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## Adolescent Alcohol Use: The Effects of Parental Knowledge, Peer Substance Use, and Peer Tolerance of Use

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### Abstract

**Objective**—Parents and peers exert significant influence on a young person's decision to consume alcohol. This study examines the relationship between parental monitoring and adolescent alcohol consumption and tests whether peer substance use and tolerance of use mediates the relationship between monitoring and drinking.

**Method**—Participants included 116 adolescents (53.5% female;  $M_{age} = 15.6$ ). All participants reported drinking alcohol in the past 6 months, and 96 participants had been previously admitted to a hospital emergency department for an alcohol-related event. Mediation analyses were used to test the study hypotheses.

**Results**—The total effect of baseline parental monitoring on 6-month alcohol use was  $-1.15$  ( $p < .01$ ), with higher monitoring related to less use. Controlling for peer use and tolerance of use, the effect of parental monitoring was reduced to  $.46$ , leaving an indirect effect of  $.69$  ( $p < .01$ ). Peer use and tolerance of use had no effect on participant alcohol use when controlling for parental monitoring.

**Conclusions**—Study findings extend current knowledge about the interactive effects of parental supervision and peer influence on the drinking patterns of adolescents. Results underscore the importance of addressing both parental monitoring and peer influence in interventions that target

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adolescent alcohol use, recognizing peer factors as a potential mechanism of the effect that parental monitoring has on adolescent drinking.

### Keywords

adolescent; alcohol use; parental knowledge; peer substance use; peer tolerance of use

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Alcohol is the most widely used substance among adolescents, with 66.2% of secondary school students consuming at least one drink of alcohol in their lifetime (Johnston, O'Malley, Miech, Bachman, & Schulenberg, 2015). In a national study conducted in schools, 75.6% of seniors and 55.6% of ninth-grade students reported having had at least one drink of alcohol in their lifetime, and approximately 50% of high school seniors and 11% of eighth-grade students reported having been drunk at least once in their lifetime (Johnston et al., 2015). Moreover, 20% of high school seniors reported binge drinking at least once in the past 2 weeks (Johnston et al., 2015). It is estimated that more than 190,000 youths go to the emergency department (ED) each year for alcohol-related injuries, and over 5,000 youths die each year from alcohol-related incidents (National Institute on Alcohol Abuse and Alcoholism, 2016).

Research suggests that both parents and peers are influential in adolescents' decisions to use alcohol (Ardelt & Day, 2002; Feldstein & Miller, 2006; Pomery et al., 2005). Moreover, findings indicate that parental monitoring, including parental knowledge, is a protective factor (Borawski, Ievers-Landis, Lovegreen, & Trapl, 2003; Ryan, Jorm, & Lubman, 2010; Shillington et al., 2005), and peer substance use and peer tolerance of another peer's use are risk factors for alcohol use among adolescents (Hawkins, Catalano, & Miller, 1992; Mason, Mennis, Linker, Bares, & Zaharakis, 2014). Some studies have demonstrated that peers have a more profound effect on this association (Bahr, Hoffman, & Yang, 2005), but other research has found parents to be more influential in this relationship (Alati et al., 2005). These conflicting findings suggest the need for further exploration of the two constructs in relation to their effect on alcohol use among adolescents. Consequently, the purpose of this study was to test the direct and indirect effects of parental knowledge and peer substance use/tolerance of use on adolescent drinking using a longitudinal design. Throughout this manuscript, *parental knowledge* refers to parents' knowledge of their adolescent's whereabouts, friendships, activities, etc., and *peer substance use* and *tolerance of use* refer to peers' own substance use and their tolerance of other peers' substance use.

