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Dyadic and Group-Level Positive Friendship Characteristics and Susceptibility to Perceived Delinquent Peer Substance Use

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Abstract

Peer relations researchers have suggested that dyadic and peer group relationship characteristics may interact with each other to affect behavior. Building on prior work that has pitted the relative effects of dyadic and peer group relationship characteristics on susceptibility to peer influence, the present study sought to integrate dyadic and group characteristics into a moderational model by testing whether friendship quality and peer group identification together exacerbate risk for conforming to peer norms for substance use. This longitudinal study included 387 early adolescents assessed annually for 4 years. Participants completed measures of perceived peer delinquency, friendship quality, peer group identification, and substance use frequency. Results indicated that perceived peer delinquency had the strongest association with substance use for adolescents characterized by high friendship quality and high peer group identification. These findings highlight the importance of considering the joint effects of multiple peer relationship characteristics on susceptibility to peer influence.

Keywords

perceived peer delinquency; friendship quality; peer group identification; substance use

Introduction

Adolescence is a developmental period marked by an increased risk for the initiation and escalation of substance use (Colder, Campbell, Ruel, Richardson, & Flay, 2002; Miech et al., 2017). Substance use during this period is of concern because it is associated with a variety of short- and long-term negative consequences (Balsa, Giuliano, & French, 2011; Ellickson, Tucker, & Klein, 2001; Hill, White, Chung, Hawkins, & Catalano, 2000; Kendler, Myers, Damaj, & Chen, 2013; Marmorstein, 2009). Adolescent substance use predominantly occurs in the context of peers (Brechwald & Prinstein, 2011), and helping youth effectively navigate social contexts that include drugs and alcohol depends on understanding risk and protective factors that affect vulnerability to peer influence. Hence, understanding peer processes that might contribute to substance use is of great importance. Adolescent

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friendships are embedded in larger peer groups, and peer relations researchers have posited that peer influences on behavior are likely a function of the joint influence of dyadic and peer group relationship characteristics (Gifford-Smith & Brownell, 2003; Rubin, Bukowski, & Bowker, 2015). To better understand the joint effects of dyadic and peer group relationship characteristics on adolescent substance use, the present study examined the moderating roles of peer friendship quality and peer group identification on the relationship between perceived peer delinquency and substance use using a longitudinal design that spanned early to middle adolescence. No studies, to our knowledge, have examined the interaction effects of dyadic and peer group relationship characteristics on substance use in adolescents. Accordingly, the present study addresses a novel and innovative set of questions that might inform our understanding of peer influences on adolescent substance use.

Perceived Peer Delinquency

Considering the importance of peers during adolescence, developmental theories of adolescent risk taking have long identified the critical role peers play in shaping an adolescent's substance use (Catalano & Hawkins, 1996; Dishion, Spracklen, Andrews, & Patterson, 1996). Adolescent substance use commonly occurs as part of a constellation of delinquent behavior (Donovan & Jessor, 1985), and delinquent peers are thought to exacerbate risk for substance use because they model, reinforce, and provide access to drugs and alcohol (Haller, Handley, Chassin, & Bountress, 2010). Adolescents are motivated to conform to the behaviors and attitudes of their peers to strengthen close interpersonal relationships and to be accepted by their peer group (Collins & Steinberg, 2006; Meisel & Colder, 2015). When peers are perceived to be engaging in delinquent behavior, including substance use, youth may be motivated to conform with these behaviors. Indeed, many researchers have argued that perception of peers' delinquent behaviors play an important role in the initiation and escalation of adolescent substance use (Perkins, 2002; Salvy, Pedersen, Miles, Tucker, & D'Amico, 2014), and this idea has garnered considerable support in the literature (e.g., Henry, Kobus, & Schoeny, 2011; Scalco, Meisel, & Colder, 2016).

Friendship Quality

In nondelinquent peer groups, adolescents are more likely to adopt the prosocial behaviors of their peers when they report having higher quality friendships within their peer groups (Barry & Wentzel, 2006; Berndt, 2002). Conformity in the context of high quality friendships is thought to reflect an adolescent's motivation to adopt the desirable behaviors of their peers and to maintain their close friendships (Hartup, 1996). Similarly, delinquent adolescents have also been posited to be more likely to conform to delinquent behaviors of their friends in the context of high quality relationships (Giordano, Cernkovich, & Pugh, 1986; Kandel, 1978), and this has been supported by several studies (Agnew, 1991; Berndt, Hawkins, & Jia, 1999; Piehler & Dishion, 2007). With respect to substance use, Urberg and colleagues (2003) found that adolescents adopted the substance use behaviors of their closest friend only when this relationship was characterized as a high quality friendship. Taken together, these studies suggest that adolescents may be more likely to conform to the perceived delinquent behaviors of their peers when they have high quality friendships with their peers.

