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Adolescent Substance Use with Friends: Moderating and Mediating Effects of Parental Monitoring and Peer Activity Contexts

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Abstract

The influence of using substances with friends on future individual use was examined in the context of parental monitoring rules and the ecology of peer activities. A one-year longitudinal study design included a combined sample of North Italian and French Canadian adolescents ($N = 285$, 53% girls, $M = 14.25$ years). Data analyses were conducted using structural equation modeling and multiple regression analyses. As expected, the covariation between parental monitoring and adolescent substance use was mediated by “co-use” with friends. Moreover, the relation between substance use with friends and individual substance use was moderated by parental monitoring rules and the peer activity context. Specifically, the relation between substance co-use with friends and individual substance use was stronger when the level of parental monitoring rules was low and when friends spent their time together primarily in unstructured contexts such as on the street or in park settings. These findings underline the importance of adults’ use of rules to monitor adolescents prone to substance use, and the role of context in facilitating or reducing peer influence.

Keywords

Substance Use; Peers; Parental Monitoring

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For the past two decades research has continued to show correlations and likely causal links between poor parental monitoring and youth substance use (Duncan, Duncan, Biglan, & Ary, 1998; Nash, McQueen, & Bray, 2005; Steinberg, Fletcher, & Darling, 1994) and between having substance-using friends and individual substance use (Andrews, Tildesley, Hops, & Li, 2002; Ashby Wills & Cleary, 1999; Nash et al, 2005; Prinstein, Boergers, & Spirito, 2001; Steinberg et al., 1994). Research also has demonstrated that these two social contextual variables affect each other and likely interact as risk factors in predicting youth

substance use (Dishion, Nelson, & Bullock, 2004; Fletcher, Steinberg, & Williams-Wheeler, 2004; Steinberg et al., 1994). In addition, it has recently been suggested that the specific contexts in which an individual spends time with friends (e.g., in school vs. out of school) may be important for understanding how peers influence each other (Kiesner & Pastore, 2005; Kiesner, Poulin, & Nicotra, 2003). For example, after-school unsupervised time with friends is a high-risk context for the initiation and growth of adolescent substance use (Dishion, Bullock, & Kiesner, 2008; Friedman, Lichtenstein, & Biglan, 1985).

The present study extends our understanding of these processes by examining the following predictors of individual substance use: substance co-use with friends, parents' rules that facilitate monitoring, and peer activity contexts. The focus of this work is on considering peer activity contexts and parent monitoring rules, in terms of mediation and moderation of risk factors associated with adolescent substance use.

Peer Influence, Peer Contexts, and Parental Monitoring

In recent decades a great deal of research has examined the potential for friends' influence on adolescent substance use. The basic idea is that having substance-using friends puts an individual at risk for the initiation or escalation of substance use. For example, research has shown that affiliation with substance-using peers can lead to both initiation as well as escalation in tobacco and alcohol use during adolescence (Urberg, Degirmencioglu, & Pilgrim, 1997). In addition to effects observed during adolescence, Dishion and Owen (2002) demonstrated that peer influence on substance use (considering a general deviant peer process construct) extends from early adolescence (13–14 years) to young adulthood (20–23 years), an effect partially attributable to continuity in delinquent-peer affiliation. Although most research has relied on cross-lag panel designs (e.g., Time 1 peer substance use predicting Time 2 individual substance use), Dishion and Medici Skaggs (2000) demonstrated temporally covarying bursts in exposure to deviant peers and individual substance use. Thus, in addition to long-term trends in substance use, short-duration bursts in substance use also appear to depend on peer contacts (Dishion & Medici-Skaggs, 2000). These studies and others (e.g., Aloise-Young, Graham, & Hansen, 1994; Andrews et al., 2002; Ashby Wills & Cleary, 1999) provide strong evidence that friends play a central role in individual initiation, escalation, and short-term temporal variations in substance use.

Although the evidence that peers play a central role in adolescent substance use is very convincing, there are several important factors that require further study. The first regards how peer substance use is conceptualized and measured. A consistent feature of the research on peer involvement in substance use is that individual substance use and the friends' substance use are measured as two separate variables. Significant associations across time are then interpreted as signs of influence between the individual and their friends. However, an unspecified assumption is that the adolescent and their friends actually engage in substance use together. A surprising omission in the empirical literature on peer influences on adolescent substance use is to actually measure episodes where youth are in fact using drugs in the company of their identified friends. That is, measuring the co-incidence of use, or in other words, 'co-use'. The underlying idea is that individual substance use can sometimes occur with close friends, but may not always occur with those close friends, and that distinguishing between the general case of individual use, and the specific case of co-use, will provide more detailed and relevant information for understanding substance use development. The scarce research conducted on this issue has documented that, for most youth, the first episode of substance use was in a situation of mutual initiation with a friend (Friedman et al., 1985). We argue here that co-use with friends is an important construct that reflects more adequately the notion that shared activities with friends represent developmentally important experiences for high-risk behaviors.

The second important factor that requires further study is the context in which peer relations and friendships occur. Although past research considering routine activities of youth has considered how and where youth pass their time (e.g., Osgood, Wilson, O'Malley, Bachman, & Johnston, 1996), research on *peer relations* and peer influence generally has not considered this construct. Thus, whereas it has been shown that going on car rides just for fun, unstructured time with friends, going to parties, and going out in the evening, are associated with higher levels of criminal behavioral and drug use (Osgood, et al, 1996), research has not examined whether the contexts in which peers spend time together moderate the potential for peer influence. Contexts may be important because each one provides a different level of adult supervision, and thus, different opportunities for delinquent behavior, reinforcement for delinquent behavior, and peer influence. Supporting the idea that context is important, recent research has shown that peer homophily on measures of antisocial behavior depends on context (in school vs. out of school; Kiesner et al., 2003), that the relation between antisocial behavior and peer acceptance depends on context (in class vs. out of class; Kiesner & Pastore, 2005), and that youth who met their first "very important person" (peer) in the neighborhood and who spent most of their time with that peer in their free time (as opposed to during school) showed the highest scores on antisocial behavior (Kiesner, Kerr, & Stattin, 2004). These findings support the idea that the context of the peer relations may be an important factor in determining the type and degree of influence resulting from peer relations.