### Peer Influence

Peer relationships can be particularly influential on an adolescent's drinking behavior because it often is the peer group that defines the behavioral norms within the social context. Adolescence also is a time when individuals begin to increase the amount of time spent with their peers while simultaneously decreasing time spent with parents (Steinberg, 2014). Previous research has examined adolescents' risk for alcohol use relative to a range of peer variables. Studies have explored peer alcohol use (Chassin, Pitts, & Prost, 2002; White, Fleming, Kim, Catalano, & McMorris, 2008) and peer attitudes toward alcohol use (Mason et al., 2014), demonstrating a relationship with underage alcohol use. These studies have

revealed that all three factors relate to alcohol use among adolescents. Moreover, past longitudinal studies with school samples suggest that the relationship between peer variables and adolescent alcohol use is especially strong in high-intensity friendships, such as with best friends (Cruz, Emery, & Turkheimer, 2012). Research conducted in schools also suggests that adolescents often select peers who engage in similar behaviors as their own (Urberg, Luo, Pilgrim, & Degirmencioglu, 2003) and influence each other's behavior (Hartup, 2005). Past cross-sectional research has demonstrated that peer substance use has one of the strongest associations with alcohol use among youth (Brook, Brook, Gordon, Whiteman, & Cohen, 1990; Hawkins et al., 1992) and that peer associations have a stronger effect on adolescent alcohol use than parent-child relationships (Olds & Thoms, 2001).

## Parent Influence

Parents exert considerable influence on their adolescents' choices to use alcohol. Despite the common belief that adolescence is a time of conflict between parents and adolescents, parents and their adolescents mostly disagree on mundane topics, such as curfew or clothing choice, but agree on more important issues, such as safety and morality (Steinberg, 2014). The literature suggesting that parents and their adolescents often agree on safety issues is important in understanding the influence parents have on an adolescent's choice to use alcohol.

Research has examined a host of parental variables as they relate to adolescents' risk for alcohol use. Parental alcohol attitudes (Stafström, 2014), parental alcohol use (Alati et al., 2014), parental bonds (Hope & Whiteford, 2008), adolescent attachment to their parents (McCann, Perra, McLaughlin, McCartan, & Higgins, 2016), and parental knowledge (Ewing et al., 2015; McCann et al., 2016) have been examined in relation to adolescents' risk for underage alcohol use. A cross-sectional study examining mothers and their adolescents in the general population demonstrated that parental tolerance of drug use is positively associated with adolescent drug and alcohol use (Brook, Whiteman, Gordan, & Cohen, 1986). Other studies have demonstrated that parental attitudes and beliefs towards adolescent alcohol use are associated with alcohol use among adolescents, with greater tolerance of alcohol use associated with higher use (McMorris, Catalano, Kim, Toumbourou, & Hemphill, 2011) and greater disapproval of alcohol use associated with lower use (Kosterman, Hawkins, Guo, Catalano, & Abbott, 2000). Moreover, review articles have shown the same positive association between parental alcohol use and adolescent drug and alcohol use (Hawkins et al., 1992). Cross-sectional (Bahr, Maughan, Marcos, & Li, 1998) and longitudinal (Wang et al., 2013) research has demonstrated that a close attachment to parents and the presence of parental knowledge are negatively associated with adolescent alcohol use. Studies have also suggested the indirect effects of parental bonds on adolescent substance use via self-control (Hope & Whiteford, 2008). As such, research is beginning to demonstrate that there may be additional indirect effects that should be examined.

## Peer and Parent Influences

It is well established that both parents and peers exert influence on adolescent behavior. Research has examined the combined contribution of parents and peers on adolescent

alcohol use. Specifically, Wood, Read, Mitchell, and Brand (2004) explored the influence of peer and parent variables on alcohol use in a sample of older high school graduates immediately prior to their entrance into college. Wood et al. (2004) found that peers and parents both had a direct effect on adolescent alcohol use and problems. Specifically, a higher level of parental monitoring was associated with lower levels of heavy drinking, and more favorable alcohol attitudes among close friends were associated with higher levels of heavy drinking. Moreover, the authors suggested that higher levels of perceived parental involvement were associated with a weaker relationship between peer influences and alcohol-related problems, providing support for parental involvement as a moderator for the relationship between peer influence and adolescent alcohol-related problems.

