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Social Goals Impact Adolescent Substance Use Through Influencing Adolescents' Connectedness to Their Schools

Samuel N. Meisel^a and Craig R. Colder^a

^aUniversity at Buffalo, The State University of New York

Abstract

Although developmental models of risk behavior highlight the role of school connectedness in the etiology of adolescent substance use, no studies to our knowledge have assessed longitudinal mediational models examining how adolescents form bonds to their school, and how the quality of those bonds relate to substance use. To address this gap, the current study used four waves of data, spanning ages 11 to 16 (grades 5 to 11), to examine the association between individual differences in agentic (Dominance/Power) and communal (Nurturance/Affiliation) social goals and school connectedness, and in turn, whether levels of school connectedness are associated with substance use. The community sample (N=387, 55% female) was assessed annually 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%). The results supported a mediational pathway whereby agentic goals were associated with low levels of school connectedness, which, in turn, were associated with high levels of substance use. Counter to our hypotheses, no association was found between communal goals and school connectedness. These findings provided initial evidence for the important role social goals play in shaping an adolescent's connectedness to their school and risk for substance use.

Introduction

Adolescence is the developmental period most strongly associated with the initiation and escalation of substance use (Colder, Campbell, Ruel, Richardson, & Flay, 2002; Johnston, O'Malley, Bachman, & Schulenberg, 2012). Adolescent substance use is of public health concern because it is associated with a number of adverse outcomes including increased risk for substance use problems in adulthood (Kendler, Myers, Damaj, & Chen, 2013), risky sexual behaviors (Ritchwood, Ford, DeCoster, Sutton, & Lochman, 2015), the development

Correspondence regarding this article should be directed to Samuel N. Meisel, B.A., Department of Psychology, 320 Park Hall, State University of New York at Buffalo, Buffalo, NY 14260-4110., snmeisel@buffalo.edu, Phone: 716-645-0189, Fax: 716-645-3801. Craig R. Colder, Ph.D., Department of Psychology, 227 Park Hall, State University of New York at Buffalo, Buffalo, NY 14260-4110., ccolder@buffalo.edu, Phone: 716-645-0190

Authors' Contributions

S.N.M. developed the research question, conducted the analysis, and prepared the manuscript. C.R.C. assisted with refining the research question, conducting the data analysis, and preparing the manuscript. Both authors read and approved the final manuscript.

Compliance with Ethical Standards

Conflicts of Interest. The authors report no conflict of interests.

Ethical Approval. The institutional review board at the University at Buffalo has approved this project.

Informed Consent. Consent (caregiver) and assent (child) were received from all participants in this study.

of internalizing pathology (Marmorstein, 2009; Marmorstein et al., 2010), and even premature death (WHO, 2011). Understanding risk and protective factors of adolescent substance use is a critical task for preventing these adverse outcomes and designing effective intervention efforts. The current study examines whether individual differences in social goals (agency and communion) shape adolescents' school connectedness, and whether school connectedness, in turn, protects youth from substance use.

School connectedness is defined as the extent to which students are engaged with school and feel accepted, respected, included, and supported by others in their school (Goodenow, 1993). It is a multicomponent construct that includes interpersonal relationships (e.g., classmates, teachers), relationships to school (e.g., feeling a part of one's school), attitudes toward school (e.g., doing well in school), and academic engagement (e.g., grades; Barber & Schluterman, 2008; Libbey, 2004). School connectedness has long been implicated in the etiology of adolescent substance use. Social Control Theory (Hirschi, 1969) argued that forming strong bonds with conventional social institutions, like school, encourages youth to adopt the conventional norms of society that are considered to be incompatible with drug use. Hence, according to this theory, school connectedness is expected to protect adolescents from engaging in a variety of delinquent behaviors, including substance use. A critique of Social Control Theory is that it does not provide an account for how strong bonds with conventional social institutions are formed (Catalano & Hawkins, 1996). The Social Development Model was an effort to explain how strong bonds are formed through integrating aspects of Social Control Theory (Hirschi, 1969) and Social Learning Theory (Akers et al., 1979; Bandura, 1997). The Social Development Model posits that individual difference factors that enhance the reinforcing effects of school play a critical role in the formation of high levels of school connectedness and the subsequent protection from substance use. To date, no studies have tested this tenet of the Social Development Model. The current study tests this idea of the Social Development Model by examining whether individual differences in adolescent social goals impact the extent to which adolescents feel connected to their school, which, in turn, is expected to be associated with subsequent substance use.

Social Goals and School Connectedness

Social goals refer to an adolescent's values in interpersonal situations and they are rooted in the interpersonal theory of personality, which conceptualizes interpersonal style as a central component of personality (Leary, 1957; Pincus & Gurtman, 2006; Pincus, Lukowitsky, & Wright, 2009). Social goals are particularly relevant to adolescent development because forming and maintaining close bonds with peers, parents, role models, and schools represents an important task for this developmental time period (Allen & Loeb, 2015; Collins & Steinberg, 2006). Social goals are organized around a circumplex structure with two orthogonal dimensions representing agency (dominance/power/assertiveness) and communion (nurturance/affiliation) (Locke, 2003; Wright, Pincus, & Lenzenweger, 2012). Agentic goals reflect placing a high value on appearing confident and obtaining status and power in interpersonal situations whereas communal goals reflect placing a high value on belonging and acceptance in interpersonal situations (Ojanen, Grönroos, & Salmivalli, 2005; Trucco, Wright, & Colder, 2013). Social goals shape how adolescents transact with their

social environments (Allen, Chango, & Szwed, 2014; Chung & Asher, 1996) and they have been posited to play an important role in determining whether an adolescent forms close bonds with their school (Wentzel, 1996).

Agency and School Connectedness—Adolescents with agentic social goals value power, status, and admiration when interacting with their peers (Trucco et al., 2013), and these interpersonal characteristics may interfere with an adolescent's ability to form healthy school bonds (Chung & Asher, 1996; Rogers et al., 2016a, 2016b). Adolescents who value power and status in interpersonal interactions may be reticent to ask for help from teachers and peers because they view these behaviors as undermining their perceived agency (Rogers et al., 2016a; Ryan, Hicks, & Migley, 1997). Moreover, they may interact with classmates and peers in a non-collaborative, dominant style, and may engage in aggressive behavior (Ojanen, Findley, & Fuller, 2012; Ojanen & Nostrand, 2014; Sijtsema, Veenstra, Lindenberg, & Salmivalli, 2009; Trucco et al., 2013). Aggressive and domineering behaviors are likely to undermine critical aspects of school connectedness such as the formation of close peer attachments and close relationships with teachers (Jariven & Nicholls, 1996; Kiefer & Ryan, 2008). Indeed, adolescents who place a high value on agentic social goals have been shown to have lower academic achievement and hold less favorable attitudes toward school (Rogers et al., 2016a; Santos, Galligan, Pahlke, & Fabes, 2013).

Communion and School Connectedness—Although agency may undermine an adolescent's connectedness to his or her school, communion has been posited to facilitate the formation of strong school bonds during adolescence (Wentzel, 1996). Valuing belongingness and closeness (communion) is thought to enhance positive experiences with classmates, teachers, as well as with school activities, and strengthen school bonds (King, McInerney, & Watkins, 2012, 2013). Notably, when adolescents have been asked about their goals for school, they commonly reference social goals related to communion. For example, Dowson and McInerney (2003) found that social affiliation, wanting to achieve academically to enhance feelings of belongingness to the group, and social approval, wanting to do well in school to gain the approval of peers, teachers, and parents, were common among some adolescents. These findings suggest that communal social goals intersect with school connectedness. Further, adolescents who strongly value communal goals are more likely to seek help from teachers (Ryan et al., 1997), be accepted by their classroom peers (Wentzel, 1994), and succeed academically (Wentzel, 1993). Taken together, these findings suggest that adolescents high in communal goals are likely to form strong bonds to their school.

School Connectedness and Substance Use

In line with Social Control Theory and the Social Development Model, adolescents with strong school connections have been shown to have lower levels of substance use. The protective effects of school connectedness on adolescent substance use have been demonstrated in studies of early (Li & Lerner, 2011), middle (Bond et al., 2007), and late adolescence (Pittman & Richmond, 2007), as well as studies using urban (Wormington, Anderson, Tomlinson, & Brown, 2013) and rural samples (Shears, Edwards, & Stanley, 2006). Further, these effects have been found in both cross-sectional (Wormington et al., 2013) and longitudinal studies (Bond et al., 2007; Dever et al., 2012). For example, in a

longitudinal sample spanning 5th to 8th grade, Li and Lerner (2011) found that students who had growth trajectories characterized by stable high levels of behavioral and emotional school connectedness had lower levels of substance use relative to adolescents with trajectories characterized by moderate levels or decreasing levels of school connectedness. This study, along with the large body of work demonstrating a protective role of school connectedness on adolescent substance use, highlights the importance of understanding how individual difference factors, such as social goals, contribute to an adolescent's connectedness to their school.

Hypotheses

Although high levels of school connectedness have been identified as a protective factor of adolescent substance use, little work has simultaneously examined factors that promote or undermine an adolescent's school connection and how that connection, in turn, relates to substance use. The present study posits that the social goals of agency and communion shape how adolescents interact with their social environments, and thus are associated with an adolescent's connection to their school. Specifically, we hypothesize that high agentic goals will be prospectively related to low levels of school connectedness, which, in turn, will be related to high levels of substance use. Conversely, we hypothesize that high levels of communion will be associated with high levels of school connectedness, which, in turn, will be associated with low levels of substance use. We also include measures of established correlates of school connectedness in adolescence, such as externalizing symptoms (Loukas, Cance, & Batnova, 2016; Loukas, Ripperger-Suhler, & Horton, 2009), internalizing symptoms (Fröjd et al., 2008; Loukas et al., 2016), and friendship quality (Hamm & Faircloth, 2005; Perdue, Manzeske, & Estell, 2009), to demonstrate the unique effects of social goals on school connectedness above and beyond these potential confounders.

Methods

Participants were drawn from a longitudinal study examining risk and protective factors associated with the initiation and escalation of early adolescent substance use. Random-digit dialing (RDD) procedures were used to recruit 387 families (1 child, 1 caregiver) in 2007 to 2009. We used both listed and unlisted telephone numbers in Erie County NY, and 98.5% of households had a landline at the time of recruitment. 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 at the first assessment was \$70,000 and ranged from \$1,500 to \$500,000, and 6.2% of the families received public income assistance. The demographic characteristics of our community sample are similar to those of Erie County from whence the sample came (for more complete details, see Trucco, Colder, Wieczorek, Lengua, & Hawk, 2014).

Data for the current study were taken from the first four annual assessments (Waves [W] 1 through W4) of the longitudinal project when school connectedness and social goals were assessed. Average ages of participants were 11.6 ($SD=0.58$, $N=387$), 12.6 ($SD=0.58$, $N=373$), 13.6 ($SD=0.59$, $N=370$), and 15.08 ($SD=0.59$, $N=363$) at W1–W4, respectively.

Participants were in 5th (7.60%), 6th (39.63%), 7th (45.93%), and 8th (6.82%) grade at W1, 6th (7.07%), 7th (38.32%), 8th (48.91%), and 9th (5.71%) grade at W2, 7th (6.59%), 8th (38.74%), 9th (48.08%), and 10th (6.59%) grade at W3, and 8th (6.42%), 9th (39.76%), 10th (47.71%), and 11th (6.11%) grade at W4.

Overall attrition across W1–W4 was low (6.20%). Chi-square and analysis of variance tests were conducted to assess potential differential attrition. No significant differences ($p > 0.05$) between adolescents who completed all interviews and those missing at least one assessment were found at W1 for race, gender, age, parental education, parental marital status, family income, agency, communion, school connectedness, or substance use. Low attrition rate and lack of differences suggest that missing data did not have a substantial impact on our findings.

Procedures

At W1–W3, adolescents and their parents were interviewed in university research offices. Before the interviews began, parents were asked to give consent and adolescents were asked to give assent. Trained research assistants interviewed parents and adolescents in separate rooms to enhance privacy. Data collection included both laboratory tasks as well as questionnaires assessing a wide range of family, peer, individual level risk and protective factors for adolescent drug use. Items from the structured questionnaires participants completed were read aloud and then entered by the interviewer. Items containing sensitive information (e.g., substance use items) were read aloud but were then entered by the participant. Assessments took approximately 2.5 to 3 hours. Families were compensated \$75, \$85, and \$125 dollars for W1–W3, respectively.

W4 consisted of a brief telephone-based audio-Computer-Assisted Self-Interview (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.

Measures

Substance Use (W1–W4)—The National Youth Survey (Elliot and Huizinga, 1983) was used to assess past year substance use at W1–W4. Adolescents reported 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–W4, respectively. It is difficult to compare the rates of use in our sample to other studies because our study is younger than many other large studies of adolescent substance use and because with respect to alcohol use, we distinguished use with and without parental permission. Nonetheless, approximate

comparisons are possible, and these suggest that our rates of use are comparable to those found in other studies. For example, the Monitoring the Future Study (MTF) assesses lifetime alcohol, cigarette, and marijuana use in a nationally representative sample of 8th, 10th, and 12th graders. MTF found rates of lifetime alcohol use of 36.60% in 8th grade and 56% in 10th grade (Johnston et al., 2010), however, this study did not distinguish between use with and without parental permission. When we collapse lifetime alcohol use with and without parental permission in our sample, lifetime drinking rates are comparable to those in MTF (38% for 8th graders and 60% for 10th graders). MTF found lifetime rates of cigarette use of 20.10% and 30.40% in 8th and 10th grade, respectively, compared to 6.83% in 8th and 15.36% in 10th grade in our sample. This suggests lower rates of cigarette use in our sample. However, our lifetime rates of cigarette use are closer those found in New York State as reported in the New York Youth Development Survey (NYYDS, 2008), which are 15.80% in 8th and 25.90% in 10th grade. MTF found rates of lifetime marijuana use of 15.70% and 34.50% in 8th and 10th grade, respectively, compared to 3.73% in 8th and 19.67% in 10th grade in our sample. Here again, our rates of marijuana use are closer to those in NYYDS (6.80% in 8th and 22.90% in 10th grade in NYYDS).

Social Goals (W1–W3)—Social goals were assessed with the Interpersonal Goals Inventory for Children Revised (IGI-CR; Trucco et al., 2013). The IGI-CR has been shown to fit a circumplex structure (Trucco et al., 2013) and has demonstrated strong convergent and divergent validity (Trucco et al., 2013, Trucco, Bowker, & Colder, 2008). The IGI-CR is comprised of 32 items all containing the prompt, “When with your peers, in general how important is it to you that. . .?” Responses options included a 5-point scale ranging from 0 (not at all important to me) to 4 (extremely important to me). The IGI-CR is comprised of 8 octants containing 4 items each. Vector scores were computed at each wave to represent agentic and communal goals using formulas commonly used by social goals researchers (Locke, 2003; Ojanen et al., 2005). High scores on the agentic vector correspond to valuing and appearing dominant and independent. High scores on the communal vector correspond to valuing solidarity and belongingness. The internal consistencies were high for agentic ($\alpha=.82$ to $.84$ across waves) and communal ($\alpha=.89$ to $.92$ across waves) goals scores.

School Connectedness (W1–W3)—School connectedness was assessed using five items taken from the School Connectedness Scale developed by Resnick et al. (1997): “You feel close to people at your school,” “You feel like you are part of your school,” “You are happy to be at your school,” “The teachers at your school treat students fairly,” and “You feel safe in your school.” Four additional items were taken from a Commitment to School Measure developed for the Rochester Youth Development Study (Thornberry, Lizotte, Krohn, Farnworth & Jang, 1991), including “Homework is a waste of time,” “You try hard in school,” “Education is so important that it’s worth putting up with the things about school you don’t like,” and “In general, you like school.” Responses were on a 4-point scale ranging from 1 (Strongly Agree) to 4 (Strong Disagree). Items were coded so higher scores reflected higher levels of school connectedness. The nine items were averaged to form a scale score at each wave, and the internal consistency ranged from $\alpha=.75$ to $.81$ across waves.

Friendship Quality (W1–W3)—A revised version of the Network of Relationships Inventory (NRI) was used to assess friendship quality (Furman & Buhrmester, 1985). The revised version of the NRI contained five items assessing how much time an adolescent spends with their friend, how much they share secrets and private feelings with their friend, how much their friend really cares about them, how much their friend likes or approves of the things they do, and their confidence that their relationship with their friend will last. Adolescents rated these friendship qualities for each of their three close friends on a five-point response scale (1=none [item 1], never [item 2], not at all [items 3 and 4], not a lot [item 5] to 5=almost all [item 1], very often [item 2], extremely sure [item 3], very much [items 4 and 5]). Ratings for an adolescent's three close friends were averaged to form a composite of friendship quality. The NRI demonstrated strong internal consistency ranging from $\alpha=.90$ to $.92$ across waves.

Externalizing and Internalizing Symptoms (W1–W3)—Both externalizing and internalizing symptoms was measured using the Youth Self Report (YSR) form of the Achenbach System of Empirical Behavioral Assessment (Achenbach & Rescorla, 2001). Adolescents responded to questions using a 3-point scale ranging from 0 (not true) to 2 (very true or sometimes true). The Rule Breaking Behavior and Aggressive Behavior subscales were averaged to form the externalizing symptoms scale score and the Anxious-Depressed, Withdrawn-Depressed and Somatic Complaints subscales were averaged to form the internalizing symptoms scale score. The YSR has widely been used to assess externalizing and internalizing symptoms and has demonstrated strong reliability and validity (Achenbach & Rescorla, 2001). Internal consistencies for the externalizing scale score ranged from $\alpha=.87$ to $.89$ across waves for the internalizing scale score ranged from $\alpha=.72$ to $.75$ across waves.

Data Analytic Strategy

Structural Equation Modeling using Robust Maximum Likelihood estimation (MLR) was used to assess cross-lagged mediational pathways from agentic and communal social goals to substance use through school connectedness in Mplus 7.4 (Muthen and Muthen, 1998–2014). Missing data was handled with full information maximum likelihood estimation. To reduce the influence of extreme outliers, substance use frequency values that exceeded +3 standard deviations from the mean were recoded to 3 standard deviations from the mean (Tabachnick and Fidell, 2007). Cross-lagged panel models were estimated in a sequential fashion such that autoregressive paths were first estimated for our repeated measures variables (see Figure 1). Nested model tests were then conducted to determine whether autoregressive paths could be constrained to be equal over time. Next, paths were estimated from W1 and W2 agentic and communal social goals, school connectedness, externalizing and internalizing symptoms, peer closeness, and substance use to school connectedness at W2 and W3. Nested model tests were conducted to determine whether cross-lagged paths to school connectedness could be constrained to be equal over time. Paths were then added from W2 and W3 agentic and communal social goals, school connectedness, internalizing and externalizing symptoms, peer closeness, and substance use to substance use at W3 and W4. Nested model tests were used to assess whether cross-lagged paths to substance use could be constrained over time. Gender, grade, and parental education from W1 were

initially included as predictors of all variables in the models and then non-significant associations were removed to reduce model complexity. Covariances were estimated within time. Lastly, bias-corrected confidence intervals for the proposed mediational paths were computed using 5000 randomly generated samples (Hayes & Scharkow, 2013).

Results

Table 1 presents zero-order correlations, means, standard deviations, skewness and kurtosis coefficients for the outcomes, predictors, 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 had a positive cross-sectional association with agentic goals at W2 and W3, communion at W2, externalizing symptoms at W3, peer closeness at W2, and grade at W2 and W3. Substance use was negatively related to school connectedness at W2 and W3. Agency was negatively related to school connectedness at W1–W3, negatively related to friendship quality at W2 and W3, and was associated with being male. Communion was positively associated with school connectedness at W1, W2, and W3, friendship closeness across the first three waves, and being female. Parental education was positively associated with school connectedness at W1–W3, and negatively associated with externalizing symptoms at the first three waves.

Cross-Lagged Panel Model

Autoregressive paths were significant for each of the repeated measures variables (see Figure 1). Nested tests supported constraining the auto-regressive paths for the symptom variables and for communal goals ($\chi^2=1.34(4)$, $p=.85$), but not for the other variable in the model (all $ps > .05$), including school closeness, agency, friendship quality, and substance use (from W3–W4). Next, cross-lagged paths were estimated from agentic goals, communal goals, externalizing symptoms, internalizing symptoms, friendship quality, substance use, and prior levels of school connectedness to school connectedness at the subsequent wave. Nested model tests supported constraining these paths across each lag to be equal except for the paths from friendship quality to school connectedness ($\chi^2=9.94(5)$, $p=.08$). Paths were then estimated from school connectedness, agentic and communal social goals, internalizing and externalizing symptoms, friendship quality, and prior levels of substance use to substance use at the subsequent wave. Nested model tests supported constraining these paths to be equal across waves ($\chi^2=9.49(12)$, $p=.66$). Modification indices suggested allowing externalizing symptoms at W3 to be regressed on agentic goals at W2, which resulted in a significant improvement in model fit ($\chi^2=14.16(1)$, $p<.001$). Lastly, gender, grade, and parental education were initially included as predictors of all variables in the models and then non-significant associations were removed to reduce model complexity. Retained paths are described below. The final model provided a good fit to the data ($\chi^2=206.36(187)$, $p=.15$, CFI=.99, TLI=.99, RMSEA=.01, SRMR=.05).

Females had significantly higher levels of communal goals at W1, school connectedness at W1, friendship quality at W1–W3, internalizing symptoms at W3, and significantly lower levels of internalizing symptoms at W1, agentic goals at W1 and W2, and externalizing symptoms at W1. High grade level was positively associated with substance use at W1, W2,

W4, agentic goals at W1, and externalizing symptoms at W1. High levels of parental education were associated with low levels of externalizing symptoms at W3.

Significant paths, besides those for gender, grade, and parental education, can be seen in Figure 1. Consistent with our hypotheses, agentic goals were negatively associated with school connectedness. However, contrary to hypotheses, communal goals were unrelated to school connectedness¹. Results also indicated a significant positive association between substance use and school connectedness and a negative association between internalizing symptoms and school connectedness. Friendship quality was positively associated with school connectedness at W2, but not W3. Consistent with our hypotheses, school connectedness was negatively associated with substance use. Externalizing symptoms was also positively associated with substance use. The pathway from W2 agentic goals to W3 externalizing symptoms was also statistically significant such that higher levels of agency were associated with higher levels of externalizing symptoms. Overall, the model accounted for 30% and 28% of the variance in school connectedness at W1–W2, respectively, and 32%, 36%, and 36% of the variance in substance use at W2–W4, respectively.

Bias-corrected confidence intervals for the indirect effects can be found in Table 2. Results indicated a statistically significant indirect effect from agentic social goals to substance use through school connectedness such that agentic social goals were associated with low levels of school connectedness, and low levels of school connectedness were associated with high levels of substance use. The indirect path from communal goals to substance use through school connectedness was not statistically significant. This effect is not surprising as communal goals were not prospectively associated with school connectedness. An indirect pathway was also found from agentic social goals at W2 to substance use at W4 through W3 externalizing symptoms such that agentic social goals were associated with high levels of externalizing symptoms, which, in turn, were associated with high levels of substance use.

Sensitivity Analyses

Sensitivity analyses were conducted to determine whether results were consistent when using different substance use outcomes (e.g., substance use frequency outcome where outliers were not recoded to 3 standard deviations above the mean, and a log-transformed substance use frequency outcome). Findings replicated across these outcomes, although, when using the log-transformed substance use outcome, the indirect effect from agentic goals to the substance use frequency outcome with outliers not recoded through school connectedness just missed criteria for statistical significance (95% CI: –0.002, 0.06). Additionally, considering our measures were all adolescent self-report, we reran our cross-

¹Based on work suggesting that school connectedness varies as function of both grade and gender (Johnson, Crosnoe, & Thaden, 2006; Wang & Dishion, 2012), we explored potential moderating effects of these variables in the association between agentic and communal social goals and school connectedness. Interactions between social goals and grade and social goals and gender were not statistically significant ($p > .05$). Additionally, some research has suggested that adolescents who are able to both share their opinions and beliefs (high agency) and form close bonds (high communion) with their peers may be best equipped to form strong connections with social institutions (Allen et al., 2002; Allen & Loeb, 2015). Based on this work, interactions between agency and communion predicting school connectedness were examined. A significant interaction between agency and communion predicting school connectedness at the first but not second lag was supported ($p < .05$). However, regression diagnostics suggested two extreme outlying observations, and when these observations were removed, the path from the agency x communion interaction term to W2 school connectedness was no longer statistically significant ($p > .15$). In sum, we did not find robust support for any of these interaction terms.

lagged panel model substituting our adolescent report of internalizing and externalizing symptoms with parent reports (Child Behavior Checklist, Achenbach and Rescorla, 2001). The pattern of our results were replicated using these alternative statistical control variables. Overall, the generally consistent pattern of results across substance use outcomes and reporters of externalizing and internalizing symptoms provides support for a risk pathway from agentic social goals to substance use through school connectedness.

Discussion

Developmental models of risk behavior have long identified school connectedness as an important protective factor from risk behaviors such as substance use. Although the Social Development Model asserts that individual difference factors likely influence whether an adolescent forms a healthy connection to their school, and that a healthy school connection should protect adolescents from substance use, this specific mediational chain has not been formerly assessed. The current study sought to build upon prior work by prospectively assessing the role social goals play in shaping an adolescent's connectedness to their school, and subsequently the role school connectedness plays in adolescent substance use.

Consistent with our hypotheses, high levels of agency were associated with low levels of school connectedness, and in turn, low school connectedness was associated with high levels of substance use. This risk pathway from agency to substance use through school connectedness was the first longitudinal test to support the argument made in the Social Development Model that individual difference factors influence the quality of adolescent bonds to conventional social institutions, and in turn, the quality of those bonds impact substance use. Further, this finding lends support to the importance of social goals in the etiology of adolescent substance use by adding to the few studies that have examined how social goals relate to adolescent substance use behaviors (Lochman, Wayland, & Wright, 1993; Meisel & Colder, 2015; Trucco, Colder, Bowker, & Wieczorek, 2011). Considering the centrality of bonds to conventional social institutions and interactions in many theories of adolescent substance use (e.g., Catalano & Hawkins, 1996; Dishion, Spracklen, Andrews, & Patterson, 1996; Kaplan, 1972), developmental researchers may benefit from including assessments of social goals to better understand the formation of these bonds and their resulting impact on substance use.

We also observed a risk pathway from W2 agentic goals to W4 substance use such that high levels of agency at W2 were associated with high levels of externalizing symptoms at W3, which, in turn, predicted higher levels of substance use at W4. The association between agency and externalizing behaviors is thought to result from adolescents resorting to externalizing behaviors, such as physical and relational aggression, to establish dominance amongst peers (Ojanen, Findley, & Fuller, 2012). In line with this idea, the association between agency and externalizing symptoms coupled with the negative association found between agency and school connectedness builds on prior work that has found agency to be associated with externalizing behaviors such as aggression and substance use (Ojanen et al., 2005; Meisel & Colder, 2015). The positive association between externalizing symptoms and substance use in this mediational pathway is consistent with the robust association found

between externalizing symptoms and substance use in adolescence (Chassin, Colder, Hussong, & Sher, 2016).

Although our results suggest that high levels of agency are problematic, we do not think that intervention efforts should target helping agentic adolescents become less agentic.

Developmental researchers have argued that there are benefits to high levels of agency during adolescence (Allen et al., 2002; Allen & Loeb, 2015). Specifically, Allen and Loeb (2015) argue that being able to advocate for one's own point of view, feel comfortable voicing dissenting opinions, and act on one's own beliefs, are important social skills adolescents should obtain to foster close interpersonal ties and avoid risk behaviors. Hence, there may be utility in considering how to foster connections to school without reducing agency. Adult control and discipline that are emphasized in many American schools may be particularly alienating to agentic youth leading to low connectedness (Pianta & Allen, 2008; Waters, Cross, & Runions, 2009). If this is true, one way to foster school connectedness with agentic adolescents may be to make developmentally informed changes to middle schools and high schools (Allen, Pianta, Gregory, Mikami, & Lun, 2011; Connell, & Wellborn, 1991; Waters et al., 2009). For example, Reeve (2009) argued that if educators work to become less controlling, value student agency, and learn interpersonal and instructional skills to support agency (e.g., allow students to have a voice in their education, use non-controlling language), student agency may enhance school connectedness and in turn, reduce risk for substance use. In sum, there may be some utility in considering making changes to the school context rather than reducing youth agency.

Contrary to our hypotheses, communion was not prospectively associated with school connectedness in the present study. This finding was surprising, considering the theoretical and empirical work suggesting that there should be a strong association between communion and school connectedness. A potential explanation for lack of an association between communal goals and school connectedness is that our measure of school connectedness did not include items that assessed peer relations in school. In a review of measures of students' relationships to school, Libbey (2004) examined the extent to which various measures of students' relationships addressed the domains relevant to students' connectedness to their schools. This review highlighted that peer relationships in school was not adequately covered in several instruments, including the School Connectedness Scale. While our measure also contained items from Thornberry et al. (1991), none of these items were related to an adolescent's peer relationships in school. Considering that communion is thought to facilitate school connectedness by enhancing closeness to classmates, limited coverage of this domain in our measure may explain the lack of an association between communion and school connectedness.

Prior work examining reciprocal effects between substance use and school connectedness have found a negative association between substance use and school connectedness (Henry, 2010). Surprisingly, the present study found a positive association between substance use and school connectedness. However, the positive association between substance use and school connectedness is likely attributable to a suppression effect considering the zero order correlations between substance use and school connectedness were negative ($r = -.04$ to $-.22$).

Although the current study had several strengths including its longitudinal design spanning early to middle adolescence and its assessment of unique mediating mechanisms of agentic and communal goals above and beyond several other variables, it is important to note several limitations. First, our results may not generalize to periods beyond early and middle adolescence or the early stages of substance use. The relationship between social goals and school connectedness may change in later developmental time periods. Specifically, agency becomes increasingly important over the course of adolescence, and teachers have been shown to engage in behaviors that undermine agency in high school (Reeve, 2009). Thus, the relationship between agency and school connectedness may become stronger in later periods of adolescence. Second, our measure of school connectedness did a better job assessing certain domains of school connectedness relative to others. As noted above, our measure of school connectedness provided limited coverage of peer relationships in school and it also provided limited coverage of academic engagement (e.g., academic achievement or grades). Future work would benefit from including a measure of school connectedness that did a better job covering this important domain of school connectedness as well as other important domains of school connectedness such as academic engagement (Libbey, 2004; Manlove, 1998). Third, our measures of school connectedness, social goals, and substance use were all based on adolescent self-reports and future work may benefit from using multiple reporters of these constructs to attenuate concerns related to shared method variance. Lastly, the current study did not include a measure of social status in school, or other school level variables (such as student-teacher relationships, school level social norms). It might be important for future work to consider these variables as they may moderate the relationship between social goals and school connectedness. For example, adolescents who value communion but have low social status (goal incongruence) may differ in their connectedness to their schools relative to adolescents who value communion and have high social status (goal congruence).

Conclusion

Theoretical models of adolescent substance use highlight the important role that bonds to conventional social institutions play in protecting adolescents from engagement in substance use. The current study provided initial evidence for the important role social goals play in shaping an adolescent's connectedness to their school, and its association with substance use. Specifically, a significant indirect effect was found from agentic social goals to substance use such that agentic goals were negatively associated with school connectedness, which, in turn, was negatively associated with substance use. The current study was the first, to our knowledge, to demonstrate a risk pathway from social goals to substance use through school connectedness.

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Biographies

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

Samuel 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.

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Figure 1.

Cross-Lagged Panel Model Predicting School Connectedness and Adolescent Substance Use
Note. Regression coefficients outside of the parentheses are unstandardized and standardized regression coefficients and in parentheses. Covariances, non-significant regression paths, and regression paths for gender, grade, and parental education are not included for visual clarity.
 * $p<.05$, ** $p<.01$, *** $p<.001$.

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	19	20	21	22	23
1. SU W1	-																						
2. SU W2	0.32	-																					
3. SU W3	0.19	0.55	-																				
4. SU W4	0.16	0.51	0.63	-																			
5. SC W1	-0.09	-0.10	-0.09	-0.04	-																		
6. SC W2	-0.11	-0.17	-0.18	-0.12	0.51	-																	
7. SC W3	-0.06	-0.11	-0.22	-0.14	0.48	0.51	-																
8. AG W1	0.05	0.14	0.17	0.16	-0.14	-0.11	-0.16	-															
9. AG W2	0.08	0.16	0.16	0.24	-0.17	-0.16	-0.19	0.35	-														
10. AG W3	0.06	0.16	0.12	0.13	-0.19	-0.19	-0.24	0.33	0.43	-													
11. CG W1	0.01	0.08	0.06	0.05	0.19	0.13	0.13	-0.09	0.00	0.00	-												
12. CG W2	-0.04	0.11	0.02	0.11	0.23	0.23	0.17	-0.09	-0.02	0.02	0.51	-											
13. CG W3	-0.06	0.01	0.00	0.03	0.24	0.25	0.27	-0.17	-0.08	-0.09	0.44	0.60	-										
14. Ext W1	0.01	0.04	0.12	0.05	-0.18	-0.21	-0.17	0.03	0.04	0.07	-0.18	-0.13	-0.17	-									
15. Ext W2	-0.09	0.10	0.10	0.11	-0.16	-0.19	-0.23	0.05	0.06	0.11	-0.02	-0.01	-0.02	0.33	-								
16. Ext W3	0.10	0.19	0.20	0.17	-0.14	-0.18	-0.15	0.11	0.11	0.02	-0.05	-0.07	-0.13	0.22	0.08	-							
17. Int W1	0.01	-0.09	0.01	-0.04	-0.12	-0.14	-0.08	0.03	0.03	0.10	-0.03	-0.08	-0.08	0.62	0.21	0.10	-						
18. Int W2	-0.12	0.05	0.05	0.01	-0.10	-0.10	-0.15	0.07	0.02	0.10	0.02	0.05	-0.01	0.26	0.65	0.08	0.29	-					
19. Int W3	0.03	0.02	0.00	0.00	-0.11	-0.11	-0.04	-0.01	-0.03	-0.06	-0.06	-0.13	-0.13	0.14	0.00	0.60	0.12	0.06	-				
20. FQ W1	0.08	0.13	0.08	0.11	0.21	0.17	0.16	-0.10	-0.07	-0.05	0.44	0.36	0.35	-0.09	-0.01	-0.02	-0.05	0.03	0.03	-			
21. FQ W2	0.03	0.15	0.04	0.13	0.26	0.27	0.27	-0.05	-0.13	-0.03	0.28	0.45	0.37	-0.13	-0.01	-0.07	-0.10	0.03	-0.09	0.59	-		
22. FQ W3	0.02	0.10	0.10	0.12	0.24	0.22	0.29	-0.11	-0.14	-0.14	0.28	0.42	0.46	-0.13	0.03	-0.06	-0.09	0.03	-0.09	0.53	0.70	-	
23. GR W1	0.03	0.15	0.20	0.21	0.01	0.03	0.03	0.13	0.01	-0.01	0.00	0.07	0.10	0.04	0.04	0.07	-0.05	0.05	0.04	0.03	0.06	0.07	-
24. Par Ed	-0.08	-0.18	-0.14	-0.09	0.17	0.13	0.28	-0.05	-0.09	-0.08	0.06	0.05	0.12	-0.13	-0.19	-0.13	-0.07	-0.16	-0.02	-0.07	0.01	0.06	0.02
25. Gender	-0.03	-0.07	0.00	-0.01	0.16	0.13	0.13	-0.16	-0.18	-0.16	0.27	0.34	0.40	-0.18	-0.02	-0.06	-0.04	0.07	0.11	0.32	0.39	0.46	0.15
M	0.10	0.50	2.40	3.34	3.57	3.59	3.54	-1.49	-1.22	-1.00	2.44	2.85	3.02	0.77	0.83	7.32	0.77	0.83	6.32	3.74	3.89	3.96	6.40
SD	0.44	1.77	7.50	10.24	0.43	0.45	0.55	1.40	1.27	1.29	1.68	1.79	1.88	2.64	2.49	6.83	2.44	2.43	5.97	0.58	0.56	0.58	0.64
Skew	4.43	4.33	4.21	4.44	-1.37	-1.57	-1.62	-0.17	-0.07	0.25	0.35	0.42	0.31	6.92	5.33	1.74	6.97	6.23	1.50	-0.20	-0.34	-0.55	-0.61

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	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Kurtosis	18.49	18.65	18.10	20.36	2.04	2.65	2.63	0.19	0.32	0.64	-0.10	-0.50	-0.25	62.72	34.92	4.59	61.17	47.23	2.36	-0.26	-0.15	0.09	-0.60

Note. Correlations in bold are significant at $p<.05$. W=wave, SU=substance use frequency, SC= school closeness, AC= agentic goals, CG= communal goals, Ext= externalizing symptoms, Int= internalizing symptoms, FQ= friendship quality, GR= grade, Par Ed= parental education.

Table 2

Indirect Effects from Agentic and Communal Social Goals to Substance Use Frequency

Indirect Effects	95% CI
<i>Agentic Goals to Substance Use</i>	
Total Indirect Effect from Agentic Goals at W1 to Substance Use at W3	(−0.04, 0.51)
Agentic Goals (W1) to School Connectedness (W2) to Substance Use (W3)	(0.001, 0.03)
Agentic Goals (W1) to Agentic Goals (W2) to Substance Use (W3)	(−0.01, 0.06)
Agentic Goals (W1) to Substance Use Frequency (W2) to Substance Use (W3)	(−0.04, 0.45)
Total Indirect Effect from Agentic Goals at W2 to Substance Use at W4	(0.01, 0.34)
Agentic Goals (W2) to School Connectedness (W3) to Substance Use (W4)	(0.001, 0.03)
Agentic Goals (W2) to Agentic Goals (W3) to Substance Use (W4)	(−0.01, 0.17)
Agentic Goals (W2) to Substance Use Frequency (W3) to Substance Use (W4)	(−0.01, 0.14)
Agentic Goals (W2) to Externalizing (W3) to Substance Use (W4)	(0.01, 0.08)
<i>Communal Goals to Substance Use</i>	
Total Indirect Effect from Communal Goals at W1 to Substance Use at W3	(−0.26, 0.29)
Communal Goals (W1) to School Connectedness (W2) to Substance Use (W3)	(−0.01, 0.002)
Communal Goals (W1) to Communal Goals (W2) to Substance Use (W3)	(−0.07, 0.08)
Communal Goals (W1) to Substance Use Frequency (W2) to Substance Use (W3)	(−0.19, 0.21)
Total Indirect Effect from Communal Goals at W2 to Substance Use at W4	(−0.14, 0.14)
Communal Goals (W2) to School Connectedness (W3) to Substance Use (W4)	(−0.01, 0.002)
Communal Goals (W2) to Communal Goals (W3) to Substance Use (W4)	(−0.07, 0.08)
Communal Goals (W2) to Substance Use Frequency (W3) to Substance Use (W4)	(−0.06, 0.06)

Note. Significant indirect effects are in bold. Bias-corrected confidence intervals that do not include 0 are statistically significant. W=wave.