4	0.20 (0.72); 0-4	0.29 (0.87); 0-4	0.19 (0.65); 0-4
did something later regretted?	0.10 (0.47); 0-4	0.38 (0.91); 0-4	0.33 (0.78); 0-4	0.36 (0.89); 0-4	0.24 (0.60); 0-4
gotten into sexual situation later regretted?	0.15 (0.57); 0-4	0.46 (1.06); 0-4	0.38 (0.96); 0-4	0.30 (0.83); 0-4	0.28 (0.75); 0-4
gotten into physical fights?	0.22 (0.73); 0-4	0.47 (1.12); 0-4	0.40 (0.95); 0-4	0.33 (0.91); 0-4	0.22 (0.73); 0-4

**Note:** Response options for both questions are: None (0), 1-2 times (1), 3-5 times (2), 6-9 times (3), 10 or more time (4)

Table 2:

Correlations, means and standard deviations of study measures

Outcome	Grade	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20			
1. Alcohol misuse	6.5	--																						
2. Alcohol misuse	7.5	<b>0.19</b>	--																					
3. Alcohol misuse	8.5	<b>0.12</b>	<b>0.30</b>	--																				
4. Alcohol misuse	9.5	n/a	<b>0.16</b>	<b>0.35</b>	--																			
5. Alcohol misuse	10.5	n/a	n/a	<b>0.11</b>	<b>0.37</b>	--																		
6. Substance-specific monitoring	6.5	<b>0.15</b>	0.07	0.03	n/a	n/a	--																	
7. Substance-specific monitoring	7.5	<b>0.13</b>	0.04	0.05	0.00	n/a	<b>0.53</b>	--																
8. Substance-specific monitoring	8.5	<b>0.19</b>	0.03	<b>0.13</b>	0.05	-0.03	<b>0.50</b>	<b>0.53</b>	--															
9. Substance-specific monitoring	9.5	n/a	<b>0.22</b>	<b>0.12</b>	<b>0.10</b>	<b>0.16</b>	n/a	<b>0.55</b>	<b>0.50</b>	--														
10. Substance-specific monitoring	10.5	n/a	n/a	0.08	<b>0.13</b>	<b>0.26</b>	n/a	n/a	<b>0.48</b>	<b>0.48</b>	--													
11. Permissive messages	6.5	-0.01	<b>0.13</b>	-0.03	n/a	n/a	0.00	-0.06	-0.04	n/a	n/a	--												
12. Permissive messages	7.5	0.06	0.05	-0.02	0.07	n/a	-0.06	-0.02	-0.03	-0.03	n/a	<b>0.70</b>	--											
13. Permissive messages	8.5	0.01	0.02	<b>0.06</b>	<b>0.09</b>	<b>0.13</b>	0.02	-0.01	0.01	-0.02	-0.04	<b>0.63</b>	<b>0.72</b>	--										
14. Permissive messages	9.5	n/a	-0.02	0.04	<b>0.09</b>	<b>0.20</b>	n/a	-0.03	-0.01	-0.05	-0.04	n/a	<b>0.67</b>	<b>0.69</b>	--									
15. Permissive messages	10.5	n/a	n/a	0.09	<b>0.17</b>	<b>0.23</b>	n/a	n/a	-0.03	-0.05	-0.06	n/a	<b>0.66</b>	<b>0.74</b>	n/a	--								
16. Cautionary messages	6.5	0.00	0.04	0.06	n/a	n/a	<b>0.18</b>	<b>0.11</b>	0.04	n/a	n/a	0.07	0.03	0.03	n/a	n/a	--							
17. Cautionary messages	7.5	0.06	-0.01	<b>0.09</b>	0.06	n/a	<b>0.16</b>	<b>0.17</b>	<b>0.12</b>	0.04	n/a	0.00	<b>0.07</b>	0.05	<b>0.12</b>	n/a	<b>0.61</b>	--						
18. Cautionary messages	8.5	0.01	0.03	<b>0.07</b>	0.04	0.08	<b>0.14</b>	<b>0.14</b>	<b>0.14</b>	<b>0.12</b>	0.11	0.00	0.05	<b>0.08</b>	0.06	0.02	<b>0.50</b>	<b>0.62</b>	--					
19. Cautionary messages	9.5	n/a	0.06	0.04	0.06	0.02	n/a	<b>0.12</b>	<b>0.11</b>	<b>0.13</b>	<b>0.15</b>	n/a	0.08	0.05	<b>0.11</b>	0.03	n/a	<b>0.53</b>	<b>0.64</b>	--				
20. Cautionary messages	10.5	n/a	n/a	0.05	0.01	0.06	n/a	n/a	0.06	0.04	0.05	n/a	n/a	0.08	0.11	0.09	n/a	n/a	<b>0.51</b>	<b>0.65</b>	--			
<b>Mean</b>		-0.10	0.11	0.29	0.52	0.70	0.30	0.36	0.36	0.41	0.38	0.17	0.22	0.23	0.26	0.27	0.84	0.85	0.87	0.88	0.91			
<b>SD</b>		0.31	0.52	0.63	0.71	0.74	0.41	0.43	0.43	0.44	0.43	0.27	0.31	0.32	0.33	0.35	0.25	0.24	0.23	0.21	0.19			