Additional research has examined the direct and indirect effects of parental approval of high-risk alcohol use on college drinking (Rulison, Wahesh, Wyrick, & DeJong, 2016). Rulison et al. (2016) conducted a study among incoming first-year college students to test two competing models: whether perceived parental approval of high-risk drinking had a direct effect on alcohol-related outcomes among college students, or whether perceived parental approval of high-risk drinking was a mediator for the relationship between perceived friends' approval of high-risk drinking and alcohol-related outcomes among college students. Rulison et al. (2016) found that parental approval was directly associated with college student drinking and that perceived friends' approval of high-risk drinking mediated the relationship between perceived parental approval and alcohol use among college students. This study demonstrated that the effects parents had on their children's drinking were often diminished or removed once peer effects were included.

## Study Purpose

An abundance of research demonstrates that both peers and parents exert influence on an adolescent's choice to use alcohol. Although findings are inconsistent on whether peers or parents have a more profound effect on adolescent alcohol use, looking at these factors as independent contributors fails to consider the possibility of potential mediating effects. Moreover, studies that have examined the combined influence of parents and peers on adolescent alcohol use either fail to examine mediational processes through a longitudinal design (Wood et al., 2004), or they use a college sample (Rulison et al., 2016).

Research has consistently used cross-sectional designs with samples collected from schools (Bahr et al., 2005; Brook et al., 1986; Brook et al., 1990; Olds & Thombs, 2001), hindering the ability to establish causality and only enabling exploration of associations among variables. The few longitudinal studies conducted are limited in their use of school-based samples (Cruz et al., 2012; Johnston et al., 2015; Wang et al., 2013). The purpose of this study, therefore, was to longitudinally examine both direct and indirect effects of parental knowledge and peer substance use and tolerance of use on alcohol consumption among a sample of community adolescents and adolescents who were recruited from an ED after admission for an alcohol-related incident.

This study was guided by three hypotheses. First, we hypothesized that parental knowledge would be negatively associated with adolescent alcohol use. Second, we hypothesized that

peer substance use and tolerance of use would be positively related to adolescent alcohol use. Third, we hypothesized that peer substance use and tolerance of use would mediate the relationship between parental knowledge and adolescent alcohol use. This study extends previous findings generated from school-based studies in that it represents adolescents from the general community as well as at-risk adolescents who may drop out of school (Chen, Yi, & Faden, 2011) and frequently visit the ED for health care (Monti et al., 1999).

## Method

### Participants

Participants were recruited from a hospital ED and the neighboring communities in the northeastern United States using data collected in a larger clinical trial that tested the efficacy of a family intervention and a brief individual motivational intervention for adolescents who use alcohol (Spirito et al., 2011). The original study found that the motivational interviewing (MI) intervention resulted in a reduction in adolescent alcohol use at 3, 6, and 12 months. To participate in the original study, adolescents from the ED had to meet at least one of the following eligibility criteria: They presented to the ED with alcohol use in the past 6 hours, or they had a positive alcohol test or breathalyzer reading. In addition to the participants recruited from the ED, participants were also recruited from neighboring communities. These participants were eligible if they scored a 4 or above—a common cut-off indicating potential alcohol-related risk (Chung, Colby, Barnett, & Monti, 2002; Fairlie, Sindelar, Eaton, & Spirito, 2006)—on the Alcohol Use Identification Test (Saunders, Aasland, Barbor, de la Fuente, & Grant, 2006). It is important to note, however, that although our sample was recruited from the ED and community, our sample in general does not demonstrate evidence of risky substance use. In fact, at baseline, participants reported drinking alcohol an average of 5.4 days in the 3 months before their hospitalization, indicating that as a sample they do not engage frequently in heavy drinking. The study was approved by the institutional review boards of the overseeing university and hospital.

Participants in the present study included a sample of 116 adolescents (53.5% female, 46.5% male,  $M_{\text{age}} = 15.6$ ,  $SD = 1.20$ ) who completed three waves of data collection (baseline, 3 months, and 6 months; see Table 1 for descriptive statistics of the sample). Of the sample, 96 participants were recruited from a hospital ED after an alcohol-related event, and 20 participants were recruited from the surrounding community. Among participants recruited from the ED and participants recruited from the community, there were no statistically significant differences in alcohol use at any wave, peer use and tolerance of use at any wave, or in annual family income. However, participants recruited from the ED had slightly higher average parental monitoring scores at baseline ( $M = 2.15$ ) than those recruited from the community ( $M = 1.79$ );  $t(114) = -2.63$ ,  $p < 0.05$ .