The third important factor that requires further study regards control and supervision imposed by the parents, generally referred to as *parental monitoring* (Patterson, 1982; Patterson & Stouthamer-Loeber, 1984). During the past two decades, research has documented the empirical covariation between parental monitoring practices and youth substance use (Duncan et al., 1998; Fletcher et al., 2004), including early-onset substance abuse (Chilcoat & Anthony, 1996; Chilcoat, Dishion, & Anthony, 1995). This base of research supports the idea that parenting behaviors may increase or decrease risk for youth involvement in substance use. However, recent theorists have suggested that measures of parental monitoring have frequently focused on how well informed parents are rather than on actual supervision and control of youth behavior (Stattin & Kerr, 2002), and thus interpretation of some studies remains ambiguous with regard to inferring causation. Because of this criticism of past research, our study focused on rules and expectations imposed by parents regarding youth behavior.

Integrating Context with Parent and Peer Influence

Parallel to the research on peer influence and parental monitoring, researchers and theorists have also attempted to integrate parenting effects and peer effects into a broader framework that includes either mediation or moderation. For example, research has supported a mediational model in which inadequate parental monitoring is proposed to increase the risk of youth delinquency because it allows the child or adolescent to associate with delinquent peers (Chung & Steinberg, 2006; Dishion, Patterson, Stoolmiller, & Skinner 1991; Snyder, Dishion, & Patterson, 1986). This model has been empirically validated in the United States across ethnic samples of American Indians, Hispanics, and North American Caucasians (Barrera, Biglan, Ary, & Li, 2001). Although these studies focused on general constructs of antisocial behavior, other research has provided support for this mediational model also considering substance use (Dishion, Capaldi, Spracklen, & Li, 1995; Dishion & Loeber, 1985).

In addition to using a mediation model, a second possibility for integrating parent and peer effects is to use a moderation model. That is to say, the effect of one variable may depend on the level of a second variable, in predicting individual escalation. Dishion et al. (2004) provided support for this idea by showing a significant interaction between delinquent peer

involvement and changes in family management practices, when predicting both antisocial behavior in general and marijuana use. Specifically, friendship influence on problem behavior was most pronounced for boys whose parents had decreased their family management practices. Consistent with these results, Mounts and Steinberg (1995) found that effects of peer drug use on individual drug use during adolescence was moderated by parenting style: low levels of authoritative parenting were associated with the highest level of peer influence. Similarly, Galambos, Barker and Almeida (2003) found that parental control slowed the increase of externalizing behaviors among adolescents with deviant peers; and Barnes, Hoffman, Welte, Farrell and Dintcheff (2006) found that high levels of monitoring/disclosure decreased the slope for alcohol misuse among adolescents with delinquent peers. Finally, Farrell and White (1998) found that the effects of peer pressure for drug use were moderated by family constitution, with peer influence being stronger for adolescents who were living with the biological father absent and stepfather present than for adolescents whose biological father was living in the home. Although the presence of a father is not a direct indicator of parental monitoring, the absence of one parent may be associated with less overall parental monitoring.

Results of one study supported both mediation and moderation (Nash et al., 2005). The researchers found that a family environment construct (including parental monitoring) had negative effects on adolescent substance use directly and indirectly, via mediation through peer influence on substance use. Moreover, the effect of peer influence was also moderated by the family environment construct: positive family environment was associated with weaker peer influence effects on substance use.

However, not all research testing for mediation and moderation has found evidence for these effects. For example, although Steinberg et al. (1994) found evidence for effects of both parental monitoring and peer influence on individual substance use, their study did not provide support for either mediation or moderation among these two constructs. Similarly, Kim, Hetherington, and Reiss (1999) found only very weak support for a mediational effect of parental monitoring on externalizing behaviors (not on substance use), passing through peer delinquency (this effect was found only for stepfather monitoring of girls). Thus, further research is needed to clarify under what conditions such effects exist.

In addition to potential moderation of friends' influence by parental monitoring, the context in which youth spend time with their friends may also moderate the potential for peer influence. For example, a youth may have delinquent friends and may engage in activities such as substance use with those friends, but if these individuals spend most of their time together only at school, then the potential for peer influence leading to individual escalation in substance use may be small. On the other hand, if most of their time together is spent on the streets, then the potential for peer influence on substance use may be increased. Because parental monitoring rules and peer context are likely to be correlated (youth who are not monitored by their parents may spend more time with peers in the street/park settings), a test of this hypothesis must control for the main effect of parental monitoring rules and the interaction between parental monitoring rules and delinquent peer affiliation.

Gender Differences

Because gender differences have previously been found with regards to substance use (Andrews et al., 2002), and peer relations variables (Rose & Rudolph, 2006), gender will also be considered in the present study. It should be noted, however, that past research has generally not found gender differences regarding peer influences on substance use (see for example, Andrews et al., 2002; Aloise-Young et al., 1994; Urberg et al., 1997). Thus, there is little evidence that peer influences on substance use are conditioned by gender. Moreover, because we had no specific *a-priori* hypotheses regarding interactions between gender and

the other variables considered in this study, and because of the high number of possible interactions, our treatment of these interactions should be considered exploratory.

This Study

The goal of this study was to integrate theoretically diverse approaches to understanding youth substance use by considering mediated and moderated effects among parental monitoring, drug use with friends, and peer activity contexts. Parents' use of rules to define expectations for adolescent behavior was used as an indicator of parental monitoring (*control* as defined by Stattin and Kerr, 2000). In contrast to typical approaches to measuring peer substance use, we measured the adolescents' use of substances *with* specific close friends. Our measure of peer activity contexts was defined in terms of whether the individual spends most of his or her time with specific friends in school or in the street/parks setting. It was hypothesized that (a) substance co-use (with friends) would mediate the relation between parental monitoring rules and individual substance use, (b) high levels of rules would attenuate the relation between co-use and individual use, and (c) time spent with friends in the streets/parks would be associated with a stronger correlation between co-use and individual use. As described above, we also consider gender and its possible interactions with other predictors. These relations were examined using both concurrent and longitudinal data. To test these research questions, a combined sample of Italian and French Canadian adolescents was used. Using a geographically and culturally diverse sample helps increase confidence in the results and provides a greater degree of generalizability. In addition to testing the hypotheses using the combined sample, the Structural Equation Models were also conducted on each sample separately, and provided strong evidence of its replicability.

Participants were recruited in the eighth grade, and were assessed once in the eighth grade (T1) and once in the ninth grade (T2). Thus, the present data represent a 1-year longitudinal study, with two assessment waves.

Methods

Participants

For both the Italian and French Canadian samples, letters were sent to the parents of all eighth grade students in the participating middle schools. These materials explained the nature of the study and invited parents to sign a letter of informed consent if they agreed that they and their child would participate.

For the Italian sample, two middle schools participated, with a total of 244 eighth grade students (i.e., potential participants). Signed consent letters were returned for 152 students (62% of all potential participants). Of these participants, 69 (45%) were female and 83 (55%) were male. Their average age was 14 years. Almost all participants ($n = 146$; 96%) indicated that they had been born in Italy and that their native language was Italian.

For the French Canadian sample, two middle schools participated, with a total of 260 eighth grade students (i.e., potential participants). Signed consent letters were returned for 151 students (58% of all potential participants). Of these participants, 90 (60%) were female and 61 (40%) were male. Their average age was 14.55 years. Most participants ($n = 123$; 81%) indicated that they had been born in Canada. This sample, however, demonstrated more variability with regard to native language, with 96 (64%) reporting that French was their native language, 16 (11%) Spanish, 9 (6%) Creole, 4 (3%) Vietnamese, 4 (3%) English, 4 (3%) Portuguese, 2 (1%) Chinese, 1 Italian, and 15 (10%) some other language.

These data show that the Italian sample was quite homogeneous with regard to nationality and native language, and that the French Canadian sample was more diverse. Moreover,

although the mean ages of these samples seem very similar, the French Canadian sample demonstrated more variability also on this measure: 90% of the Italian sample were 14 years old, nearly 10% were 15 years old, and 1 participant was 16 years old, whereas for the Canadian sample, 58% were 14 years old, 31% were 15 years old, 8% were 16 years old, and nearly 3% were 17 years old.

At T1, 12 parents from the Italian sample and 11 parents from the Canadian sample did not return the parent report questionnaire. Thus, at T1, parent data were available for 140 families in the Italian sample and 140 in the Canadian sample (92% of participating families). At T2, data were available for 142 of the Italian youth (93%), 124 of the Italian parents (82%), 144 of the Canadian youth (95%), and 143 of the Canadian parents (95%). Thus, missing data was very low and retention was very high for both samples.

Data collection for the two samples was separated by one year, but all assessments occurred at the same time of the year, with the Canadian sample being recruited and assessed first, followed by the Italian sample. Because the same procedures and measures were used for both the Italian sample and the French Canadian sample, in the following section we first present a general description of the procedures and measures, then provide relevant information specific to each sample (e.g., descriptive statistics).

Descriptive statistics cited in the following section are based on all available data at each wave and for each measure. Listwise exclusion was used in all analyses presented in the Results section, so that if data were missing for a participant on one variable in that analysis, then she/he was excluded from that analysis.

Measures

Parental monitoring rules—To measure parental monitoring rules, we used both child and parent reports on the 5-item Control subscale of the Parent Monitoring measure developed by Stattin and Kerr (2000; Kerr & Stattin, 2000). Although the items are the same as those used by Stattin and Kerr, we use the term *rules* because it more accurately captures the content of the scale items (see Kiesner, Dishion, Poulin, & Pastore, 2009, for specific wording of all items). The same items were used for both the child report and the parent report. A 5-point response scale was used for all 5 items. Although the wording of the five responses was adapted for each item, the overall ratings were the following: 1 (*almost never*), 2 (*rarely*), 3 (*sometimes*), 4 (*often*), 5 (*very often*). This subscale, across both child report and parent report, across both assessment waves, and across both samples demonstrated adequate internal reliability, with Cronbach's alphas ranging from $\alpha = .60$ to $\alpha = .85$. The final score used for analyses was the average of the child and parents reports (correlations between child and parent reports: $r = .28$ at T1, and $r = .42$ at T2).

As previously reported (Kiesner, et al., 2009), in both years of data, Italian youth and parents both reported higher levels of rules than did the Canadian youth and parents.

Youth self-report of substance use—To measure youth substance use, we implemented a self-report scale asking how often in the past month the youth had smoked cigarettes, drunk beer, drunk wine, drunk wine coolers (for the Italian sample we used the term *spritz*, which is similar to a wine cooler), drunk hard alcohol, and smoked marijuana. Thus, a total of 6 items contributed to this scale (one item for each substance). Responses were given on a 14-point scale ranging from “0” to “41 or more times” in the past month. This scale demonstrated adequate internal consistency for both the Italian sample (standardized $\alpha = .75$ at T1, standardized $\alpha = .81$ at T2) and the Canadian sample (standardized $\alpha = .85$ at T1, standardized $\alpha = .74$ at T2). Because of differences in the frequency distributions across substance types, the item scores were standardized before

combining them into a scale score. This strategy was used within each sample, and therefore, both samples had a mean level of substance use equal to zero, and no group comparisons could be tested. However, it should be noted that there were fairly large differences across the groups in terms of the percentage of youth who reported having *ever* used each substance. Specifically, for the Canadian sample, 49% had smoked cigarettes, 66% had drunk beer, 72% had drunk wine, 56% had drunk wine coolers, 46% had drunk hard alcohol, and 39% had smoked marijuana, whereas for the Italian sample, 32% had smoked cigarettes, 54% had drunk beer, 59% had drunk wine, 35% had drunk wine coolers (spritz), 30% had drunk hard alcohol, and 3% had smoked marijuana. Thus, in all cases, a larger percentage of the Canadian youth reported having ever used the specific substance, with differences ranging from 12 to 36 percentage points. This same pattern was also observed at T2, with a higher percentage of Canadian youth using all types of substances, compared with the Italian sample.

Substance co-use with friends—Youth participants were asked to report who their “five most important friends” were. Although participants were asked about their five most important friends, this study focused on the first two of these friends (the reason for this is explained below in the section describing “*Peer Activity Context*”). Using three separate questions, participants were asked whether they ever used tobacco, alcohol, and marijuana with each friend (e.g., “Have you ever drunk alcohol with this friend?”). Responses were given as either yes or no, and coded as “no” = 0, “yes” = 1. This score is based on only the first two best friends. Responses to these three questions were averaged together for each friend, and then averaged again across friends. Therefore, a participant would have a score of 0 if they responded “no” to all three questions for both friends, and a score of 1 if they responded “yes” to all three questions for both friends. The average for T1 was $M = .17$ ($SD = .26$), and for T2 was $M = .25$ ($SD = .32$). Note that this score is not a measure of whether the target child believes their friend uses each substance, but whether they use each substance together. Therefore, this variable is named *substance co-use with friends*.

Peer activity context—In addition to asking about substance use with each friend, we also asked where they spent most of their time with each friend (one question for each friend). Response options regarding where they spend most of the time together included school, home, the other’s home, street/park, organized sports, organized extra-scholastic activities, youth center, shopping mall, video game center, cinema, church, or other. Participants were asked to select only one of these options. For this study we were interested in the school context and the street/park context. These contexts were the focus because past research has focused most often on school friends, although recent research has shown that out-of-school peers and unsupervised street settings are associated with higher levels of problem behavior (Kiesner et al. 2004). Moreover, the school and street/park settings were the most commonly reported by youth as their peer activity context, and thus more data were available for these contexts. Combined, the school and street/park settings accounted for 70% to 83% of the peer activity contexts for both the first and second best friends at both T1 and T2. Specifically, the distributions for these two contexts were as follows: T1 best friend (school = 39.3%, street/park = 30.5%), T1 second-best friend (school = 47.2%, street/park = 23.2%); T2 best friend (school = 47.7%, street/park = 28.3%), T2 second-best friend (school = 50.4%, street/park = 33.1%). All other contexts accounted for 10% or less of the peer contexts.

This information was used to create a dichotomous variable indicating whether the individual reported spending most of the time with their first two best friends in the school setting or in the street/park setting. Specifically, to be in the category of “street/park” the individual must have reported spending most of the time with both friends in *that* setting, and to be in the category “school” the individual must have reported spending most of the

time with both friends in that setting. If the individual reported spending most of the time at school with one friend and in the street/park with the other friend, that individual was not included in the analyses focusing on peer context (not all analyses included peer context). Because including more friends resulted in higher levels of participants who could not be categorized, we considered only the first two friends. Considering the T1 data, 189 participants were categorized into one of the two peer activity context groups (school context = 127, street/park context = 62); considering the T2 data, 215 participants were categorized into one of the two peer activity context groups (school context = 130, street/park context = 85). Thus, the number of participants who were *not* categorized were $n = 114$ (38%) at T1 and $n = 88$ (29%) at T2. Participants who were included in these analyses were not different from the excluded participants on the measures of individual substance use or substance co-use with friends, at T1 or T2 (all t 's < 1.77).

Comparisons of peer activity contexts across the Italian and Canadian samples using χ^2 tests showed significant differences at both T1 ($\chi^2 = 15.09, p < .0001$) and T2 ($\chi^2 = 16.40, p < .0001$). For both time periods Italian youth were categorized into each peer activity context group (street/park, school) about equally as often, whereas the Canadian youth were more frequently categorized into the school context group (they reported spending most of the time with both friends in the school context).

Teacher reports of youth problem behavior (T1 only)—The teacher report of problem behavior was based on a 9-item scale regarding general disruptive behavior in the classroom and affiliation with delinquent peers. Example items included “argues with or talks back to an adult,” “yells at or calls others mean names,” “argues a lot,” “appears to be using tobacco, drugs, or alcohol.” Responses were given on a 10-point scale ranging from 1 (*not at all a problem*) to 10 (*clear and frequent signs*). This scale demonstrated adequate internal consistency for both the Italian sample ($\alpha = .92$) and the Canadian sample ($\alpha = .94$). There was no significant difference between mean levels of teacher-reported problem behavior across the two samples ($t = 1.10, ns; M = 2.46, SD = 1.75$ for the Italian sample, and $M = 2.72, SD = 2.3$ for the Canadian sample). Teacher reports were not available for T2.

Translation of Measures

All measures were separately translated from English to Italian and French. This was conducted by individuals who were fluent in English and whose first language was Italian or French. Following this initial translation, a back translation was conducted by a second person for each language. When differences were identified they were discussed until agreement was established. Next, a person whose first language was French, and who was also fluent in Italian, then compared the Italian and French translations. Again, when questions about match were raised, these were discussed with the other individuals involved in the translation, until agreement was achieved.

Results

The Results section is divided into three subsections. The first section briefly reports relevant descriptive statistics regarding the relations between context and substance use and parental monitoring rules. The second section examines the hypothesis that the relation between low levels of parental monitoring rules and individual substance use would be mediated by substance co-use with friends. The third section examines the hypothesis that parental monitoring rules and peer activity context will moderate the relation between substance co-use and individual substance use. These tests were conducted separately for both waves of data as well as longitudinally.

Descriptive Statistics

As expected, youth who reported spending most of the time with both best friends in the street/park setting showed higher levels of substance use than did those who spent most of the time with their friends in the school context, at both T1 ($t = 3.15, p < .01$; street/park $M = .26, SD = 1.00, n = 62$; school $M = -.16, SD = .47, n = 127$) and T2 ($t = 4.05, p < .0001$; street/park $M = .30, SD = .92, n = 85$; school $M = -.15, SD = .54, n = 130$).

Also as expected, spending most of the time with friends in the street/park setting was associated with a lower level of parental monitoring rules, at T1 ($t = 2.37, p < .05$; street/park $M = 3.69, SD = .61, n = 62$; school $M = 3.92, SD = .59, n = 127$) and T2 ($t = 4.11, p < .0001$; street/park $M = 3.38, SD = .74, n = 85$; school $M = 3.79, SD = .63, n = 130$).

Because we considered only the first two “most important friends” we could be missing important information from the other three friends that were not included. For example, the correlation between individual substance use and peer substance use could significantly increase if we considered all five friends, rather than only the first two. This would occur, for example, if all substance use were done with the inclusive set of 5 friends. To test for this we also calculated a substance co-use score including all five friends, and compared the correlations between individual use and co-use when including only two friends and when including all five friends. The results were as follows: When considering only two friends the bivariate correlations were $r = .66$ at T1 and $r = .62$ at T2; whereas when all five friends were included in the co-use score the correlations were $r = .69$ at T1 and $r = .66$ at T2. Thus, whether 2 or 5 friends were included in the co-use score made very little difference. Additionally, the correlations between the co-use score including only two friends and the co-use score including all five friends were: $r = .93$ at T1 and $r = .95$ at T2. Thus, including only the first two friends provides essentially the same information as including all 5 friends. Finally, it should be noted that the correlations between individual use and co-use ($r = .66$ for T1, and $r = .62$ for T2) indicate that these two measures have between 38% and 44% of their variance in common. Thus a significant portion of the variance in individual use is not in common with peer co-use. Together, these results indicate that individual use and co-use are not highly collinear, and they support the validity of including only the first two friends in the co-use score (i.e., there is no significant loss of information).

Are the Effects of Parental Monitoring Rules on Individual Substance Use Mediated by Substance Co-Use?

To test for mediation, we used a series of structural equation models (SEM; Lisrel 8.7). In these analyses we used a nested-model approach to test whether increasingly complex models progressively improved the model fit. In the first model, only the stability coefficients were included, thus assuming that the three variables of interest were concurrently and longitudinally not associated with each other. In the second model we added the direct effects of parental monitoring rules on individual substance use (T1 rules → T1 individual use, T1 rules → T2 individual use, T2 rules → T2 individual use). In the third model we added the direct effects of substance co-use on individual use (T1 co-use → T1 individual use, T1 co-use → T2 individual use, T2 co-use → T2 individual use). Finally, in the fourth model, we added the direct effects of parental monitoring rules on peer co-use (T1 rules → T1 co-use, T1 rules → T2 co-use, T2 rules → T2 co-use). Thus, in this fourth model, by allowing parenting effects on co-use, we are also allowing for the indirect effects of parental monitoring rules on individual substance use, passing through substance co-use. This final model is presented in Figure 1.

It should be noted that individual substance use likely has reciprocal effects on friends’ substance use and parental monitoring rules, and thus many of the paths could theoretically

be reversed. Thus, in these analyses we did not intend to argue that these effects do not exist, but rather, our goal was to test whether the potential effects of parental monitoring rules on individual substance use are direct or indirect.

All variables were treated as latent constructs with a single indicator. Initial analyses were conducted on the full model (including all direct and indirect effects) with the error variance for all six constructs fixed to zero. The modification indices for this initial model indicated that two of the error terms could not be assumed to be zero (T1 parental monitoring rules, T1 co-use). The error terms for these variables were fixed at 15%. These error terms were fixed, rather than freed to be estimated, to save degrees of freedom. In these SEM analyses the covariance matrix was used.

The correlations among the variables included in these SEM analyses are presented in Table 1. All the correlations were significant and in the predicted direction. Two important points should be emphasized. First, the stability coefficients were very similar across the three measures ($r = .66$ to $r = .69$). Second, the T1 and T2 concurrent correlations, as well as the longitudinal correlations, were all significant and generally of a similar magnitude. This is important because it indicates that an important first criterion for mediation is met (i.e., the predictor variables and the mediator variables show bivariate associations with the outcome variables).

Regarding possible gender differences, correlations were also computed separately for males and females, and compared using a Fisher r -to- z transformation. Only 1 of the 15 correlations showed a significant difference across males and females. Specifically the correlation between T2 individual use and T2 co-use was $r = .72$ for males, and $r = .52$ for females (significance test for the difference: $p < .01$). No other differences were observed. Given the overall similarity in these correlations across males and females, separate SEM analyses were not conducted.

Results from the SEM analyses are presented in Table 2. The first model, including only stability of the three variables, did not fit the data well. The second model, including stability and direct effects of parental monitoring rules on individual substance use, resulted in a significant improvement of the model fit, but still did not show a good fit with the data. In the third model, direct effects of peer co-use on individual use were also included. Again, although this model demonstrated a significant improvement when compared with the previous model, it still did not show a good fit with the data. Finally, in the fourth model, the paths leading from parental monitoring rules to peer co-use were added, thus allowing for indirect effects of parental monitoring rules on individual use. This model showed a significant improvement in fit when compared with the previous model, and also showed an excellent fit with the data. The path coefficients for this model are presented in Figure 1.

As can be observed in Figure 1, T1 parental monitoring rules demonstrated a strong effect on T1 co-use, and T1 co-use showed a strong effect on individual use, but T1 parental monitoring rules demonstrated no significant effect on T1 individual use. At T2 the results were very different: both T2 parental monitoring rules and T2 co-use demonstrated significant direct effects on T2 individual use, whereas T2 parental monitoring rules showed no significant effect on T2 co-use. Finally, no longitudinal cross-lag effects were observed. Overall, these results indicate that, at T1 and longitudinally, the effects of parental monitoring rules on individual substance use, are entirely mediated by substance co-use with friends. At T2 the effects of parental monitoring rules on individual substance use were only direct.

One advantage of using an SEM approach to analyzing these data is that it provides direct statistical tests of all indirect effects. In the full model presented in Figure 1, there are five

indirect effects to be considered. It should be noted that an indirect effect includes all non-direct paths linking the two variables of interest. Thus, an indirect effect is not the result of one sequence of paths linking these two variables, but all possible sequences. For example, the indirect effect of T1 parental monitoring rules → T2 individual use includes the paths going from T1 parenting → T1 co-use → T1 individual use → T2 individual use; as well as the paths going from T1 parenting → T2 parenting → T2 co-use → T2 individual use; etc.). It should also be noted that, if one path in the sequence of paths linking two variables is not statistically significant, then that sequence of paths is not a plausible path for an indirect effect (e.g., because the path going from T2 parenting → T2 co-use is statistically not significant, then the indirect path going from T1 parenting → T2 parenting → T2 co-use → T2 individual use, is not a plausible link between T1 parenting and T2 individual use). Four indirect effects were statistically significant: T1 parental monitoring rules → T1 individual use ($\beta = -.33, p < .001$), T1 parental monitoring rules → T2 individual use ($\beta = -.36, p < .001$), T1 parental monitoring rules → T2 co-use ($\beta = -.37, p < .001$), T1 co-use → T2 individual use ($\beta = .73, p < .0001$). The fifth indirect effect (T2 parental monitoring rules → T2 individual use) was not significant.

To test for differences across the Italian and Canadian samples, the above model was also run separately for each group. Only one minor difference was found across groups in the model presented in Figure 1. Whereas in the model using the combined sample, and the model considering only the Italian sample, no direct effect was found for parental monitoring rules on Year 1 individual substance use, for the Canadian sample a small but significant negative effect was found ($\beta = -.15, p < .05$). Additionally, whereas in the analysis with the combined sample a small but significant direct effect of T2 parental monitoring rules on T2 individual substance use was found, when the analyses were conducted separately for each subsample, this effect was not significant for either country. The lack of significance is probably attributable to the lower statistical power for a generally weak effect. All other effects were of the same direction, magnitude, and significance across the combined sample and across both countries separately. Overall, the results from the combined sample provide a robust test of the hypotheses, and group differences do not threaten the interpretation of these results.

These results provide strong support for the hypothesis that parental monitoring rules protect against individual substance use both concurrently and longitudinally, and that these effects are primarily indirect, passing through substance co-use with friends.

Parental Monitoring and Peer Activity Contexts as Moderators

As previously defined by Baron and Kenny (1986), moderation is present when the effect of one variable on a second variable is conditioned by (i.e., depends on the level of) a third variable, and is considered to be present when there is a statistical interaction between the predictor variables of interest. In these analyses we consider parental monitoring rules *and* peer activity context as possible moderators of the relation between substance co-use and individual substance use.

In these analyses we expected that high levels of parental monitoring rules would be associated with a weaker association between co-use and individual substance use, and that spending time with friends in unsupervised settings (street/park as opposed to school setting) would be associated with a stronger association between co-use and individual use. These analyses are based on a sub-sample ($n = 189$ for T1, $n = 215$ for T2) focusing only on those participants who could be categorized into a peer activity context group (see methods section).

Three sets of hierarchical multiple regressions were conducted. In the first two multiple regressions we test for moderation separately at T1 and T2, and in the third model we test for moderation using the longitudinal data (in all three sets of analyses, the dependent variable was individual substance use). Of primary interest in these analyses are three main effects of substance co-use, parental monitoring rules, and peer activity context, and the three two-way interactions among these three variables. In addition to these main effects and interaction terms we also included country and gender as control variables. Because interpretation of main effects is not possible when significant interaction effects are excluded from the model, in the present analyses we present only the full model in which all main effects and interaction terms are included simultaneously. In this way, all effects can be interpreted unambiguously. Finally, all continuous variables used in interaction terms were centered prior to creating the interaction term.

The analyses considering the first year of data are presented in Table 3. The overall model was highly significant ($R^2 = .53$; $F(8, 180) = 25.67$, $p < .0001$). As can be seen in Table 3, after controlling for gender and country (males and Canadians demonstrated higher levels of substance use), the only main effect that was significant was for co-use, which showed a strong positive association with individual use. Of the three interactions tested, only the two hypothesized interactions were significant: Rules \times Co-Use and Peer Activity Context \times Co-Use. The direction of these effects indicates that the association between substance co-use and individual substance use is the strongest when the level of parental monitoring rules is low and when time spent with friends is in the street/park setting.

In an additional analysis the two- and three-way interactions between gender and (a) parental rules, (b) co-use, and (c) peer context, were also tested. Results showed that none of the 3-way interactions involving gender were significant, but two of the 2-way interactions were. A significant interaction between gender and parental monitoring rules ($t = 2.67$; $p < .01$) indicated that for boys there was no effect of parental rules on individual substance use, whereas for girls there was a significant negative effect of rules on individual substance use. The second significant interaction was between gender and T1 co-use ($t = 5.25$; $p < .0001$), and indicated that a positive association between co-use and individual use existed for boys, but not for girls.

In the analyses for the second year of data (see Table 4), the overall model was again highly significant ($R^2 = .49$; $F(8, 206) = 25.05$, $p < .0001$). As can be seen in Table 4, the same pattern of results was found, with only two exceptions: (a) parental monitoring rules did show a significant main effect, and (b) gender did not show a significant main effect (girls appeared to “catch up” to the boys in their substance use). The same interaction terms that were significant with the T1 data were also significant, and in the same direction, as the T2 data.

To facilitate interpretation of these interactions, the simple slopes are presented in Figure 2. As can be seen in this figure, the association between substance co-use and individual use is the strongest when the level of parental monitoring rules is low and when the peer context is the street/park.

As was done with the first year data, an additional analysis was conducted testing the two- and three-way interactions between gender and (a) parental rules, (b) co-use, and (c) peer context. None of the 2-way or 3-way interactions involving gender were significant.

Finally, we tested for moderation effects considering longitudinal change. In this analysis we tested for all main effects and the four interaction effects of primary interest. In addition, in the present analysis we also controlled for T1 teacher-reported antisocial behavior, which was available only for the T1 data. This variable was excluded from the previous analyses

conducted on the T1 and T2 data to ensure that those analyses included the same variables, thus avoiding problems of interpretation in case different effects were found. The present analysis is based on a reduced sample of 150 participants who had full longitudinal data. The overall model was highly significant ($R^2 = .77$; $F(14,135) = 31.44$, $p < .0001$). As reported in Table 5, results indicated that Year 1 co-use was negatively associated with later individual substance use, a finding that is in the opposite direction as was expected, and possibly the result of multicollinearity. Neither of the T1 interactions effects was statistically reliable. On the other hand, T2 co-use was positively associated with T2 individual substance use, and both T2 interactions were significant and in the same directions as observed in the earlier analyses.

Again, an additional analysis was conducted testing for interactions involving gender. In this case only the two-way interactions between gender and all other predictors were considered. This was because of the high number of possible interactions with the other 8 predictor variables. None of the 2-way interactions involving gender were statistically reliable.

Discussion

The results presented in this study show a clear pattern indicating that the effects of parental monitoring rules on youth substance use are mediated through substance use opportunities with friends. Moreover, results also demonstrated that parental monitoring rules and peer activity context moderate the association between substance co-use with friends and individual substance use. Specifically, insufficient parental monitoring rules and spending time with friends in the street/park settings were both associated with a stronger relation between substance co-use and individual use.

The results regarding mediation add further evidence to a growing literature demonstrating that a clear outcome of poor parental monitoring is an increased potential to associate with friends who use substances and engage in problem behavior. This study, however, provides further insight into these processes. First, it is important to note that these mediated effects of parental monitoring rules on individual substance use, passing through substance co-use with friends, occurred both during T1 and longitudinally. That is to say, T1 parental monitoring rules showed an indirect effect on T1 substance use, as well as an indirect effect on T2 substance use. In both cases these effects passed through T1 substance co-use. Thus, this mediation has both immediate importance as well as long-lasting importance for individual development. Second, in T2, parental monitoring rules no longer showed a significant effect on substance co-use with friends, and thus no indirect effect on individual use. This finding suggests that relations among these variables at T2 are very much dependent on and embedded in pre-established patterns that existed already at T1. This is supported by the findings that the bivariate correlations show the same pattern and magnitude of relations at both T1 and T2, but in the longitudinal SEM model, T2 parental monitoring rules no longer appeared to influence substance co-use with friends. This underscores the importance of intervening early to prevent a developmental trajectory that includes substance use and involvement with substance-using peers.

At an applied level, this finding provides a very specific direction for prevention research because it emphasizes a clear target for parental monitoring programs. For example, when working with parents to develop their monitoring practices, many skills can be the target of intervention, including limit setting, maintaining a positive rapport, monitoring school progress, and managing peer relations. Considering the results of this study, when substance use is a concern, it may be critical to focus very specifically on managing and intervening in the adolescent's activities and behavior with friends. Such a highly focused approach may provide protection against initiation and escalation in substance use, which would likely

carry with it negative consequences in multiple domains. Moreover, considering the importance of T1 parental monitoring rules, such an approach would likely be most effective if applied early in development. Previous research has found that interventions that target parental monitoring reduce substance use at ages 12 and 13, with reductions in substance use mediated by changes in parental monitoring practices. Moreover, parental monitoring is relatively sensitive to brief interventions such as the Family Check-Up (Dishion, Nelson & Kavanagh, 2003).

The second set of findings regards the moderation effects of parental monitoring rules and peer context on the relation between substance co-use and individual substance use. A clear pattern of results, replicated at T1 and T2, showed that low levels of parental monitoring rules and the street/park context are both associated with a stronger association between substance co-use with friends and individual use. An important aspect of these results is that the moderation effects (interactions) are primarily relevant to the concurrent risk for the individual. That is to say, when the data were analyzed separately for each year, all expected interactions were significant. However, when the data were analyzed considering longitudinal changes, only the T2 interactions were significant. This suggests that a low level of parental monitoring rules, out-of-school peer activity contexts, and substance co-use at T1 interact to create high risk for the individual at T1, but these T1 interactions do not predict T2 substance use independent of their effects at T1, or independent of the same interactions at T2. In simpler terms, T1 risk factors are associated with T2 outcomes because they have an effect on T1 outcomes that are stable over time. This is consistent with the findings in the SEM analyses testing for mediational effects.

However, on a more optimistic note, in the longitudinal tests for moderation, the T2 interactions were both significant. Moreover, in the SEM analyses, at T1 parental monitoring rules had no direct effect on individual substance use, whereas at T2 a direct effect was observed. Thus, considered together, these results provide an optimistic view for intervening even as late as at 14–15 years old. Specifically, it suggests that parental monitoring rules, and controlling where youth spend time with their friends, may continue to provide protective effects even late in the developmental process.

Study outcomes support the important role of peer activity contexts, and suggests that future research must consider this variable in addition to the behavioral characteristics of the individual and his or her friends. It should be noted that, in addition to low levels of parental monitoring rules being associated with high levels of substance co-use, it was also found that low levels of parental monitoring rules were associated with spending time in the street/park context. This is consistent with past research showing that unsupervised youth wandering, and changes in youth wandering, are associated with delinquent peer affiliation and individual delinquent behavior (Stoolmiller, 1994). Thus, in helping to structure the boundaries of youth behavior, parents should specifically focus on the *who*, *the what*, and the *where* of peer relations. This type of specificity in parental monitoring rules and monitoring may help facilitate positive effects in protecting youth from substance use initiation and escalation.

Three significant gender differences were found in these analyses. The first difference showed a stronger correlation between T2 individual use and T2 co-use for boys ($r = .72$) than girls ($r = .52$). Although this difference was statistically significant, these correlations are both moderately strong and in the same direction, suggesting that the same general process applies to both boys and girls. Nonetheless, it may suggest that, when using substances, the presence of peers may be more important for boys than girls. A second difference between boys and girls was revealed by a significant interaction between gender and T1 co-use, when predicting T1 individual use, indicating a positive association between

co-use and individual use for boys, but not for girls. Note that this difference is similar to the difference in correlations, but found at T1 rather than T2, and using the reduced sample. Thus, this finding also suggests that when using substances, the presence of peers may be more important for boys than for girls. However, when considering analyses on the T2 data, this interaction was no longer present. Finally, a second interaction in the T1 analyses indicated that parental rules decreased individual substance use only for girls, but not for boys. However, this interaction was no longer present in the T2 analyses. Thus, girls may be more sensitive to parenting strategies than boys, at least at a younger age. It should be noted however, that the analyses regarding gender were primarily exploratory, and these conclusions should be considered with caution.

Three limitations of this study should be noted. The first limitation involves the heavy reliance on youth self-report. Although we also included parent reports for the parental monitoring rules measure, the substance use measures and the peer context measure were all based on self-reports. This may artificially inflate estimates because of mono-method bias. However, we believe that, given the specificity and complexity of the hypotheses and the close match between the hypotheses and the observed results, it is unlikely that a mono-method bias could account for these findings.

Second, although this study makes an innovative contribution by considering the context in which peers spend time together, we did not measure the amount of time spent with each peer in each context. Thus, it is possible that an individual spends most of his/her time with a specific friend in the street/park context, even though they may only see that friend once a week and may have very little time with that friend. Although this scenario may be unlikely (because we asked about best their best friends) this would be a simple limitation to address in future research.

Related to the second limitation is that, to be included in the analyses regarding peer context, participants needed to spend most of their time with both peers in the same context. Thus, multiple contexts for each peer could not be considered, and individuals who spent time in different contexts with different peers were not considered. Considering the present findings, future research should attempt to address these added levels of complexity.

Third, one could argue that, because the substance co-use measure includes both the friends' and the individual's substance use, the measure of individual use is at least partially embedded within the co-use measure. However, as was demonstrated by the correlations between co-use and individual substance use, even when including all five peers in the co-use score, the co-use and individual use scores had less than 50% of their variance in common. Thus, although correlated, these measures are not highly collinear, nor are they statistically confounded due to measurement. Moreover, the present data have clearly shown that the inclusion of the co-use measure provides important new information that is associated with, but not captured by, the individual substance use measure.

Future research should focus on combining the constructs of co-use and peer activity context. Our study examined these variables separately, without knowing in which context the co-use was occurring. For example, co-use at someone's home may carry different risks than co-use in the park. Similarly, co-use in a dyadic context may carry different risks than co-use within group contexts. This added level of complexity will be a challenge to assess because extending the assessment of friendships outside of schools and other organized activities will be essential. Nonetheless, this and past research provide clear justification for extending peer relations assessment to include these variables.

In conclusion, the findings presented in this article provide insight into the integration of friends' influence, peer activity contexts, and parental monitoring rules in predicting

individual substance use. The results underscore the importance of parental involvement in the *who*, the *what*, and the *where* of youth peer activities. It should further be emphasized that, although many of the effects were found to be temporally proximal during T1, there was also clear evidence that even in the second year of the study parental monitoring rules showed direct and moderating effects on individual substance use. Thus, even as late as 14–15 years old, adolescents' risk for substance use can be moderated by parental rules that facilitate monitoring. This finding provides an optimistic view for parents of adolescents who may already be demonstrating high- risk behaviors.

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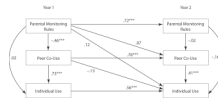


Figure 1. Structural equation model testing whether substance co-use with friends mediates the effects of parental monitoring rules on individual substance use.

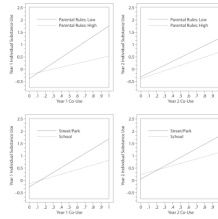


Figure 2.
Simple slopes of individual substance use regressed on substance co-use with friends, at different levels of parental monitoring rules and peer activity context, and separately for Year 1 and Year 2.

Table 1

Correlations Used in the Structural Equation Model Testing for Mediation ($n = 285$)

	Rules T1	Rules T2	Co-Use T1	Co-Use T2	Use T1	Use T2
Rules T1	1					
Rules T2	0.66***	1				
Co-use T1	-0.38***	-0.35***	1			
Co-use T2	-0.26***	-0.26***	0.69***	1		
Use T1	-0.28***	-0.28***	0.66***	0.54***	1	
Use T2	-0.21**	-0.29***	0.54***	0.62***	0.69***	1

** $p < .001$,

*** $p < .0001$.

Table 2Summary of Structural Equation Models Testing for Mediation ($n = 285$)

Model	$\chi^2(df)$	RMSEA	CFI	GFI	$\Delta\chi^2(df)$
Stability only	250.19*** (12)	0.26	0.72	0.77	–
Direct effects of parents	186.81*** (9)	0.26	0.75	0.82	63.38(3)***
Direct effects of parents and peers	46.44*** (6)	0.15	0.95	0.95	140.37(3)***
Full model	2.49 (3)	0.00	1.00	1.00	43.95(3)***

Note. $\Delta\chi^2$ is relative to the previous model.

 $p < .0001$

Table 3

Regression Model Predicting T1 Individual Substance Use, Considering T1 Parental Control and Peer Context as Moderators of Substance Co-Use with Peers ($n = 189$)

Predictor	β	t
Gender	0.14	2.74**
Country	0.17	2.87**
T1 Parental Rules	-0.02	-0.36
T1 Co-Use	0.49	6.94***
T1 Peer Context	-0.01	-0.20
T1 Parental Rules \times T1 Peer Context	-0.10	-1.50
T1 Parental Rules \times T1 Co-Use	-0.25	-3.59**
T1 Peer Context \times T1 Co-Use	-0.15	-2.85**

*
 $p < .05$,

**
 $p < .01$,

 $p < .0001$

Table 4

Regression Model Predicting T2 Individual Substance Use, Considering T2 Parental Control and Peer Context as Moderators of Substance Co-Use with Peers ($n = 215$)

Predictor	β	t
Gender	0.02	0.45
Country	0.11	2.00*
T2 Parental Rules	-0.12	-2.24*
T2 Co-Use	0.57	9.95***
T2 Peer Context	-0.01	-0.27
T2 Parental Rules \times T2 Peer Context	-0.05	-0.91
T2 Parental Rules \times T2 Co-Use	-0.12	-2.04*
T2 Peer Context \times T2 Co-Use	-0.17	-3.27**

*
 $p < .05$,

**
 $p < .01$,

 $p < .0001$

Table 5

Longitudinal Regression Model Predicting T2 Individual Substance Use, Considering T1 and T2 Parental Control and Peer Context as Moderators of Substance Co-Use with Peers ($n = 150$)

Predictor	β	t
Gender	-0.05	-1.09
Country	0.01	0.15
T1 Teacher Report Antisocial	0.14	2.96**
T1 Substance Use	0.59	9.45***
T1 Parental Monitoring Rules	-0.05	-0.72
T1 Peer Context	-0.08	-1.53
T1 Co-Use	-0.15	-2.02*
T2 Parental Monitoring Rules	-0.10	-1.63
T2 Peer Context	0.04	0.77
T2 Co-Use	0.32	5.22***
T1 Co-Use \times T1 Parental Monitoring Rules	-0.06	-1.03
T1 Co-Use \times T1 Peer Context	0.01	0.24
T2 Co-Use \times T2 Parental Monitoring Rules	-0.11	-2.21*
T2 Co-Use \times T2 Peer Context	-0.10	-2.00*

* $p < .05$,

** $p < .01$,

*** $p < .0001$