Peer Group Identification

In addition to friendship quality, the extent to which an adolescent identifies with their peer group has also been suggested to influence conformity to peer behavior. Social Identity Theory posits that the more an individual identifies with their peer group, the more likely they are to conform to the behaviors of their peers to maintain positive social comparisons and in-group preference (Tajfel & Turner, 1986). Consistent with this theory, Kiesner, Cadinu, Poulin, and Bucci (2002) found group problem behaviors had the strongest association with an adolescent's own delinquent behaviors when adolescents strongly identified with their peer group. Taken together, theoretical and empirical work support the utility of considering peer group identification when studying the relationship between perceived peer delinquent behavior and an adolescent's own behavior.

Interactive Effects of Friendship Quality and Peer Group Identification

Studies on peer influences in adolescence have demonstrated that multiple aspects of peer relationships (e.g., close friendships, peer groups) are associated with adolescent risk behaviors, such as substance use (Brechwald & Prinstein, 2011). To date, studies examining conformity to peer behavior have assessed either dyadic or group-level relationship characteristics or have pitted the relative effects of dyadic and group characteristics on adolescent substance use against one another (Urberg, 1992; Urberg, Deirmencio lu, & Pilgrim, 1997). However, peer relations researchers have argued that research on peer influences should consider the interactive effects of dyadic and peer group relationships characteristics (Brechwald & Prinstein, 2011; Rubin et al., 2015). Dyadic relationships are often embedded in larger peer groups, and the characteristics of these different types of relationships may jointly affect behavior (Gifford-Smith & Brownell, 2003). Indeed, prior research has assessed the interactive effects of friendship quality and friendship quantity on adolescent depression (Nangle, Erdley, Newman, Mason, & Carpenter, 2003), of best friendship and peer acceptance on loneliness (Parker & Asher, 1993), and of best friendship and peer acceptance on academic outcomes (Ladd, Kochenderfer, & Coleman, 1997).

The joint interactive effects of dyadic and peer group relationship characteristics have also been suggested to affect peer influences on adolescent delinquent behaviors. In their review of peer relationships, Gifford-Smith and Brownell (2003) suggested that peer influence may spread more quickly and have a stronger impact on behavior when adolescents have close ties with individual members of their peer group *and* are strongly connected to their peer group as a whole. Drawing from Social Identity Theory, adolescents with high quality friendships and high peer group identification are expected to focus on what differentiates their peer group from other peer groups because these adolescents not only feel a strong connection to their peer group as a whole but also strongly value their friendships with the individual members of their group (Tajfel & Turner, 1986). A focus on what differentiates an adolescent's in-group from their out-group is thought to enhance an adolescent's motivation to adopt the behaviors of their peers as a means of maintaining friendships and group acceptance.

Current Study

The present study examined whether the relationship between perceived peer delinquency and adolescent substance use varied as a function of friendship quality and peer group identification (a three-way interaction). We forward the following hypotheses:

Hypotheses 1: Perceived peer delinquency would be positively associated with substance use.

Hypotheses 2: The relationship between perceived peer delinquency and an adolescent's substance use would be strongest for adolescents with both high friendship quality and high peer group identification.

These hypotheses are informed by the large body of work demonstrating the important role of perceived peer delinquency on adolescent substance use and social identity theory, which suggests that adolescents with high quality friendships *and* high levels of peer group identification may be more motivated to adopt the behaviors of their peers as a means of maintaining their close friendships and group acceptance. In testing the hypothesized three-way interaction, we included externalizing symptoms as a statistical control variable because perceptions of peer delinquent behavior are associated with an adolescent's own externalizing behaviors (e.g., aggressive behaviors, rule-breaking; Henry et al., 2011; Prinstein & Wang, 2005), and because externalizing behavior is robustly associated with both membership in delinquent peer groups (Dishion, Andrews, & Crosby, 1995) and adolescent substance use (Chassin, Colder, Hussong, & Sher, 2016). Finally, the literature on the gender differences in peer influence processes has been mixed. A number of studies have found support for gender moderation (Brooks-Russell, Simons-Morton, Haynie, Farhat, & Wang, 2014; Elek, Miller-Day, & Hecht, 2006; Fagan, Van Horn, Hawkins, & Arthur, 2007; Piquero, Gover, MacDonald, & Piquero, 2005) with some finding stronger effects for males (Brooks-Russell et al., 2014; Elek, Miller-Day, & Hecht, 2006; Fagan et al., 2007; Piquero et al., 2005) and others finding stronger effects for females (Callas, Flynn, & Worden, 2004; Yeh, Chiang, & Huang, 2006). Further, a number of studies have failed to find support for moderation by gender (Cotter & Smokowski, 2016; Epstein, Griffin, & Botvin, 2008; Pedersen et al., 2013). Considering these mixed findings, we explored gender as a potential moderator but do not offer specific hypotheses.

Method

Participants

Participants were drawn from a longitudinal study examining risk and protective factors associated with the initiation and escalation of early adolescent substance use. The sample included 387 families (one caregiver and one child) from Erie County in western New York and was recruited from 2007 to 2009 using random-digit dialing (RDD) procedures. RDD helps provide a representative sample through using both listed and unlisted telephone numbers. The county from which the sample was recruited is especially well suited for RDD because 98.5% of households have a landline. The sample was evenly split on gender ($N=213$ females, 55%) and included non-Hispanic Caucasian (83.1%), African American (9.1%), Hispanic (2.1%), and Asian (1.0), as well as youth of mixed ethnicity (4.7%).

Median family income was US\$70,000 and ranged from US\$1,500 to US\$500,000, and 6.2% of the families received public income assistance. The demographic characteristics of our community sample are similar to those in Erie County from whence the sample came (for more complete details, see Trucco, Colder, Wieczorek, Lengua, & Hawk, 2014).

Data were collected annually, and the present study uses data from Waves 1 through 4 (spanning 2007 to 2012) because these assessments included the peer variables of interest and allowed us to test prospective associations. The sample at W1 ($\bar{X}$ age = 11.6, SD = 0.58), W2 ($\bar{X}$ age = 12.6, SD = 0.58), W3 ($\bar{X}$ = 13.6, SD = 0.59), and W4 ($\bar{X}$ age = 15.08, SD = 0.59) included 387, 373, 370, and 363 adolescents, respectively.

Overall attrition across W1 through W4 was small (6.2%). Chi-square and analysis of variance tests were conducted to assess potential differential attrition. No significant differences ($ps > .05$) between targets who completed all interviews and those with missing data were found for race, gender, age, perceived peer delinquency, peer group identification, friendship quality, substance use, parental education, parental marital status, or family income. The low attrition rate and lack of differences suggest that missing data did not have a substantial impact on the findings of the present study.

Procedures

For W1 to W3, adolescents and their parents were interviewed in university research offices. Informed consent (parents) and assent (adolescents) procedures were completed before the interviews began. Interviews took approximately 2.5 to 3 hours for each assessment. Families were compensated US\$75, US\$85 and US\$125 dollars for W1 to W3, respectively, and adolescents were given a small prize valued at US\$5 to US\$15 at each wave.

W4 consisted of a brief telephone-based audio-computer-assisted self-interviewing (CASI) survey of substance use that took 10 to 15 minutes to complete. Parents provided consent over the phone and were given a phone number and PIN for their adolescent to use. Assent from the adolescent was obtained at the initiation of the audio-CASI survey. Adolescents were compensated US\$15 for their participation at W4.

Measures

Substance use (W1-W4)—The National Youth Survey (Elliot & Huizinga, 1983) was used to assess past year substance use at W1 to W4. Adolescents used a fill-in-the-blank response format to report the number of times in the past year they used alcohol, without their parents' permission, smoked cigarettes, and used marijuana. Past year frequency of alcohol, cigarette, and marijuana use were summed to form a past year substance use frequency variable at each wave. Several studies support the validity of self-reports of adolescent substance use (Del Boca & Darkes, 2003; Smith, McCarthy, & Goldman, 1995).

As would be expected given the age of our sample, rates of substance use were low and suggestive of the early stages of initiation and experimentation. Rates of past year substance use were 2.84%, 13.14%, 25.75%, and 32.07% at W1 through W4, respectively.

Friendship quality (W1-W3)—A revised version of the Network of Relationships Inventory (NRI) was used to assess friendship quality (Furman & Buhrmester, 1985). Adolescents rated friendship qualities for each of their three close friends on a five-point response scale. The revised version of the NRI includes five items assessing how much time an adolescent spends with their friend (1 = *none* to 5 = *almost all*), how much they share secrets and private feelings with their friend (1 = *never* to 5 = *very often*), how much their friend really cares about them (1 = *not at all* to 5 = *very much*), how much their friend likes or approves of the things they do (1 = *not at all* to 5 = *very much*), and their confidence that their relationship with their friend will last (1 = *not at all* to 5 = *extremely sure*). Ratings for an adolescent's three close friends were averaged to form a composite of friendship quality. The NRI demonstrated strong internal consistency at W1 ($\alpha = .90$), W2 ($\alpha = .91$), and W3 ($\alpha = .92$).

Peer group identification (W1-W3)—Peer group identification was assessed using the group identification measure developed by Kiesner et al. (2002). Adolescents were asked to think of a group of friends they spend the most time with and were asked to respond to eight questions regarding their level of identification with that group. The measure contains five items assessing positive reinforcement from group identification (e.g., "Is it important for you to belong to this group?" "Are you proud to be part of this group?" "Do you feel connected to the other members of this group?") and three items assessing negative reinforcement from group identification (e.g., "If you were not part of this group would you feel lonely?" "Would you feel insecure if you were not a member of this group?"). Adolescents rated these items on a six-point response scale (1 = *no, not at all* to 5 = *yes, very much*). A group was operationalized as three or more people an adolescent spends time with (Kiesner et al., 2002). A prompt was given at W1 for respondents to think of the three friends they listed on the NRI for the peer group identification measure. Adolescents did not receive this prompt at W2 or W3. Consistent with prior work (Kiesner et al., 2002), the positive and negative reinforcement (reversed coded) items were all averaged to create a composite score of peer group identification. The internal consistency of the group identification measure was .79, .80, and .82 at W1, W2, and W3, respectively.

Because participants were prompted to consider his or her three closest friends at W1, but not at W2 and W3, we assessed for measurement invariance of our peer group identification measure across time to determine the impact of this modification on the measurement of this construct. We estimated higher-order factor models for peer group identification at W1, W2, and W3, such that at each time point, the five positive reinforcement items were specified to load onto a positive peer group identification factor, and the three negative reinforcement items were specified to load onto a negative peer group identification factor, and these latent factors were specified to load onto a higher-order peer group identification factor. Mplus 8.0 (Muthen & Muthen, 1998–2017) was used for this analysis. Factor loadings were constrained to be equal across time. This constraint resulted in a significant decrement in fit, $\chi^2(14) = 28.33, p = .01$, but this was due to one constraint. Partial metric invariance was supported after freeing the loading of the item "Are you happy to be a member of this group" at W2, $\chi^2(13) = 18.50, p = .13$. Next, we constrained the covariance between the higher-order peer group identification factors at W1 and W2 to be equal to the covariance

between W2 and W3 to assess whether the association of our measure changed as a function of the modification in instructions. Nested model tests supported constraining these covariances to be the same across time suggesting the change in instructions did not affect the across-time associations, $\chi^2(1) = 1.65, p = .19$. In sum, factor analysis suggests that although there was a slight modification in instructions, this had little impact on the construct validity of our measure.

Perceived peer delinquency (W1-W3)—Perceived peer delinquency was assessed with 15 items from Fergusson, Woodward, and Horwood (1999). Adolescents were asked whether their three close friends from the NRI had ever engaged in behaviors such as purposely damaged property that did not belong to them, been in trouble with the police, used alcohol without their parents' permission, smoked cigarettes, and skipped school. Items were dichotomous (0 = *no*, 1 = *yes*) and were summed to create a composite score of perceived peer delinquency. Prior work using this measure has demonstrated good reliability and validity (Fergusson & Horwood, 1996; Fergusson, Swain-Campbell, & Horwood, 2002). Internal consistencies ranged from .80 to .87 across waves.

Externalizing symptoms (W1-W3)—Externalizing symptoms were measured using the Youth Self Report (YSR) form of the Achenbach System of Empirical Behavioral Assessment (Achenbach & Rescorla, 2001). Responses ranged from 0 (*not true*) to 2 (*very true or often true*), and the Rule Breaking Behavior and Aggressive Behavior subscales were averaged to form the externalizing symptom variable. The YSR has been widely used to assess externalizing symptoms and has demonstrated strong reliability and validity (Achenbach & Rescorla, 2001). Internal consistency of this measure ranged from .87 to .89 across waves.

Data Analytic Strategy

Hierarchical linear models (hierarchical linear model[ing] [HLM]) estimated with maximum likelihood (ML) in Proc Mixed in SAS 9.4 (SAS Institute, 2011) were used to test our hypotheses. HLM is appropriate in our case because repeated measures were nested within individuals (a two-level HLM). An advantage of using this approach was that it allowed us to include cases that had some missing data. Prior frequency of substance use, perceived peer delinquency, friendship quality, peer group identification, and external-izing symptoms were all included as Level 1 covariates (or time-varying covariates). Gender and age were included in all models as Level 2 covariates (or time-invariant covariates). The data were arranged to test prospective associations between the peer variables and substance use, controlling for prior frequency of substance use (e.g., W1 variables predicting W2 substance use, W2 variables predicting W3 substance use, and W3 variables predicting W4 substance use). This allowed us to test prospective associations between perceived peer delinquency and substance controlling for prior frequency of substance use. The model included a random intercept.

Of interest in the present study was the three-way interaction between perceived peer delinquency, friendship quality, and peer group identification. Nested model tests were conducted to determine whether the inclusion of the hypothesized block of interactions led

to a significant improvement model fit (Raudenbush, 2004). This involved comparing a model with and without interaction terms using a likelihood ratio test. To aid in the interpretation of the interaction effects and to reduce nonessential collinearity, all predictor variables and moderators were standardized at the sample level (Aiken & West, 1991; Hox, 2002). Finally, we present standardized regression coefficients to help characterize small ($\beta \leq .20$), medium ($.30 < \beta < .40$), and large sized effects ($\beta \geq .50$) based on recommendations by Gelman and Hill (2006).

Results

Table 1 presents zero-order correlations, means, standard deviations, skewness and kurtosis coefficients for the outcome, predictor, moderator, and statistical control variables. Given the non-normal distributions of many of the variables in our models, Spearman correlation coefficients are presented in Table 1. Substance use was positively related with perceived peer delinquency and externalizing symptoms. Friendship quality and peer group identification were modestly positively correlated. Age was positively correlated with substance use and perceived peer delinquency.

HLM Regressions

Substance use was non-normally distributed (skew = 5.16 and kurtosis = 29.17); therefore, substance use was transformed using the reciprocal transformation. The transformed variables had skew = 1.46 and kurtosis = 0.39. Analysis of residuals in our final model suggested that this power transformation did a reasonable job of meeting the assumptions of ML estimation (e.g., distribution of residuals had skew of 0.77 and kurtosis of 1.87). We note that analysis of untransformed dependent variables yielded the same pattern of results; however, given the normality assumption of ML, we present the results with transformed variables.

A first-order effects model was run to assess the relationship between gender, age, prior substance use, externalizing symptoms, perceived peer delinquency, peer group identification, and friendship quality on subsequent substance use frequency. As seen in Table 2, age, prior substance use, externalizing symptoms, perceived peer delinquency, and friendship quality were all positively prospectively associated with substance use. Nested model tests supported the inclusion of the block of two-way interactions, $\chi^2(3) = 8.10, p = .04$, and the hypothesized three-way interaction, $\chi^2(1) = 4.50, p = .03$. The regression coefficients for the model are presented in Table 2. To facilitate the interpretation of this three-way interaction, simple slopes of friendship quality by peer group identification were plotted at high and low levels of perceived peer delinquency (see Figure 1). The simple slopes of perceived peer delinquency were plotted at the 50th, 70th, and 90th percentiles of friendship quality and peer group identification.

As seen in Figure 1, consistent with a moderate effect size, perceived peer delinquency was most strongly related to substance use for adolescents with high levels of friendship quality and peer group identification ($\beta = .35, p < .0001$). Medium effect sizes were found for the relationship between perceived peer delinquency and substance use at low levels of friendship quality and high levels of peer group identification ($\beta = .33, p < .0001$), low

levels of friendship quality and low levels of peer group identification ($\beta = .30, p < .0001$), and high levels of friendship quality and low levels of peer group identification ($\beta = .22, p < .0001$). These findings supported the hypothesis that perceived peer delinquency would have the strongest relationship with substance use for adolescents who have closer relationships with their delinquent peers and place a greater value in being a member of their delinquent peer group.¹

Gender Moderation

Gender interactions were examined to assess whether our proposed three-way interaction (Perceived peer delinquency $\times$ Friendship quality $\times$ Peer group identification) and lower-order interaction terms varied for males and females. Nested model tests did not support the inclusion of two-way, $\chi^2(3) = 1.8, p = .61$, three-way, $\chi^2(6) = 10.3, p = .11$, or four-way interactions, $\chi^2(7) = 10.6, p = .15$, with gender, suggesting no support for differences in our results across males and females.

Discussion

Studies examining features of social relationships among deviant youth have either focused on the quality of dyadic friendships in the deviant peer group or the importance of being a member of the group. Although dyadic and peer group relationship characteristics have been suggested to operate together synergistically to strengthen peer influence (Gifford-Smith & Brownell, 2003), no studies to date have tested this idea. The present study expanded on prior work by examining how both friendship quality and group identification, together, affect adolescent substance use through a moderational model.

Consistent with our hypotheses, perceived peer delinquency was found to have the strongest association with substance use for adolescents with high friendship quality *and* high peer group identification. This finding adds to the small literature documenting the interactive effects of dyadic and peer group relationship characteristics on behavior (Ladd et al., 1997; Nangle et al., 2003; Parker & Asher, 1993). Although the hypothesized three-way interaction effect appears small given the relatively modest differences in the simple slopes (see Figure 1, Panel A), the difference in strength of association resulted in one more occasion of substance use per year among those with high friendship quality/high peer group identification *compared* with those with high friendship quality/low peer group identification (Figure 1, Panel B). Such an increase is of concern because frequent substance use during early adolescence has been prospectively associated with school difficulties, employment issues, crime and violence, and substance use disorders (Ellickson, Tucker, & Klein, 2003; Lewinsohn, Rhode, & Brown, 1999).

That peer delinquency is associated with risk for substance use is consistent with a large literature, suggesting that delinquent peers provide support for and access to drugs (Dishion

¹Indicators of past year quantity of alcohol and cigarette use were also collected in the annual assessments. We reanalyzed our hierarchical linear models using a substance use outcome representing the total number of substances consumed in the past year (quantity $\times$ frequency of alcohol use + quantity $\times$ frequency of cigarette use). Results were similar to the models where substance use frequency of alcohol, cigarette, and marijuana use were the outcome. Perceived peer delinquency had the strongest association with substance use at high levels of friendship quality and high levels of peer group identification ($\beta = .41, p < .0001$).

et al., 1996). More novel is that findings from the present study are the first, to our knowledge, to provide support for the argument that individuals with close ties to individual members of their peer groups and who are strongly connected to their peer group as a whole are particularly susceptible to conforming to peer norms regarding delinquent behavior (Gifford-Smith & Brownell, 2003). Theoretical accounts of conformity to peer delinquency have largely focused on either dyadic or group-level relationship characteristics (Brown, 2004). For example, Differential Association Theory (Agnew, 1991), which focuses on dyadic-level characteristics, posits that adolescents are more likely to conform to the delinquent behaviors of their friends if those friendships are of a high quality. Social Identification Theory, a group-level theory of conformity to peer delinquency, argues that strong identification with a delinquent peer group increases conformity to peer-delinquent behaviors because individuals strive to gain acceptance from their in-group and differentiate themselves from out-groups (Tajfel & Turner, 1986; Terry & Hogg, 1996). Our findings suggest that integrating both dyadic (friendship quality) and group-level (peer group identification) characteristics provides a richer account of peer social processes through which peers influence delinquent behaviors such as substance use than either alone.

Tenets of Social Identification Theory (Tajfel & Turner, 1986) and Social Learning Theory (Akers, Krohn, Lanza-Kaduce, & Radosevich, 1979) may provide some insight into why adolescents who perceive their peers to engage in delinquent behavior are at the greatest risk for substance use when they have high quality friendships with the individual members of their peer group and strong identification with their peer group as a whole. Having close friendships with the individual members of a peer group are thought to enhance an adolescent's tendency to focus on the behaviors that differentiate their peer group from others (Tajfel & Turner, 1986). For adolescents who perceive their peers to engage in delinquent behaviors, substance use may be viewed as a behavior that differentiates their close friends and peer groups from other individuals and peer groups (Dishion et al., 1996). This idea is consistent with deviancy training, a process whereby delinquent peer groups provide strong positive reinforcement to conversations about and engagement in substance use behaviors (Dishion et al., 1996). Adolescents with high quality friendships and strong group identification may conform to perceived peer behavior such as substance use because it enhances close friendships through social reinforcement and enhances group identification by delineating the peer group from others.

We found no evidence for gender differences, suggesting that peer dynamics operate similarly for males and females. The literature on gender differences in peer influences on substance use is notably mixed (e.g., Brooks-Russell et al., 2014; Pedersen et al., 2013), and it is hard to draw firm conclusions from our study about gender differences in part because our sample size likely did not provide enough power to detect a four-way interaction. It will be important for future research to systematically evaluate potential gender differences in the peer dynamics of social influence on substance use with sufficiently large samples to help clarify mixed findings in the literature.

The present study should be evaluated within the context of certain limitations. Whereas participants received a prompt at W1 to think about their three close friends from the NRI when completing our measure of peer group identification, they did not receive this prompt

at W2 or W3. Although factor analysis suggested that this modification in instructions did not have a large impact on our measure, it is possible that the peer group an adolescent was thinking of when reporting on their peer group identification at later waves did not include their three close friends listed on the NRI. Prior work examining the relationship between close friendships and peer group affiliation in adolescence found best friends were a member of an adolescent's peer group 69% of the time, and one of an adolescent's three closest friends was a member of their peer group 82% of the time (La Greca, Prinstein, & Fetter, 2001). This suggests potential for considerable overlap in the peers an adolescent was reporting on for the NRI and the peer group identification measure.

We also note that peer groups have been assessed and defined in multiple ways such as friendship networks, friendship groups, and interaction-based groups or cliques (Bagwell, Coie, Terry, & Lochman, 2000; Cairns, Cairns, Neckerman, Gest, & Garipey, 1988; Gest, Farmer, Cairns, & Xie, 2003). We assessed friendship groups, and future work might examine our moderational model with a different operationalization of a peer group (e.g., friendship networks). Further, our measure of friendship quality assessed the adolescent's perception of relationships with three friends. Adolescent friendship groups vary in size (George & Hartmann, 1996), and size may influence quality of friendships, peer group identification, and the moderating role of these variables. Considering size of friendship groups would be an important direction for future research.

Our sample consisted of early adolescents, our findings are most generalizable to early stages of substance use (experimentation and initiation), and it is not clear whether our findings would generalize to later developmental periods or more advanced stages of substance use (e.g., heavy use). Finally, we did not include measures of quantity in our study. Considering the low rates of marijuana use in early adolescence, quantity of marijuana use was not assessed. Furthermore, it is difficult to assess quantity of marijuana use given the lack of standardization of potency and method of using. This precluded having a substance use outcome that represented the sum of the quantity by frequency of alcohol, cigarette, and marijuana use.

Despite these limitations, the present study builds on the small, yet growing, literature examining how positive relationship characteristics affect adolescent conformity to the substance use behaviors of their delinquent peers. The moderating roles of friendship quality and peer group identification suggest that adolescents with high quality friendships and strong ties to their peer groups are most susceptible to engaging in the substance use behaviors of their peers. These findings suggest that integrating theories of peer influence to account for the simultaneous influences of both dyadic and group-level relationship characteristics may help advance our understanding of peer social processes through which peers influence delinquent behaviors. Future work examining how the reinforcing effects of peers may differ among adolescents with either close dyadic or peer group relationships versus those with both close dyadic and peer group relationships may provide insight into the mechanism of peer influence.

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Biographies

Samuel N. Meisel is a doctoral student at the University at Buffalo, and his research is interested in understanding how multiple ecologies contribute to the initiation and escalation of adolescent substance use. He is particularly interested in how interpersonal processes contribute to substance use behaviors in adolescence.

Craig R. Colder is a professor at the University at Buffalo. His research interests are in identifying multiple levels of influence that contribute to the development of adolescent substance use, including individual differences (e.g., temperament and personality), family influences, and community factors.

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Figure 1.

Simple slopes for perceived peer delinquency at high and low levels of PGI and friendship quality (Quality).

Note. Panel A depicts simple slopes for transformed substance use frequency, and Panel B depicts simple slopes for nontransformed past year substance use frequency. PGI = peer group identification.

Table 1

Bivariate Spearman Correlations Among Predictor Variables and Their Means, Standard Deviations, Skew, and Kurtosis.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1. W1 SU	—																	
2. W2 SU	.42	—																
3. W3 SU	.27	.55	—															
4. W4 SU	.30	.50	.66	—														
5. W1 PPD	.27	.25	.25	.16	—													
6. W2 PPD	.17	.44	.47	.40	.45	—												
7. W3 PPD	.24	.36	.59	.53	.39	.58	—											
8. W1 FQ	.10	.13	.08	.09	-.01	-.01	.05	—										
9. W2 FQ	.06	.17	.07	.13	-.07	-.03	.03	.60	—									
10. W3 FQ	.02	.11	.11	.12	-.05	-.03	.03	.54	.71	—								
11. W1 PGI	.06	-.02	-.06	-.06	-.01	-.06	-.01	.29	.13	.12	—							
12. W2 PGI	.07	-.03	.04	.00	-.07	-.13	-.10	.20	.25	.42	.42	—						
13. W3 PGI	.04	-.07	-.04	-.06	.02	-.06	-.03	.23	.20	.32	.43	.51	—					
14. W1 Ext	.23	.19	.18	.19	.41	.33	.24	-.12	-.18	-.16	.05	-.07	-.02	—				
15. W2 Ext	.20	.31	.35	.30	.40	.50	.41	-.03	-.09	-.09	.05	-.07	-.03	.68	—			
16. W3 Ext	.22	.36	.49	.45	.37	.51	.57	-.01	-.06	-.04	.01	-.08	-.07	.59	.78	—		
17. W1 Age	.07	.13	.24	.26	.08	.16	.15	.04	.01	.01	-.09	.04	-.06	.11	.09	.16	—	
18. W1 Gender	.03	.03	-.01	.00	.14	.12	.02	-.33	-.39	-.45	-.03	-.13	-.19	.25	.20	.09	-.04	—
<i>M</i>	0.05	0.49	2.68	3.73	0.06	0.10	0.15	3.75	3.89	3.97	3.91	3.75	3.72	0.21	0.22	0.24	12.09	0.45
<i>SD</i>	0.32	1.76	7.99	10.89	0.11	0.16	0.21	0.58	0.57	0.57	0.62	0.60	0.62	0.17	0.19	0.21	0.59	0.50
Skew	6.27	4.41	3.88	4.11	2.96	2.20	1.45	-0.21	-0.37	-0.56	-0.36	-0.28	-0.37	1.57	1.59	1.27	-0.16	0.20
Kurtosis	38.77	19.37	15.01	17.20	10.00	5.54	1.24	-0.34	-0.14	0.10	-0.17	0.15	0.32	4.38	5.33	1.98	-1.12	-1.97
Range	2.33	9.76	42.55	58.84	0.71	0.93	0.86	2.93	3.00	3.00	2.88	3.13	3.25	1.25	1.50	1.20	2.29	1.00

Note. SU = substance use frequency; PPD = perceived peer delinquency; FQ = friendship quality; PGI = peer group identification; Ext = externalizing symptoms. Correlations in bold are significant at < .05.

Table 2

Hierarchical Linear Models Predicting Adolescent Substance Use.

Predictor	Model 1			Model 2			Model 3		
	β	SE	t value	β	SE	t value	β	SE	t value
Intercept	0.00	0.03	-0.07	0.00	0.03	0.10	0.00	0.03	0.14
Gender	0.00	0.03	0.13	0.00	0.03	0.02	0.00	0.03	-0.02
Age	0.16	0.03	5.06***	0.16	0.03	4.91***	0.16	0.03	5.05***
Substance Use	0.11	0.03	4.18***	0.11	0.03	4.32***	0.11	0.03	4.30***
Externalizing	0.12	0.03	3.76***	0.12	0.03	3.70***	0.12	0.03	3.70***
Symptoms									
PPD	0.28	0.03	8.85***	0.30	0.03	9.19***	0.29	0.03	8.79***
PGI	-0.01	0.03	-0.37	-0.01	0.03	-0.46	-0.02	0.03	-0.69
Friendship Quality	0.09	0.03	2.95**	0.09	0.03	2.95**	0.09	0.03	3.01**
PPD $\times$ PGI				0.07	0.02	2.71**	0.06	0.02	2.51*
PPD $\times$ Friendship Quality				-0.03	0.03	-1.26	-0.03	0.03	-1.03
Friendship Quality $\times$ PGI				0.00	0.02	0.20	0.01	0.02	0.30
PPD $\times$ Friendship Quality $\times$ PGI							0.04	0.02	2.13*

Note. Model 1 refers to the main effects model, Model 2 includes all two-way interactions, and Model 3 includes the hypothesized three-way interaction. PPD = perceived peer delinquency; PGI = peer group identification.

* $p < .05$.

** $p < .01$.

*** $p < .001$.