\* **Bold** correlations are significant at alpha < 0.05

**Table 3:**

Results of univariate LCM-SRs for alcohol use and each parental socialization behavior

<i>Latent factors</i>	Alcohol misuse		Substance-specific monitoring		Cautionary communication messages		Permissive communication messages	
	Mean	Variance	Mean	Variance	Mean	Variance	Mean	Variance
Random intercept	-0.14 <sup>***</sup>	0.07 <sup>***</sup>	0.32 <sup>***</sup>	0.10 <sup>**</sup>	0.83 <sup>***</sup>	0.03 <sup>***</sup>	0.19 <sup>***</sup>	0.06 <sup>***</sup>
Linear slope	0.23 <sup>***</sup>	--	0.02 <sup>***</sup>	Fixed	0.02 <sup>***</sup>	Fixed	0.02 <sup>***</sup>	0.003 <sup>***</sup>
Quadratic slope	--	--	--	--	--	--	--	--
<i>Latent factor covariances</i>	b	SE	b	SE	b	SE	b	SE
Intercept - linear slope	--	--	--	--	--	--	-0.001	0.002
Intercept-quadratic slope	--	--	--	--	--	--	--	--
Linear slope - quadratic slope	--	--	--	--	--	--	--	--
<i>Autoregressive pathways</i>	b	SE	b	SE	b	SE	b	SE
Time 1 - Time 2	0.33 <sup>***</sup>	0.04	0.01	0.05	0.28 <sup>***</sup>	0.05	0.20 <sup>**</sup>	0.08
Time 2 - Time 3	0.33 <sup>***</sup>	0.04	0.01	0.05	0.28 <sup>***</sup>	0.05	0.20 <sup>**</sup>	0.08
Time 3 - Time 4	0.33 <sup>***</sup>	0.04	0.01	0.05	0.28 <sup>***</sup>	0.05	0.20 <sup>**</sup>	0.08
Time 4 - Time 5	0.33 <sup>***</sup>	0.04	0.01	0.05	0.28 <sup>***</sup>	0.05	0.20 <sup>**</sup>	0.08

<sup>†</sup> p<.10

\*\* p<.05

\*\*\* p<.01

**Table 4:** Results of bivariate LCM-SRs between alcohol use and each parental socialization behavior

	Substance-specific monitoring		Cautionary communication messages		Permissive communication messages	
	b	SE	b	SE	b	SE
<i>Latent factor covariances</i>						
Intercept (alc) - Intercept (ps)	0.01 <sup>***</sup>	0.004	0.01 <sup>***</sup>	0.002	0.01 <sup>+</sup>	0.004
Intercept (alc) - Linear slope (ps)	--	--	--	--	-0.001	0.002
Intercept (alc) - Quadratic slope (ps)	--	--	--	--	--	--
<i>Residual covariances</i>						
	b	SE	b	SE	b	SE
Time 2	-0.01	0.01	-0.001	0.002	0.01	0.01
Time 3	0.01 <sup>**</sup>	0.01	-0.001	0.002	0.01 <sup>**</sup>	0.004
Time 4	0.01	0.01	-0.001	0.002	0.01	0.01
Time 5	0.02	0.01	-0.001	0.002	0.03 <sup>***</sup>	0.01
<i>Prospective cross-lagged regressions<sup>a</sup></i>						
	b	SE	b	SE	b	SE
Alcohol (Time t) - Parenting (Time t+1)	0.03 <sup>+</sup>	0.02	0.01	0.01	0.01	0.01
Parenting (Time t) - Alcohol (Time t+1)	-0.05	0.07	0.07	0.11	0.13	0.11

<sup>+</sup> p<.10

\*\* p<.05

\*\*\* p<.01