



Substance use among middle school students: Associations with self-rated and peer-nominated popularity

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A B S T R A C T

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Associations of popularity with adolescent substance use were examined among 1793 6–8th grade students who completed an in-school survey. Popularity was assessed through both self-ratings and peer nominations. Students who scored higher on either measure of popularity were more likely to be lifetime cigarette smokers, drinkers, and marijuana users, as well as past month drinkers. Self-rated popularity was positively associated with past month marijuana use and heavy drinking, and peer-nominated popularity showed a quadratic association with past month heavy drinking. These results extend previous work and highlight that popularity, whether based on self-perceptions or peer friendship nominations, is a risk factor for substance use during middle school. Given the substantial increase in peer influence during early adolescence, prevention program effectiveness may be enhanced by addressing popularity as a risk factor for substance use or working with popular students to be peer leaders to influence social norms and promote healthier choices.

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Most adolescents aspire to be popular among their peers, and achieving this social status is commonly viewed as both desirable and an indicator of positive youth development. However, there is growing evidence that popularity may be hazardous to an adolescent's health. Due to a confluence of biological and psychosocial factors, adolescence is a period of heightened vulnerability to risk taking (Steinberg, 2004). Adolescents who are perceived as popular may be particularly inclined to engage in risk taking, as evidenced by their greater involvement in sexual activity (Mayeux, Sandstrom, & Cillessen, 2008), minor delinquency (Allen, Porter, McFarland, Marsh, & McElhaney, 2005) and substance use (Alexander, Piazza, Mekos, & Valente, 2001; Diego, Field, & Sanders, 2003; Pirkle & Richter, 2006) compared to their less popular peers. It has been suggested that this heightened risk taking, which often takes the form of engagement in "adult" behaviors, may be one of the strategies that popular adolescents use to maintain their elevated social status (Mayeux et al., 2008). Of course, this risk taking can also put the adolescent at risk of short- and long-term adverse consequences; for example, there is evidence that popular adolescents drink more heavily in early adulthood and are at heightened risk for problem drinking by middle adulthood (Dubow, Boxer, & Huesmann, 2008).

Within this literature on adolescent popularity and substance use, there is no gold standard for the assessment of popularity and a diverse array of measures has been used. Sociometric measures of popularity involve eliciting nominations of classmates or schoolmates, and calculating popularity based on the number of nominations each adolescent receives. Some sociometric measures ask students to identify peers who are considered in the school to be the most popular (Killea-Jones,

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Nakajima, & Costanzo, 2007; Mayeux et al., 2008). A more common approach is to assess popularity by asking students to identify their closest or best friends (Alexander et al., 2001; Valente, Unger, & Johnson, 2005), or peers with whom they would desire to be best friends (Dubow et al., 2008) or spend their free time (Allen et al., 2005). Of these various measures, asking students to identify their best friends may actually yield the best indicator of popularity because it is based on actual friendships between students rather than perceptions of others' popularity or the desire to establish relationships with others students.

Studies using the sociometric measures of popularity just mentioned tend to find positive associations with adolescent substance use, although the evidence appears to be more consistent in the case of alcohol use than cigarette smoking. For example, studies of both middle school students (Allen et al., 2005) and high school students (Mayeux et al., 2008) indicate that popular students are at higher risk of increasing their alcohol use over time (Allen et al., 2005; Mayeux et al., 2008). At least one study has found this association to be stronger for older adolescents than younger ones (Ennett et al., 2006). In terms of smoking, there is some evidence that popularity is associated with an increased susceptibility to smoke (e.g., Valente et al., 2005), but other studies have either not found an association (Aloise-Young & Kaeppler, 2005; Ennett et al., 2006; Mayeux et al., 2008) or suggested that it may be limited to schools with relatively high prevalence of student smoking (Alexander et al., 2001).

The second major approach to assessing popularity is through the use of egocentric measures. Examples of egocentric measures include asking adolescents to rate their own level of popularity at school on a Likert scale, or to categorize themselves as "very popular," "somewhat popular" or "not popular." Diego et al. (2003) found that high school seniors who rated themselves as more popular reported greater cigarette, alcohol, and marijuana use. Another study focusing exclusively on female adolescents and young adults found that those who drank heavily and smoked were more likely to rate themselves as very popular compared to those who were nonsmokers and non heavy drinkers (Pirkle & Richter, 2006).

Given that studies rarely include both egocentric (self-rated) and sociometric (peer-nominated) measures of popularity, it is unclear whether the association between popularity and adolescent substance use varies depending on the type of measure used. In both cases, adolescents scoring higher on popularity may engage in substance use as a means of gaining or maintaining a higher social standing among their peers. However, because sociometric measures of popularity are based on actual connections with peers, they may be even more strongly associated with substance use than egocentric measures if they also capture greater access to substances and peer modeling of their use.

To better understand the association between popularity and substance use, a small number of studies have examined whether this association is moderated by gender. There is reason to suspect that this might be the case given that adolescent girls are more integrated into school social networks than boys (Urberg, Degirmencioglu, Tolson, & Halliday-Scher, 1995), and girls' substance use tends to be more strongly associated with peer influences in cases where gender differences emerge (Flay et al., 1994; Gaughan, 2006; van den Bree, Whitmer, & Pickworth, 2004). Valente et al. (2005) found a marginally significant effect indicating that the association between the number of friendship nominations in 6th grade and smoking one year later was stronger for girls than boys. A more recent sociometric study that directly assessed popularity in an older cohort of 10th graders did not find any evidence that gender moderated the association over a two-year period (Mayeux et al., 2008). Further research on the potential moderating role of gender is clearly needed in light of the equivocal findings to emerge from the small number of studies to date.

The present study examines the association between popularity and substance use among middle school students. We extend prior work in this area in four main respects. First, we include both an egocentric and a sociometric measure of popularity to examine their relative importance as risk factors for adolescent substance use. Second, studies of popularity and substance use have primarily examined cigarette smoking and drinking, with little attention focused on illicit drug use. In this study we examine how cigarette, alcohol, and marijuana use are associated with popularity. Third, we add to the small literature examining the potential moderating role of gender by testing whether these associations differ for boys and girls. Finally, middle school aged Hispanic youth are sometimes found to have higher rates of substance use than similarly aged non-Hispanic White, African American and Asian youth (Johnston, O'Malley, Bachman, & Schulenberg, 2009; Shih, Miles, Tucker, Zhou, & D'Amico, *in press*), and there is some evidence that peer relationships may have a particularly strong influence on the substance use of Hispanic youth during this period (Lopez et al., 2009; Yan, Beck, Howard, Shattuck, & Kerr, 2008). This study extends the current literature on popularity and substance use by examining these associations in a predominantly Hispanic sample of middle-school students.

Methods

Participants

Participants were part of the Project CHOICE (D'Amico & Tucker, 2008) field trial conducted in the greater Los Angeles area and designed to evaluate this voluntary after-school substance use prevention program. Sixth-, seventh-, and eighth-grade students ($N = 8932$) from 16 middle schools were enrolled in the study and completed a baseline in-school survey in Fall 2008. Approximately 3–5% of these students requested the survey in Spanish depending upon the school, and less than 1% requested the survey in Korean. As part of a supplemental data collection effort, students ($n = 2002$) at three of the 16 schools were administered a friend nomination survey at the time that they completed the baseline in-school survey (Green, 2008). The present analyses are based on 1793 respondents who completed both the main survey and the friend nomination survey

at one of these three schools and were not missing information on gender. The analytic sample was 49% male, 73% Hispanic, 9% Asian, 8% Other, 7% non-Hispanic White, and 3% African American. About one-half (53%) of respondents reported having an intact nuclear family and 16% earned grades of mostly C's or worse in the past year. Average age was 12.12 years (range = 10–15 years). A Certificate of Confidentiality was obtained from the National Institutes of Health. All study materials and procedures were approved by the individual schools, the school districts, and the institution's Internal Review Board.

Measures

Background control variables

All analyses controlled for the following sociodemographic variables: gender (0 = *male*, 1 = *female*), ethnicity (non-Hispanic white, Hispanic, Asian, and Other), and whether the student had an intact nuclear family (i.e., currently lived with both biological parents; 0 = *no*, 1 = *yes*). Analyses also controlled for three school-related variables: grade in school (6th, 7th, or 8th), academic performance during the past year (1 = *mostly F's* to 8 = *mostly A's*), and which of the three schools the student attended.

Substance use

Seven indicators of alcohol, cigarette, and marijuana use were assessed using well-established measures such as those from the California Healthy Kids Survey (WestEd, 2008) and Project ALERT (Ellickson, McCaffrey, Ghosh-Dastidar, & Longshore, 2003). Lifetime use was assessed by asking: "During your life, how many times have you used or tried... cigarettes, even one or two puffs; marijuana; one full drink of alcohol?" (1 = *none* to 6 = *7 or more times*). Past month use was assessed by asking: "During the past month, how many days did you use... cigarettes; marijuana; at least one drink of alcohol; five or more drinks of alcohol in a row?" (1 = *0 days* to 7 = *20–30 days*). Due to the very rare responses at higher levels of use, we dichotomized both lifetime and past month use to *any use* versus *no use*.

Popularity

Self-rated popularity was assessed with a 5-item scale based on a measure of social goals developed by Jarvinen and Nicholls (Jarvinen & Nicholls, 1996). Students were asked to think about when they were with people their own age and rate their agreement with each item (1 = *strongly agree* to 4 = *strongly disagree*). Sample items included "When I'm with people my own age, everyone wants to be my friend" and "When I'm with people my own age, I'm the most popular." The five items were averaged, with higher scores indicating greater self-rated popularity ($\alpha = 0.84$). Peer-nominated popularity was assessed by asking students to write the first and last names of "the friends at this school who you hang out with." After matching students' names with their survey ID numbers, nominations were analyzed with the computer program UCINET (Borgatti, Everett, & Freeman, 2002). The number of friendship nominations ranged from 0 to 16. Peer-nominated popularity was calculated by summing the total number of friendship nominations received by each student and then standardizing this value within schools to adjust for school-based differences in the average number of nominations. This indicator of popularity corresponds to the "indegree centrality" network measure that assesses popularity as measured by direct linkages with others (Freeman, 1979).

Analytic approach

To adjust for bias caused by missing data within the survey, we used a multiple imputation based approach, using a sequence of regression models. We imputed and analyzed 15 datasets separated by 10 iterations using the IVEware software package (Raghunathan, Solenberger, & Van Hoewyk, 2002), which allows for the incorporation of clustered data (in schools) in the imputation process; IVEware is a SAS add-on, which uses SAS Software Version 9.2 procedures to estimate the regression models on which the imputations are based. IVEware uses survey data analysis methods, identifying a primary sampling unit which is incorporated into the estimation of models – other approaches to imputation (e.g., Proc MI in SAS) do not allow such estimators. Imputations were carried out separately for males and females in the sample to preserve any information about interaction effects with gender. Where appropriate, we treated variables as categorical for the purposes of imputation. These 15 imputed datasets were analyzed separately and the results were combined using the formulae provided by Little and Rubin (1987) using SAS Proc MICombine. This approach gives valid results when the data are missing at random or missing completely at random (Schafer & Graham, 2002). We imputed all missing variables except for age, gender, and race/ethnicity. Where these variables were missing (<0.1%), the case was excluded from the analysis ($n = 1$ for our analytic sample).

Responses to substance use measures were highly skewed, and so we dichotomized these measures to create 'none' or 'some' use. We then used a series of logistic regression models to examine associations between the two indicators of popularity and the seven substance use outcomes. We first examined associations of substance use with popularity, including both indicators of popularity in the same model and controlling for background variables. We then added a quadratic term for each indicator of popularity to these models. Finally, we dropped these two quadratic terms from the models and added two Popularity \times Gender interaction terms to examine whether the associations of self-rated popularity and peer-nominated popularity with substance use significantly differed for boys and girls. School was dummy coded and treated as a covariate in

the model. Project CHOICE was implemented after the baseline survey and thus there is no adjustment for program participation in these analyses.

Results

Students received a mean of 2.51 ($SD = 2.33$) friend nominations (based on raw indegree scores) and rated themselves moderately on popularity ($M = 2.25$, $SD = 0.79$, on a 1–5 scale). We found no evidence for a correlation between self-rated popularity and peer-nominated popularity ($r = 0.03$; 95% $CI = -0.02, 0.08$). Rates of lifetime substance use were 7% for marijuana use, 9% for cigarette smoking, and 21% for alcohol use. Rates of past month substance use were 2% for smoking, 3% for marijuana use, 3% for heavy drinking, and 8% for alcohol use. Spearman correlations among the three indicators of lifetime use ranged from $r = 0.37$ to $r = 0.50$ (average $r = 0.43$), and among the four indicators of past month use ranged from $r = 0.25$ to $r = 0.58$ (average $r = 0.36$).

Results from the logistic regression analyses are presented in Table 1 for lifetime use and Table 2 for past month use. Both self-rated popularity and peer-nominated popularity were consistently and positively associated with lifetime cigarette smoking, drinking, and marijuana use. The associations with self-rated popularity tended to be of stronger magnitude. In addition to popularity, adolescents were significantly more likely to report lifetime substance use if they were in a higher grade, did not have an intact nuclear family (cigarettes and alcohol only), and earned poorer grades in the past year.

In the case of past month substance use (Table 2), both self-rated popularity and peer-nominated popularity were associated with past month drinking. However, only self-rated popularity was associated with past month heavy drinking and marijuana use. Neither indicator of popularity was significantly associated with past month cigarette smoking. In addition to popularity, adolescents were significantly more likely to be current substance users if they were female (drinking and heavy drinking only), were in a higher grade (drinking, heavy drinking, and marijuana use only), and earned poorer grades in the past year.

The second set of analyses added a quadratic term for self-rated popularity and peer-nominated popularity to the models shown in Tables 1 and 2. The quadratic term was significant for peer-nominated popularity ($OR = 0.73$, 95% $CI = 0.54, 0.99$), but not self-rated popularity ($OR = 0.96$, 95% $CI = 0.63, 1.47$), in the case of past month heavy drinking. Given the difficulties of interpreting non-linear relationships in logistic regression, we have plotted the probability of heavy drinking as a function of peer-nominated popularity (Long, 1997). As shown in Fig. 1, the likelihood of being a heavy drinker was lowest (near zero) for the least popular students and highest among the moderately popular students, with the highly popular students falling in between these two groups. The final set of analyses dropped the two quadratic terms, but added two Popularity \times Gender interaction terms to the models shown in Tables 1 and 2. None of these interactions was statistically significant at $p < 0.05$, indicating that the associations between popularity and substance use were similar for boys and girls.

Discussion

Popularity among one's peers is a desired social goal during the middle school years, but students who achieve this goal may pay an unforeseen price: they are at higher risk for early initiation of cigarette, alcohol, and marijuana use. The early initiation of substance use, in turn, is associated with heavier use and a wide range of other behavioral problems during late adolescence and young adulthood (D'Amico, Ellickson, Collins, Martino, & Klein, 2005; Ellickson, Tucker, & Klein, 2003; Ellickson, Tucker, Klein, & Saner, 2004; Hingson, Heeren, & Winter, 2006). Although several previous studies have similarly shown that popular students are more likely to engage in substance use, results from this study significantly extend our understanding of this association in a number of important respects.

By including multiple measures of popularity in our models, a sociometric measure and an egocentric measure, we were able to assess their relative utility in terms of predicting adolescent substance use. Popularity was associated with substance use initiation, as well as current use of alcohol, regardless of whether it was based on the adolescents' own perceptions of

Table 1

Logistic regression analyses predicting any lifetime substance use from popularity, controlling for background variables.

Predictor variables	Cigarettes		Alcohol		Marijuana	
	OR	[95% CI]	OR	[95% CI]	OR	[95% CI]
Gender (1 = female)	0.84	[0.60, 1.18]	0.98	[0.76, 1.27]	1.14	[0.76, 1.71]
Hispanic (vs. White)	1.63	[0.70, 3.78]	1.27	[0.75, 2.17]	0.81	[0.33, 2.01]
Asian (vs. White)	0.82	[0.27, 2.50]	0.58	[0.28, 1.20]	0.41	[0.11, 1.52]
Other (vs. White)	0.91	[0.34, 2.46]	0.72	[0.38, 1.37]	0.43	[0.14, 1.35]
6th grade (vs. 8th)	0.32	[0.20, 0.52] [‡]	0.23	[0.16, 0.32] [‡]	0.14	[0.07, 0.30] [‡]
7th grade (vs. 8th)	0.52	[0.35, 0.78] [‡]	0.40	[0.30, 0.53] [‡]	0.28	[0.17, 0.48] [‡]
Nuclear family (1 = yes)	0.59	[0.42, 0.82] [‡]	0.72	[0.56, 0.93] [*]	0.67	[0.45, 1.01]
Academic performance	0.76	[0.69, 0.84] [‡]	0.79	[0.74, 0.85] [‡]	0.73	[0.65, 0.81] [‡]
Self-rated popularity	1.40	[1.11, 1.75] [‡]	1.42	[1.20, 1.69] [‡]	1.67	[1.28, 2.19] [‡]
Peer-nominated popularity	1.18	[1.00, 1.38] [*]	1.36	[1.21, 1.53] [‡]	1.21	[1.01, 1.46] [*]

Note. Analyses also control for school attended. ^{*} $p < 0.05$. [‡] $p < 0.01$. [‡] $p < 0.001$.

Table 2

Logistic regression analyses predicting any past month substance use from popularity, controlling for background variables.

Predictor variables	Cigarettes		Alcohol		Heavy drinking		Marijuana	
	OR	[95% CI]	OR	[95% CI]	OR	[95% CI]	OR	[95% CI]
Gender (1 = female)	1.00	[0.50, 1.98]	1.59	[1.09, 2.32]*	2.06	[1.12, 3.79]*	1.44	[0.81, 2.57]
Hispanic (vs. White)	1.54	[0.19, 12.42]	1.77	[0.70, 4.48]	1.36	[0.29, 6.37]	0.72	[0.19, 2.74]
Asian (vs. White)	0.79	[0.05, 13.29]	0.95	[0.28, 3.18]	0.44	[0.04, 5.23]	0.26	[0.03, 2.73]
Other (vs. White)	0.94	[0.08, 10.74]	0.76	[0.25, 2.35]	0.48	[0.06, 3.62]	0.48	[0.09, 2.53]
6th grade (vs. 8th)	0.66	[0.23, 1.90]	0.25	[0.13, 0.46] [‡]	0.33	[0.12, 0.92]*	0.19	[0.06, 0.61] [‡]
7th grade (vs. 8th)	0.94	[0.44, 2.02]	0.41	[0.26, 0.63] [‡]	0.40	[0.18, 0.86]*	0.32	[0.15, 0.69] [‡]
Nuclear family (1 = yes)	0.86	[0.44, 1.68]	0.74	[0.51, 1.06]	0.66	[0.37, 1.20]	1.10	[0.62, 1.94]
Academic performance	0.59	[0.49, 0.71] [‡]	0.71	[0.64, 0.78] [‡]	0.63	[0.54, 0.73] [‡]	0.63	[0.54, 0.73] [‡]
Self-rated popularity	1.37	[0.86, 2.17]	1.65	[1.30, 2.10] [‡]	2.16	[1.45, 3.22] [‡]	1.81	[1.22, 2.70] [‡]
Peer-nominated popularity	0.85	[0.57, 1.24]	1.23	[1.04, 1.46]*	1.06	[0.79, 1.42]	1.14	[0.87, 1.48]

Note. Analyses also control for school attended. * $p < 0.05$. [‡] $p < 0.01$. [‡] $p < 0.001$.

their social standing or the number of school-based peers who nominated them as a friend. In these cases, self-rated popularity tended to be the stronger correlate of substance use, suggesting that perceptions of popularity or position within a social system may have a stronger impact on behaviors and attitudes than actual popularity. It may be the case that adolescents who view themselves as popular are more likely to succumb to peer pressure or otherwise be motivated to engage in risk behavior as a way of maintaining their elevated social standing. Better understanding of the mechanisms underlying the association between adolescent popularity and risk behavior is an important direction for future research.

It is interesting that the self-rated and peer-nominated measures of popularity were essentially uncorrelated, especially in light of previous work showing a moderate level of correspondence in this age group between adolescents' perceptions of social acceptance and sociometric popularity (McElhaney, Antonishak, & Allen, 2008). There are several factors that may have contributed to the lack of association in this study. As is common in studies collecting sociometric data, we did not have complete friendship nomination information due to some students not having consent to participate in the survey, and others either not completing the friend nomination items or providing friend nominations that could not be matched to the correct nominee in the dataset (despite our extensive efforts to match names that varied slightly in spelling or when nicknames were used). Whereas the peer-nominated measure focused exclusively on school-based friendships, the self-report measure referred more broadly to popularity with same-aged peers and thus may have captured relationships with peers outside of school. As discussed more below, this difference in reference group may be particularly relevant in terms of understanding why self-rated popularity, but not peer-nominated popularity, was associated with current marijuana use and heavy drinking. Finally, adolescents may not be fully aware of others' impressions of them and, as a result, may under- or over-estimate their level of popularity (Zuckerman & Jost, 2001).

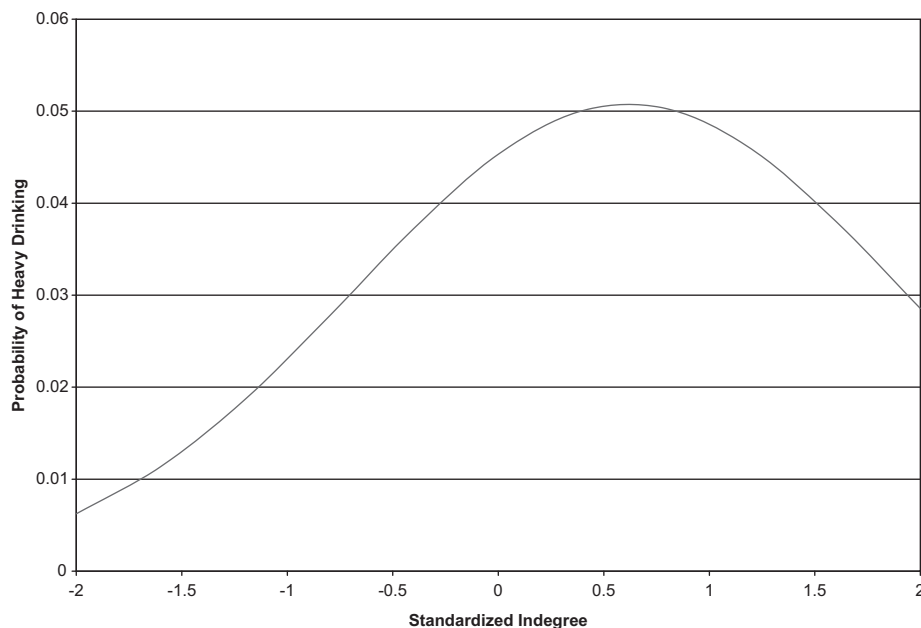


Fig. 1. Quadratic association between peer-nominated popularity (indegree) and past month heavy drinking.

To better understand how popularity is related to adolescent substance use, we explored whether any of these associations might be curvilinear in nature. For example, several studies have shown that socially isolated adolescents are at elevated risk of substance use (Ennett & Bauman, 1993; Ennett et al., 2006; Tani, Chavez, & Deffenbacher, 2001). Thus, one might speculate that both the highly popular and highly unpopular students would be more likely to engage in substance use, although perhaps having different motivations to use (Kuntsche, Knibbe, Gmel, & Engels, 2006). In general, we did not find this to be the case and the one curvilinear association that emerged was in the opposite direction of what we predicted: moderately popular students were more likely to be heavy drinkers than highly popular or highly unpopular students, but only when popularity was assessed via peer nominations. Although a potentially interesting finding, we are cautious in placing too much emphasis on it for a number of reasons: 1) the large number of tests for curvilinearity that were conducted; 2) the marginal significance of the result; 3) a similar pattern did not emerge for self-rated popularity and heavy drinking; and 4) the lack of corroborating evidence from other studies.

There has been some evidence in the literature that the associations of popularity and substance use may differ for boys and girls, but the potential moderating role of gender has rarely been investigated. Valente et al. (2005) reported a trend suggesting that perceived popularity is a stronger correlate of cigarette smoking for girls than boys, perhaps because girls are more strongly motivated to smoke as a means of weight control (Wagner & Atkins, 2000). However, results from the present study, as well as from prior work (Mayeux et al., 2008), provide no support for the idea that popularity has a differential impact on the substance use of boys and girls. Given that so few studies have tested for gender interactions in this context, more research is warranted before drawing any firm conclusions.

Finally, this is one of few studies to focus on popularity as a predictor of illicit or heavier substance use during adolescence. