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Cooperative Learning Effects on Peer Relations and Alcohol Use in Middle School

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Abstract

We tested a prevention approach aimed at reducing growth in alcohol use in middle school using four waves (2 years) of data from a cluster randomized trial (N = 15 middle schools, 1,890 students, 47.1% female, 75.2% White). Our approach exposed students to a broad cross-section of peers through collaborative, group-based learning activities in school (i.e., *cooperative learning*). We hypothesized that the increased social contact created by cooperative learning would promote greater peer relatedness, interrupting the process of deviant peer clustering and, in turn, reduce escalations in alcohol use. Our results supported these hypotheses, suggesting that the social nature of cooperative learning, and the emphasis on group work and collaboration, can provide social and behavioral as well as academic benefits for students.

Keywords

alcohol use; deviant peer affiliation; peer relatedness; cooperative learning; middle school

Developmental pathways that lead to problematic alcohol and other drug use in adulthood emphasize *early adolescence* as a key window of risk. Youth who initiate alcohol and other drug use before age 15 are at elevated risk for abuse and dependence later in adolescence and adulthood (Dawson et al., 2008; Hingson & Zha, 2009; Van Ryzin & Dishion, 2014). In turn, problematic alcohol and drug use are key risk factors for injury and premature death (WHO, 2014), as well as greater risk of preventable diseases, such as cirrhosis of the liver, diabetes, and cancer (Rehm et al., 2009).

In exploring the etiology of alcohol use and related behavioral problems, researchers have found that peer influence plays a major role. Specifically, research has linked peer influence with a wide variety of negative behaviors in adolescence, including alcohol and other drug use and abuse, antisocial and violent behavior, and high-risk sexual behavior (Van Ryzin & Dishion, 2013, 2014; Van Ryzin, Johnson, Leve, & Kim, 2011; for review, see Dishion &

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Patterson, 2006). Peer influence is particularly strong in early adolescence, when peer acceptance is critical to well-being and the influence of parents begins to wane (Steinberg & Morris, 2001).

Early adolescents who lack well-developed social skills can be socially marginalized or rejected by others in middle school. Socially rejected youth tend to affiliate with one another (i.e., *deviant peer clustering*; Dishion et al., 1991; Patterson, DeBaryshe, & Ramsey, 1989), and within these clusters, delinquent behavior is reinforced through peer pressure, modeling, facilitation, and expressions of approval (i.e., *deviancy training*; Granic & Dishion, 2003; Van Ryzin & Dishion, 2013). Indeed, deviant peer clustering is one of the strongest predictors of multiple forms of problem behavior in adolescence (Haynie & Osgood, 2005). The focus of this paper is on links between deviant peer clustering and alcohol use, which have been found from early adolescence to early adulthood (Dishion & Owen, 2002; Fergusson, Swain-Campbell, & Horwood, 2002; Van Ryzin, Fosco, & Dishion, 2012).

Prevention of Early Adolescent Alcohol Use

A variety of prevention approaches have been applied to interrupt deviant peer clustering and reduce adolescent alcohol and other drug use. A common approach among school-based prevention programs is to ask teachers or school counselors to deliver psychosocial content aimed at changing attitudes, normative beliefs, and/or peer resistance skills related to use of alcohol and other drugs. Although research has found these programs to be effective, meta-analyses have found generally small effects (i.e., mean ES = .05 in Wilson et al., 2001; median ES =.13 in Tobler et al., 2000; OR = .70 to .80 in MacArthur et al., 2016). Another strategy that has received attention is the use of “peer leaders” as agents of positive behavioral change, although the results of such programs have been mixed (e.g., Valente et al., 2007).

In this project, we took a different approach; we attempted to interrupt the process of deviant peer clustering and reduce alcohol use by exposing youth to a broad cross-section of their peers through collaborative, group-based learning activities in school (i.e., *cooperative learning*). In addition to their instructional purpose, these group-based learning activities can increase social opportunities for youth and to provide a mechanism by which socially marginalized youth can develop positive relationships with more prosocial peers. In this way, we hoped to interrupt the process of deviant peer clustering and reduce the prevalence of negative, antisocial peer influences. Specifically, we investigated whether cooperative learning could enhance peer relations among students and, in turn, reduce deviant peer clustering, which would then reduce escalations in alcohol use.

Positive Interdependence and Peer Relations

In cooperative learning, positive social experiences are created by placing students in learning groups under conditions of *positive interdependence*, where individual goals are aligned with the goals of the group such that individual success promotes group success and vice versa. Cooperative learning provides many ways in which a teacher may implement interdependence. For example, teachers may implement *goal interdependence*, in which they

require a single finished product from a group, and/or *reward interdependence*, in which they offer a reward to the group if everyone achieves above a certain threshold on an end-of-unit assessment. The lesson may specify a unique set of materials (*resource interdependence*), roles (*role interdependence*), or tasks (*task interdependence*) for each student in a group, such that the students have to collaborate with one another in order to finish the lesson. Different forms of positive interdependence can be used simultaneously in a single lesson, increasing the incentive for students to cooperate.

When learning goals are structured cooperatively under positive interdependence, students tend to interact in ways that promote goal attainment of others in the group, such as providing instrumental and emotional support, and sharing information and resources (Johnson, Johnson & Maruyama, 1983). The positive feelings that arise from these collaborative, supportive interactions tend to be transferred to the group members who helped to promote one's success, resulting in a "benign spiral" that further increases positive social interactions and promotes positive peer relations (Deutsch, 1949, 1962; Roseth et al., 2008).

We used the Johnsons' version of cooperative learning (Johnson, Johnson, & Holubec, 2013), which also asks teachers to reinforce the use of positive social skills by observing student interactions during learning activities and recording the number of times that students exhibit particular kinds of positive, helpful behavior. In addition, after the lesson is complete, students are instructed to find something specific and positive to say about each other student's contribution to the group's performance, further cementing the positive peer relations that arose during the lesson.

Current Project

In previous research, cooperative learning has been found to have significant effects on adolescent alcohol use over one year (i.e., two waves of data), with moderate to large effects (Van Ryzin & Roseth, 2018a, 2018b). In this study, we aimed to explore mediating mechanisms using the developmental pathway described above. Given the focus on social contact, the development of social skills, and positive peer relations, we hypothesized that cooperative learning would promote greater peer relatedness among students, which would reduce deviant peer affiliation and, in turn, reduce alcohol use. The conceptual model is shown in Figure 1. To ensure temporal precedence in our mediational model, we used the intervention condition (i.e., cooperative learning) to predict change in peer relatedness by wave 2, which predicted change in deviant peer affiliation by wave 3, which in turn predicted change in alcohol use by wave 4. To obtain more accurate measures of change across three and four waves, respectively, growth curve slopes are modeled for deviant peer affiliation and alcohol use (growth curves were not an option for peer relatedness when only the first two waves of data were used). Intercepts (and baseline levels of peer relatedness) were allowed to correlate freely with each other and with the intervention condition.

Method

All aspects of this study were approved by the Institutional Review Board (IRB) at the Oregon Research Institute. This study was registered as trial NCT03119415 in ClinicalTrials.gov under Section 801 of the Food and Drug Administration Amendments Act.

Sample

The sample was derived from a small-scale randomized trial of cooperative learning in 15 rural middle schools in the Pacific Northwest. Schools were matched based upon size and demographics (e.g., free/reduced lunch percentage) and randomized to condition (i.e., intervention vs. waitlist control). We were concerned about the likelihood of losing schools assigned as controls, so we randomized an extra school to this condition (i.e., 8 waitlist-control vs. 7 intervention schools).

Our analytic sample included $N = 1,890$ students who enrolled in the project during the 2016-2017 or 2017-2018 school years. In the first year of the project, we only enrolled 7th graders, and in the second year we assessed these students as 8th graders (we enrolled any additional 8th graders who were not originally a part of the study). We achieved greater than 80% student participation at each data collection point by using a passive consent procedure and providing research staff to oversee the data collection. We also offered compensation to the schools for participating in the project, and enrolled participating students in a prize raffle. Student demographics by school are reported in Table 1. Overall, the sample was 47.1% female ($N = 890$) and 75.2% White ($N = 1,421$). Other racial/ethnic groups included Hispanic/Latino (13.2%, $N = 249$), multi-racial (5.3%, $N = 100$), and American Indian/Alaska Native (3.1%, $N = 58$); our sample included less than 1% Asian, African-American, and Native Hawaiian/Pacific Islander. Overall, 13.9% ($N = 262$) were reported as having Special Ed status, 78.6% ($N = 1486$) did not have Special Ed status, and 7.5% ($N = 142$) were missing a Special Ed designation. Free-and-reduced-price lunch (FRPL) status was not made available by the schools, although school-level FRPL figures (obtained from state records) are reported in Table 1.

Procedure

Training for intervention school staff began in the fall of 2016 and continued throughout the 2016-2017 school year, consisting of 3 half-day in-person sessions, periodic check-ins via videoconference, and access to resources (e.g., newsletters). The three in-person training sessions per school were conducted in (1) late September and early October, (2) late October through early December, and (3) late January through late March. Where possible, we included the entire staff in each training session; occasionally scheduling or other restrictions did not permit access to the entire staff, but there were teachers representing 6th, 7th, and 8th grades in each training session. These sessions were conducted by D. W. and R. T. Johnson, supported by the authors, and utilized *Cooperation in the Classroom, 9th Edition* by Johnson, Johnson, and Holubec (2013); each staff member was given a copy of the book. Due to the geographic dispersal of the schools, each school received training individually according to their own schedule for professional development. Finally, we conducted a one-

day administrator training during the summer of 2017, and a half-day follow-up training for teachers in the second year.

Under the Johnson's approach, cooperative learning can include reciprocal teaching (e.g., Jigsaw), peer tutoring, collaborative reading, and other methods in which peers help each other learn in small groups under conditions of positive interdependence. The Johnsons' approach also emphasizes individual accountability, explicit coaching in collaborative social skills, a high degree of face-to-face interaction, and the guided processing of group performance after the lesson is complete. Cooperative learning is viewed as a conceptual framework within which teachers can apply the basic concepts to design their own group-based activities using existing curricula. The training was not provided in a lecture format; rather, teachers were trained in cooperative learning through the use of cooperative learning techniques. At the conclusion of each training session, the trainers discussed how the lesson structure reflected the foundational concepts of cooperative learning, providing teachers with insight into how these concepts could be applied in their own teaching, as well as giving them a clear sense of what it feels like to participate in a cooperative learning lesson. At the end of the training session, teachers were provided the opportunity to develop draft lesson plans which they could use to deliver cooperative learning lessons in their own classroom.

Measures

Student data collection was conducted in schools during September/October and March/April of the 2016-2017 and 2017-2018 school years (4 waves in total) using on-line surveys (i.e., Qualtrics; https://www.qualtrics.com/). To assess fidelity of implementation, we also conducted teacher observations. A Certificate of Confidentiality was obtained for these data from NIAAA (#CC-AA-17-011). To shrink the overall number of items and reduce participant burden, existing data from other studies were used to select the highest-loading items from each scale below (additional information available from the first author).

Peer relatedness.—We used 4 items from the Relatedness Scale, which has been used in previous research as a predictor of positive school adjustment in adolescents (Furrer & Skinner, 2003). Items included "When I'm with my classmates, I feel accepted" and "When I'm with my classmates, I feel unimportant" (reverse scored). Students responded on a 4-point scale from 1 (*Not at all true*) to 4 (*Very true*). Items were averaged to arrive at the scale score. Alpha reliability was .71 at wave 1 and .79 at wave 2.

Deviant peer affiliation.—Students reported on the frequency in the last month with which they associated with other youth who engaged in delinquent activities, including "get in trouble a lot", "fight a lot", "take things that don't belong to them", and "skip school" (4 items overall). Students responded on a 5-point scale from 0 (*Never*) to 4 (*7 or more times*). Items were averaged to arrive at the final scores. Alpha reliability was between .76 and .84 for Waves 1-3.

Alcohol use.—Students reported on their use of alcohol in the last month using the following scale: *No use* = 1, *Occasionally (1-3 times)* = 2, *Fairly often (4-6 times)* = 3, *Regularly (7-9 times)* = 4, and *All the time (10+ times)* = 5. At baseline, 95.8% of students

(N = 1,392) reported no alcohol use, but by wave 4, the percentage of students reporting no use had declined to 78.9% (N = 1,168).

Demographics.—Sex was collected from school records and coded as *Male* (0) vs. *Female* (1).

Observed intervention fidelity.—Research staff blind to intervention assignment observed teaching practices in intervention and control schools. We trained our observers to adequate reliability using simulated data before they were permitted to conduct observations in actual classrooms, and we used an established observation protocol for key aspects of cooperative learning (e.g., positive interdependence; Krol, Sleegers, Veenman, & Voeten, 2008; Veenman et al., 2002). Observations were conducted in the late fall/early winter and in the spring. Classrooms were selected for observation at random, and observers remained in a classroom for an entire class period.

Analysis Plan

A test of mediation traditionally includes an initial direct-effects model that tests the path between the predictor and outcome (commonly referred to as “path c”), followed by a mediation model in which the following paths are tested: the predictor to the presumed mediator (“path a”), the mediator to the outcome (“path b”), and the combined indirect effect of the predictor on the outcome via the mediator, while controlling for the direct effect (commonly referred to as “path c-prime”; Judd, Kenny, & McClelland, 2001; MacKinnon & Dwyer, 1993).

Thus, we initially tested a direct-effects model for alcohol use (referred to in the Results section as “Model 1”). We used all four waves of measurement in a latent growth curve and evaluated intervention effects on the linear slope (i.e., the change in alcohol use during the project). Next, we evaluated deviant peer affiliation as a mediator of these effects using linear growth curve terms that included the first three waves of measurement (i.e., Model 2). To test mediation, we calculated the indirect effects of the intervention on alcohol use by means of deviant peer affiliation. Finally, we added peer relatedness to the model as a mediator of intervention effects on deviant peer affiliation, and tested the indirect pathway (i.e., Model 3). We used peer relatedness from wave 2, controlling for wave 1 levels, to represent change, as two time points are not sufficient to create a latent growth curve. The full model (i.e., Model 3) is represented in Figure 1. At each step, we tested for sex differences. All linear growth curve slopes were regressed on the corresponding intercept terms, and intercept terms (and baseline scores for peer relatedness) were allowed to correlate with each other and with the intervention condition.

We fit these models and calculated the significance of the indirect effects using Mplus 7.4 (Muthén & Muthén, 1998-2012) and Maximum Likelihood (ML) estimation with robust standard errors, which can provide unbiased estimates in the presence of missing data and/or non-normal or skewed distributions (Enders & Bandalos, 2001). Mplus also enabled us to account for the nesting in the data and calculate appropriate standard errors; however, sample size limitations prevented us from including random effects in the model, so all effects were fixed. For each model, standard measures of fit are reported, including the chi-

square (χ^2), comparative fit index (CFI), nonnormed or Tucker-Lewis index (TLI), and root mean square error of approximation (RMSEA). CFI values greater than .95, TLI values greater than .90, and RMSEA values less than .05 indicate good fit (Bentler, 1990; Bentler & Bonett, 1980; Hu & Bentler, 1999).

Results

Descriptive data for all variables and correlations are presented in Table 2. Female students reported lower levels of relatedness at waves 1 and 2 ($r = -.05$ and $-.11$, respectively) and lower levels of deviant peer affiliation at wave 1 ($r = -.08$); all other sex differences were non-significant.

ANOVA models indicated that students in intervention and control schools did not differ in terms of baseline levels of alcohol use [$F(1, 1451) = 1.47$, *ns*], or peer relatedness [$F(1,1445) = .04$, *ns*]. The two groups did differ in terms of deviant peer affiliation [$F(1,1451) = 3.97$, $p < .05$], with control schools higher than intervention schools, but this effect was very small, $R^2 < .01$. Means and group comparisons for all variables are presented in Table 3.

With regards to fidelity observations, ANOVA indicated significantly higher levels of observed positive interdependence in intervention schools as compared to control schools in the spring of the first year, $F(1,98) = 10.79$, $p < .01$, $R^2 = .10$. Fidelity observations at baseline demonstrated no differences, $F(1,99) = 1.41$, *ns.*

We first evaluated the direct effects of cooperative learning on change (i.e., slope) in alcohol use (i.e., path c). Model fit was adequate, $\chi^2(8) = 8.54$, *ns*; CFI = 1.00; TLI = 1.00; RMSEA = .006 (90% C.I.: .000-.028). Results are provided in Table 4 (see Model 1). Intervention effects on change in alcohol use were significant and small to moderate. Sex differences were not significant, $\chi^2(1) = 2.74$, *ns*.

We next evaluated intervention effects with the mediator (i.e., change in deviant peer affiliation) included. Model fit was adequate, $\chi^2(21) = 107.74$, $p < .001$; CFI = .95; TLI = .93; RMSEA = .047 (90% C.I.: .038-.056). Results are provided in Table 4 (see Model 2). The effects of cooperative learning on change in deviant peer affiliation were significant, and the indirect effect of cooperative learning on alcohol use by means of deviant peer affiliation was significant (standardized effect = −.17, $p < .05$). The direct effect of cooperative learning on change in alcohol use was no longer significant, suggesting full mediation. Sex differences were not significant, $\chi^2(5) = 4.29$, *ns*.

Finally, we added relatedness to the model as a mediator of effects on change in deviant peer affiliation. Model fit was adequate, $\chi^2(32) = 152.56$, $p < .001$; CFI = .95; TLI = .93; RMSEA = .044 (90% C.I.: .038-.052). Results are provided in Table 4 (see Model 3). Cooperative learning predicted significant growth in peer relatedness, which in turn significantly and negatively predicted change in deviant peer affiliation; the indirect effect was significant (standardized effect = −.06, $p < .001$). The effect of cooperative learning on change in deviant peer affiliation was no longer significant, suggesting full mediation. Sex differences were not significant, $\chi^2(13) = 8.51$, *ns*. Interestingly, the effect of peer relatedness on change in alcohol use was close to significance ($p = .056$).

Discussion

In this study, we found evidence supporting the hypothesized causal pathway from cooperative learning to alcohol use. First, we extended previous results that reported lower levels of alcohol use in schools using cooperative learning (Van Ryzin & Roseth, 2018a, 2018b); we found significant effects using 4 waves of data (2 years) instead of two waves (1 year) as in the previous research. Second, we found that the effects of cooperative learning on alcohol use were mediated by reductions in deviant peer affiliation across the first three waves. Finally, we found that the impact of cooperative learning on deviant peer affiliation was mediated by growth in peer relatedness across the first two waves. The experimental design of our trial provides strong internal validity for these results.

Our findings suggest that the social nature of cooperative learning, and the emphasis on group work and collaboration, can provide students with the opportunity to develop positive relationships with peers (i.e., peer relatedness), a finding that echoes previous research (Roseth et al., 2008). This implies that peer influences will not be exclusively antisocial in nature, which tends to occur when socially marginalized youth self-aggregate and establish antisocial behavioral norms (i.e., deviant peer clustering; Dishion et al., 1991). Instead, under cooperative learning, youth can develop relationships with more prosocial youth, reducing deviant peer affiliation. In turn, this change in the nature of their social influences can reduce escalations in alcohol use.

In addition to effects on deviant peer affiliation and alcohol use, there are many other salutary effects that can arise from more positive peer relations among early adolescents. For example, positive peer relations have been linked to increases in cognitive and affective empathy and, in turn, to reductions in bullying (Van Ryzin & Roseth, in press). Positive peer relations have also been linked to reductions in antisocial behavior and enhancements to academic engagement and achievement, self-esteem, and individual well-being among children of this age (Bukowski, 2003; Criss et al., 2002; Liem & Martin, 2011; Wentzel, 2005). This suggests that, rather than being viewed as an adjunct to educational goals (or worse, a distraction), a focus on positive peer relations should be considered a key mechanism by which to promote student achievement and adjustment, particularly in middle school when peer relations become developmentally important (Steinberg & Morris, 2001).

Interestingly, we found that the effects of peer relatedness on alcohol use were close to significance ($p = .056$), even when accounting for the influence of deviant peers. This suggests that there may be other mechanisms by which peer relations can impact alcohol use outside of the mediating mechanism of deviant peer affiliation. For example, loneliness, or a lack of social acceptance, can create risk for a variety of maladaptive outcomes, including depression, anxiety, eating disorders, and suicide ideation (Lasgaard, Goossens, Bramsen, Trillingsgaard, & Elklit, 2011; Vanhalst et al., 2012). Loneliness can even create significant risk for early mortality (Holt-Lunstad, Smith, Baker, Harris, & Stephenson, 2015). Thus, it seems plausible that lack of social acceptance could be, by its very nature, a significant risk factor for alcohol use in adolescence, regardless of downstream impacts on peer affiliation and social influences. Future research should investigate this hypothesis.

Implications for Prevention

These results indicate that group-based learning activities in middle school, when implemented through cooperative learning, can have salutary effects on peer relations, which in turn can address some of the social processes that contribute to escalations in alcohol use. Cooperative learning has already been demonstrated to have far-reaching positive effects on academic motivation and achievement (Johnson, Johnson, Roseth, & Shin, 2014; Roseth et al., 2008), and can also reduce behavioral problems such as bullying and victimization (Van Ryzin & Roseth, 2018c, in press). In addition, cooperative learning does not require the purchase of specific prevention curricula or materials, and schools do not have to allocate instructional time for non-instructional purposes. Thus, cooperative learning represents a way for schools to improve instruction and student learning while *simultaneously* preventing student behavioral problems and improving school climate through the development of more positive peer relations.

Limitations and Conclusion

Although this research has many strengths, including a cluster randomized design and longitudinal data, it is limited in several ways. First, it is based upon a relatively homogeneous sample of rural students that was about three-quarters White, which limits the external validity (generalizability) of the results. Second, all student measures were self-report, which limits internal validity. Future research should consider additional data sources, such as teachers and/or parents, and more diverse populations. And third, the small number of schools in our sample (i.e., 15) limited the complexity of the models that we were able to fit to the data and may have prevented us from finding significant effects in some cases.

In spite of these weaknesses, this study contributes significantly to the literature on peer relations and alcohol use prevention in middle school. Our results suggest that adolescent alcohol use can be reduced through a series of positive social experiences with peers that are designed to enhance peer relations. These learning experiences can be designed and implemented by teachers to reflect local learning standards and content requirements, and do not require the purchase of outside curricula or materials as with traditional school-based alcohol and drug use prevention programs. Thus, we argue for an increased emphasis on cooperative learning as a school-wide prevention program that can enhance social, behavioral, and academic outcomes for students.

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Highlights

- We tested mediators of effects of cooperative learning (CL) on alcohol use.
- CL should increase peer relatedness, reducing deviant peer affiliation.
- These effects, in turn, should reduce alcohol use.
- We used a cluster randomized trial of 15 middle schools (1,890 students).
- Statistical results confirmed our hypotheses.

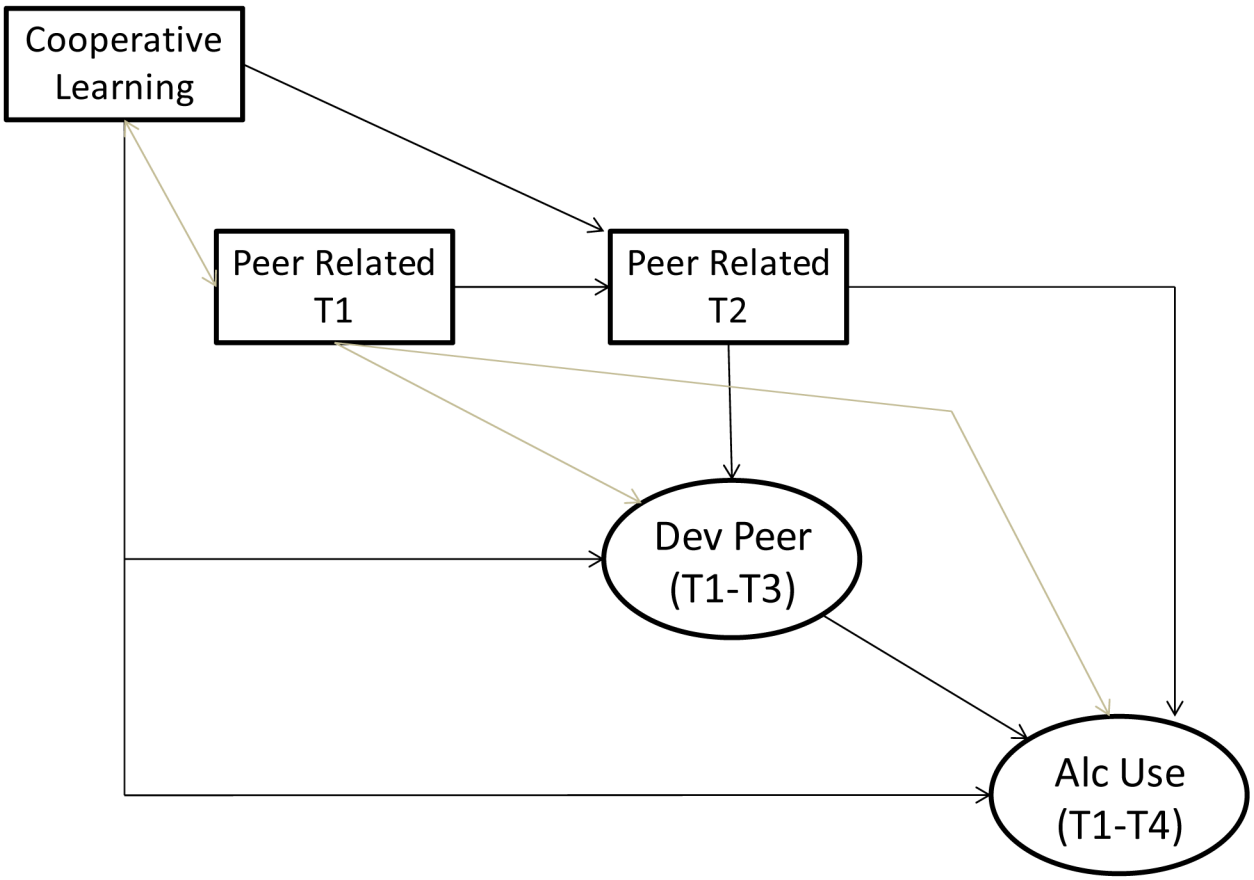

Figure 1.
Full model. Peer Related = Peer Relatedness. Dev Peer = Deviant Peer Affiliation. Alc Use = Alcohol Use. Latent constructs (i.e., the ovals) are linear growth curve slopes; models also included intercept terms (not pictured), which were allowed to correlate freely with each other and with the intervention condition (i.e., cooperative learning). Baseline levels of Peer Relatedness were also allowed to correlate with the intervention condition. Key model paths are in black, and control paths are in gray.

Table 1.

Descriptive data by school

School	Intervention	N	% female	% White	% Special Ed	% FRPL[a]
1	Yes	282	47.9	73.0	11.7	53
2	Yes	61	52.5	75.4	16.4	66
3	Yes	110	40.0	60.9	n/a	62
4	No	114	47.4	93.0	24.6	65
5	Yes	112	50.0	83.0	15.2	72
6	Yes	121	47.1	90.1	19.8	71
7	No	53	41.5	92.5	18.9	33
8	Yes	105	46.7	78.1	10.5	57
9	No	71	45.1	81.7	19.7	45
10	Yes	84	33.3	72.6	4.8	95
11	No	183	44.8	65.0	17.5	61
12	No	239	51.0	48.5	13.0	84
13	No	197	49.2	90.4	11.7	66
14	No	50	48.0	88.0	16.0	39
15	No	108	51.9	80.6	15.7	46

[a]State records.

Note. One school did not provide Special Ed status.

Table 2.

Correlations and descriptive data (Level 1)

Variable	1	2	3	4	5	6	7	8	9	10
1. Peer Relatedness (W1)	—									
2. Peer Relatedness (W2)	.50***	—								
3. Deviant Peer Affiliation (W1)	−.25***	−.12***	—							
4. Deviant Peer Affiliation (W2)	−.14***	−.27***	.42***	—						
5. Deviant Peer Affiliation (W3)	−.12***	−.07**	.36***	.46***	—					
6. Alcohol Use (W1)	−.05*	−.01	.29***	.24***	.12***	—				
7. Alcohol Use (W2)	−.10***	−.20***	.28***	.42***	.19***	.49***	—			
8. Alcohol Use (W3)	−.06*	−.05	.23***	.32***	.48***	.22***	.35***	—		
9. Alcohol Use (W4)	−.05	−.05	.21***	.29***	.30***	.13***	.26***	.36***	—	
10. Sex	−.05*	−.11***	−.08**	−.02	−.01	−.04	−.02	.03	−.03	—
N	1447	1513	1453	1532	1569	1453	1534	1569	1481	1856
M	3.07	2.97	1.44	1.50	1.54	1.07	1.17	1.27	1.34	.48
SD	.68	.76	.62	.67	.74	.41	.61	.73	.81	-

*$p < .05$.

**$p < .01$.

***$p < .001$.

Table 3.

Group differences for key outcomes

Variable	*M* (control)	*M* (intervention)	ANOVA
1. Peer Relatedness (W1)	3.07	3.08	$F(1,1445) = .04$, *ns*
2. Peer Relatedness (W2)	2.89	3.06	$F(1,1511) = 20.15$, $p < .001$
3. Deviant Peer Affiliation (W1)	1.47	1.41	$F(1,1451) = 3.97$, $p = .046$
4. Deviant Peer Affiliation (W2)	1.60	1.40	$F(1,1530) = 33.14$, $p < .001$
5. Deviant Peer Affiliation (W3)	1.61	1.45	$F(1,15671) = 17.39$, $p < .001$
6. Alcohol Use (W1)	1.08	1.06	$F(1, 1451) = 1.47$, *ns*
7. Alcohol Use (W2)	1.23	1.10	$F(1, 1532) = 16.02$, $p < .001$
8. Alcohol Use (W3)	1.34	1.19	$F(1, 1567) = 16.60$, $p < .001$
9. Alcohol Use (W4)	1.41	1.27	$F(1, 1479) = 10.77$, $p = .001$

Table 4.

Model effects

Model path	Model 1	Model 2	Model 3
Cooperative learning → Alcohol Use (Slope)	−.17***	−.03	−.03
Cooperative learning → Deviant Peers (Slope)		−.18*	−.11
Deviant Peers (Slope) → Alcohol Use (Slope)		.90***	.88***
Cooperative learning → Peer Related (T2)			.19***
Peer Related (T1) → Peer Related (T2)			.43***
Peer Related (T2) → Deviant Peers (Slope)			−.31***
Peer Related (T2) → Alcohol Use (Slope)			−.10†

† $p = .056$.

* $p < .05$.

** $p < .01$.

*** $p < .001$.