Participants were 13–17 years old, and 63.8% of participants identified as White, 24.1% identified as Latino, 8.6% identified as Black, 1.7% identified as Asian, and 1.7% identified with more than one race. Annual family income ranged from less than \$5,000 to more than \$150,000 and was normally distributed. Approximately 58% of participants were enrolled in the individual adolescent MI intervention condition, and approximately 42% were enrolled in the adolescent MI intervention plus the family intervention condition.

## Measures

Baseline and 6-month assessments were collected through face-to-face interviews, and the 3-month assessment was conducted over the phone. The present study measured peer substance use and tolerance of use at 3 months as a mediator of the relationship between parental knowledge at baseline and adolescent alcohol use at 6 months. The present study also tested the mediating effect of parental knowledge at 3 months on the relationship between peer substance use and tolerance of use at baseline and adolescent alcohol use at 6 months.

**Adolescent alcohol use**—Participants' reported alcohol use was measured at 6 months using the Adolescent Drinking Questionnaire (Jessor et al., 1989), which examined drinking frequency, quantity, frequency of binge drinking, and frequency of intoxication in the previous 3 months to measure overall adolescent alcohol use. Questions were summed into a total score. Individual items were reverse coded so that no alcohol use was coded as the lowest number and more alcohol use was coded with higher numbers. In the current study's sample, high internal consistency was demonstrated ( $\alpha = .94$ ). Given the high frequency of participants reporting no alcohol use in the previous 3 months (52.6%), as well as nonnormally distributed residuals, this variable was recoded into a dichotomous variable, with 0 representing *no alcohol use in the previous 3 months* and 1 representing *alcohol use in the previous 3 months*.

**Peer substance use and tolerance of use**—Participants reported on peer substance use and tolerance of use at both baseline and the 3-month follow-up assessment. The current study used the sum score from the 17 items of the Peer Substance Use and Tolerance of Substance Use scales (Marshal & Chassin, 2000), which measure how many of the adolescent's friends use alcohol, marijuana, and other drugs and how many would tolerate the adolescent's use of alcohol, marijuana, and other drugs. These two scales were first assessed independently, with the Peer Substance Use scale producing an alpha of .87 and the Peer Tolerance of Substance Use scale producing an alpha of .91. Because the two scales had a moderately high correlation ( $r = .69, p < .001$ ), they were combined into a single construct. The alpha for the combined scales in this study was .92, demonstrating high internal consistency.

**Parental knowledge**—Parental knowledge, as reported by adolescents, was measured at baseline and at the 3-month assessment using the average score from the four questions that comprise the Strictness/Supervision Scale (Steinberg, Lamborn, Dornbusch, & Darling, 1992). The scale asks four questions on a 5-point Likert scale ranging from 0 (*doesn't know at all*) to 4 (*always knows*) to indicate the extent to which parents know where their adolescents are at night, how they spend their free time, where they are after school or work, and who their friends are. The alpha for this sample was .72, demonstrating adequate internal consistency across the four items.

## Data Analysis

We analyzed data using Stata (Version 13.1). We began with an analysis of missing data to identify any patterns of missingness by race, sex, age, and community versus ED sample.



We found that 9 cases were missing data due to attrition. *T*-test and chi-square analyses revealed no significant differences by race, sex, age, or treatment condition (i.e., community vs. ED) among participants who completed all three waves of data collection and those who did not.

After completing analysis of missing data, we ran descriptive statistics to determine whether data were normally distributed. Next, we examined bivariate relationships among participant age, sex, race, treatment condition, household income, parental knowledge at baseline, and peer substance use and tolerance of use at 3 months. Following analyses of bivariate relationships, we ran logistic regression to evaluate how well participant alcohol use 6 months after baseline could be predicted from baseline parental knowledge, 3-month peer use and tolerance of use, age, annual family income, and sex (see Table 3). After preliminary analyses, we conducted mediation analyses. The dependent variable of adolescent alcohol use is a dichotomous variable making mediation methods—such as the Sobel and Goodman test (Goodman, 1960; Sobel, 1982)—inappropriate for use within Stata (Kohler et al., 2011) because the error variance in a nonlinear model varies across models (Breen, Karlson, & Holm, 2013). Consequently, we used methodology outlined by Karlson, Holm, and Breen (the KHB method; Breen et al., 2013; Karlson & Holm, 2011) to examine whether peer use and tolerance of use mediates the relationship between parental knowledge and adolescent alcohol use. The KHB method is a general decomposition method that estimates direct, indirect, and total effects in terms of average effects so that they are on the same scale. This is particularly helpful when using coefficients from a logit model because the coefficients remain unaffected by the rescaling that can sometimes cause bias in nonlinear models (Kohler et al., 2011).

We used a three-step mediation analysis process. First, we deconstructed the effect of parental knowledge at baseline on 6-month participant alcohol use with the peer use and tolerance of use variable at 3 months and age, sex, race, treatment condition, and family income as covariates. (These covariates had the potential to confound the decomposition results). Second, we interpreted the results as average partial effects to provide a simpler interpretation. To examine the competing hypothesis that parental knowledge influenced peer use and tolerance of use, we also deconstructed the effect of baseline peer use and tolerance of use on 6-month participant alcohol use with the 3-month parental knowledge variable and age, sex, race, treatment condition, and family income as covariates. Given the likelihood that the intervention affected not only subsequent alcohol use but also potential reports of peer use and tolerance of use, treatment condition is controlled in all analyses.

## Results

Of the sample, 53% reported no alcohol use in the prior 3 months when assessed at the 6-month follow-up assessment. The average parental knowledge score at baseline was 2.01 ( $SD = 0.58$ ) out of 3, suggesting that on average, the participants' parents had relatively high levels of knowledge regarding their children's activities and whereabouts. In addition, the average peer use and tolerance of use score at the 3-month assessment was 25.76 ( $SD = 11.67$ ) out of 70, suggesting that, on average, participants believed that some of their peers used alcohol and other drugs and that their peers would not approve of their own alcohol and

other drug use (see Table 2). Adolescent alcohol use was negatively related to parental knowledge and positively related to peer use and tolerance of use. In addition, parental knowledge was negatively related to peer use and tolerance of use (see Table 4).

Results from the first model, which included parental knowledge, peer use and tolerance of use, and adolescent alcohol use—as well as five covariates that could have potentially confounded decomposition effects—indicated that including peer use and tolerance of use in the analysis significantly reduced the effects of parental knowledge on adolescent alcohol use, even when controlling for age, sex, race, treatment condition, and family income. In this model, parental knowledge significantly decreased the odds of participants drinking alcohol by 68.4% ( $OR = .32$ , 95% CI [.13, .75]). Controlling for peer use and tolerance of use, the effect of parental knowledge was reduced from 68.4% to 37.1%, leaving an indirect effect of 50%. Moreover, the total effect was 2.5 times larger than the direct effect, and 59.8% of the total effect was due to peer use and tolerance of use (see Table 5).

To provide a simpler interpretation, we analyzed average partial effects applied through the KHB method to estimate the coefficients of the logit model. When compared to logit coefficients, average partial effects allow for easier interpretation because they use a probability scale, which is often more intuitively understood. The results demonstrated that, on average, the probability of a participant drinking alcohol decreased by 21.4 percentage points—an odds ratio of 19% for a one-standard-deviation change in parental knowledge score. After controlling for peer use and tolerance of use, the strength of the relationship between parental knowledge and adolescent drinking was reduced by 8.6 percentage points—an odds ratio of 8%. An increase of parental knowledge led to lower peer use and tolerance, which then translated into a lower probability of adolescents drinking alcohol, decreasing by 12.8 percentage points or an odds ratio of 12%.

We also examined the competing model that parental knowledge at 3 months was a mediator between baseline peer substance use and tolerance of use and 6-month adolescent alcohol use. Age, sex, race, treatment condition, and family income were included as covariates. The results (see Table 6) demonstrated that there was a significant direct effect of peer use and tolerance of use on participant alcohol use, even when including parental knowledge. However, the indirect effect of peer use and tolerance of use to participant drinking via parental knowledge was not significant, suggesting that parental knowledge is not a mediator between peer substance use and tolerance of use and adolescent drinking.

## Discussion

This study's findings were consistent with previous research demonstrating associations between parental knowledge, peer substance use and tolerance of use, and adolescent alcohol use (Ardelt & Day, 2002; Borawski et al., 2003; Feldstein & Miller, 2006; Hawkins et al., 1992; Mason et al., 2014; Pomery et al., 2005; Ryan et al., 2010), supporting our first hypothesis. In our study, parental knowledge was negatively related to adolescent alcohol use: When parental knowledge increased, the likelihood of adolescent drinking decreased. Moreover, when peer use and tolerance of use increased, the likelihood of adolescent drinking did as well, supporting our second hypothesis. Our third hypothesis, that peer use



and tolerance of use would mediate the relationship between parental knowledge and adolescent alcohol use, was supported as well. Specifically, when adding peer use and tolerance of use into the model as a mediator of the association between parental knowledge and adolescent drinking, the effects of parental knowledge diminished. The effect of parental knowledge on adolescent alcohol use was almost fully mediated by peer use and tolerance of use. This was not the case when parental knowledge was added into the model as a mediator of the association between peer use and tolerance of use and adolescent drinking. Therefore, the effect of peer use and tolerance of use on adolescent alcohol use was not mediated by parental knowledge, again emphasizing the influence of peers on adolescent drinking.

Our findings help to deconstruct the effects of parental knowledge and peer substance use and tolerance of use on adolescent drinking. Further, our study helps to illuminate the processes by which parental knowledge affects adolescent alcohol use. Although research has consistently demonstrated that increased parental knowledge leads to decreased alcohol use among adolescents (Ewing et al., 2015; Wang et al., 2013), this study extends the knowledge base by elucidating a primary pathway through which this reduction occurs. That is, parental knowledge may modify adolescent exposure to and interaction with substance-using peers. This finding is important, as deviant peer selection includes both those who use and those who tolerate and enable use. With higher parental knowledge, adolescents may select peers with both lower alcohol use and lower tolerance of others' alcohol use.

Although our study does not settle the argument of whether peers or parents exert more influence on adolescent alcohol use, it does aid our understanding of *how* increased parental knowledge can lead to a decrease in drinking among adolescents. When parents either have low knowledge of their adolescents, or when adolescents do not perceive that their parents are supervising their activities closely, adolescents are more likely to let their own preferences guide their decision to drink alcohol (Bahr et al., 2005). Therefore, when parents increase the monitoring and knowledge of their adolescent, the adolescent may be less likely to associate with peers who use substances. This notion is consistent with social learning theory (Bandura, 1986) in that adolescents' substance-use behavior may be influenced by parental regulation (i.e., via parental knowledge), which produces experiences that adolescents use to regulate their own activities and choices (i.e., choosing to associate with peers who do not drink alcohol). These peer-related choices then serve as one way to achieve long-term goal-directed behavior (i.e., reducing or stopping alcohol use). As such, these nuanced findings extend our understanding of potential mechanisms of change in drinking frequency among adolescents.

## Implications

These findings have implications for individual and family clinical work with adolescents who use alcohol, particularly as parenting interventions have been identified as effective in reducing alcohol use among adolescents both in the short and long term (Allen et al., 2016). First, clinicians treating adolescents who use alcohol should be encouraged to inquire about friends' perceptions of alcohol and other drug use and build motivational interventions around this peer influence. Second, work with parents of adolescents could emphasize the importance of knowing their children's whereabouts and activities as a means of reducing

their adolescent's alcohol use and related consequences. Moreover, parent interventions that specifically target the monitoring of an adolescent's involvement with friends who use substances may be particularly effective in reducing their adolescent's alcohol use. It should be noted that being aware of children's activities, friends, and location is not easy for parents, especially with adolescents who demonstrate other problem behaviors. In addition, through a systematic review of parenting interventions aimed at reducing adolescent substance use, Allen and colleagues (2016) found that a common challenge for parenting interventions includes the intensity of the intervention (i.e., interventions requiring more contact hours may not see effects due to the burden placed on the family and the accessibility of those services). Therefore, parent interventions should include practical steps, tangible techniques, and the minimum amount of intervention contact hours necessary to most effectively increase parents' ability to monitor their adolescent and still maintain a positive parent-adolescent relationship. A systematic review of studies demonstrated that low-intensity parenting interventions, including computer-based intervention delivery with a manageable amount of 12 contact hours, resulted in decreased alcohol use for adolescents (Allen et al., 2016). Other key components of effective parenting interventions for adolescent substance use included MI techniques, video demonstrations, parent-child communication skills, collaborative rule making, and youth strategies for substance avoidance (Allen et al., 2016).

### Limitations

Results should be interpreted with caution given that findings were based on adolescent self-report and that no other components of parent-adolescent or peer-adolescent interactions were measured that could have potentially influenced the relationship between parental knowledge, peer use and tolerance of use, and adolescent alcohol use. For instance, our study did not measure peer relationship changes, parent-child communication, parent-child conflict, parent-child attachment, type of communication, and frequency and intensity of relationships. Future research would benefit from the assessment of additional parent-adolescent and peer-adolescent interactions and how they directly and indirectly influence adolescent alcohol use. Although there are limitations inherent in self-reported data, perceptions affect behavior (Clarkson, Hirt, Jia, & Alexander, 2010) and may even be more influential than the reality of others' behaviors in predicting one's own behavior. Moreover, McGillicuddy, Rychtarik, Morsheimer, and Burke-Storer (2007) demonstrated fair to good congruence between parents and adolescents in their reports of adolescent alcohol use and frequency of alcohol use.

A second limitation is that the present study captured just one aspect of parental monitoring (i.e., parental knowledge). Although parental knowledge represents the result of monitoring behaviors and other information acquisition methods (Kerr & Stattin, 2000), it would have been helpful to have other data about how parents intentionally and actively sought or received information about their adolescent's behavior (e.g., through child disclosure and/or parental solicitation). Consequently, future research would benefit from identifying how parents gather information about their adolescents' whereabouts, activities, and peer associations to more accurately capture various aspects of parental monitoring.

Third, the present study used secondary data from an intervention study. Without a control condition, we cannot be certain that the intervention did not influence the participants' reports of alcohol use, peer use, and peer tolerance of use. Although it is possible that the intervention affected participants' later use, the treatment condition was controlled in all analyses to account for potential confounding effects.

Finally, the predominantly White sample prohibits generalizing our findings to more ethnically diverse samples and limits our ability to understand nuances in how the relationships between parental monitoring, peer substance use and tolerance of use, and adolescent alcohol use may differ among ethnic groups. Thus, future research should examine these relationships in more ethnically diverse samples.

## Conclusion

We must contextualize our findings by giving attention to the study sample, which—as a whole—did not frequently engage in heavy alcohol use, even though most participants were recruited from an ED after an alcohol-related event. It is possible that simply experiencing an alcohol-related event may directly influence parents' monitoring choices and adolescents' peer involvement decisions. Knowing this, the peer pathway may be a particularly important target for individual and parental interventions to decrease alcohol use among adolescents. Of course, our findings are aggregated from a sample of primarily high-risk adolescents; in any individual adolescent—or in a sample of adolescents from the general population—parental knowledge and peer use and tolerance of use may have a stronger or weaker association with alcohol consumption. Nonetheless, this study used a longitudinal design to improve understanding of peer and parent influences on adolescent alcohol use and provide insight into the mechanisms of change in alcohol use among adolescents.

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**Table 1**

## Participant Demographics

Variables	Observations (N = 116)	Mean/%
Age	116	15.60
Sex		
Male	54	46.55%
Female	62	53.45%
Race		
White	139	61.23%
Not White	88	38.77%
Family Income		
< \$5,000	4	3.64%
\$5,000–\$9,999	4	3.64%
\$10,000–\$14,999	11	10.00%
\$15,000–\$25,999	18	16.36%
\$26,000–\$49,999	16	14.55%
\$50,000–\$74,999	16	14.55%
\$75,000–\$99,999	12	10.91%
\$100,000–\$149,999	18	16.36%
> \$150,000	11	10.00%

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**Table 2**  
Descriptive Statistics for Parental Knowledge, Peer Use and Tolerance of Use, and Adolescent Drinking (N = 116)

Variables	Baseline		3 Months		6 Months	
	(n)	Mean (SD)	(n)	Mean (SD)	(n)	Mean (SD)
Parental knowledge	116	2.01 (.58)	113	2.07 (.64)	-	-
Peer use and tolerance of use	116	25.67 (10.39)	113	25.76 (11.67)	-	-
	(n)	%	(n)	%	(n)	%
Adolescent drinking						
Use	115	100%	53	46.90%	55	47.41%
No use	0	0%	60	53.10%	61	52.59%

Note. SD = standard deviation.

**Table 3**

Logistic Regression Coefficients and Odds Ratios for the Effects of Variables

Variables	Coefficients ( <i>b</i> )	Odds Ratio	95% CI for Odds Ratio	
			Lower Limit	Upper Limit
Parental monitoring	-0.46	0.63	-1.35	0.42
Peer use and tolerance of use	0.09***	1.10	0.04	0.15
Age	0.24	1.28	-0.16	0.64
Family income	0.27*	1.31	0.02	0.52
Female <sup>a</sup>	0.57	1.77	-0.34	1.48
White <sup>b</sup>	-1.10	0.33	-2.23	0.02
MI plus family intervention <sup>c</sup>	-0.36	0.70	-1.28	0.56

Note. CI = confidence interval; MI = motivational interviewing.

\*  $p < .05$ ;

\*\*  $p < .01$ ;

\*\*\*  $p < .001$ .

<sup>a</sup>Reference group = male.

<sup>b</sup>Reference group = not White.

<sup>c</sup>Reference group = MI only.

**Table 4**  
Correlation Matrix for Continuous Predictors and Adolescent Drinking Frequency

Variable	1	2	3	4	5
1. 6-month adolescent alcohol use	–	–	–	–	–
2. Baseline parental knowledge	–.22*	–	–	–	–
3. 3-month peer substance use and tolerance of use	.53***	–.37***	–	–	–
4. Age	.21*	–.02	.29**	–	–
5. Family income	.13	.11	–.03	–.01	–

Note.

\*  $p < .05$ ;

\*\*  $p < .01$ ;

\*\*\*  $p < .001$ .

**Table 5**

Model One Results: Decomposition of Total Effect, Direct Effect, and Indirect Effect

	Logit			
	Coefficient ( <i>b</i> )	<i>z</i>	Odds Ratio	95% CI
Coefficients				
Total effect	-1.15 **	-2.63	.32 **	[0.13, 0.75]
Direct effect	-0.46	-1.03	.63	[0.26, 1.52]
Indirect effect	-0.69 **	-2.74	.50 **	[0.31, 0.82]
Relative measures				
Mediation percentage	59.76%	-	-	-

*Note.* Decomposition of the total effect of baseline parental knowledge on participant alcohol use at 6 months into direct and indirect effects via peer use and tolerance of use at 3 months, controlling for covariates (age, sex, race, treatment condition, and family income). CI = confidence interval.

\*  
 $p < .05$ ;

\*\*  
 $p < .01$ ;

\*\*\*  
 $p < .001$ .

**Table 6**

Competing Model Results: Decomposition of Total Effect, Direct Effect, and Indirect Effect

	Logit			
	Coefficient ( <i>b</i> )	<i>z</i>	Odds Ratio	95% CI
Coefficients				
Total effect	0.07 <sup>**</sup>	2.78	1.07 <sup>**</sup>	[.02, .11]
Direct effect	0.05 <sup>*</sup>	2.18	1.05 <sup>*</sup>	[.01, .10]
Indirect effect	0.01	1.19	1.01	[-.01, .03]
Relative measures				
Mediation percentage	17.74%	–	–	–

*Note.* Decomposition of total effect of baseline peer substance use and tolerance of use on participant alcohol use at 6 months into direct and indirect effects via parental knowledge at 3 months, controlling for covariates (age, sex, race, treatment condition, and family income). CI = confidence interval.

\*  
 $p < .05$ ;

\*\*  
 $p < .01$ ;

\*\*\*  
 $p < .001$ .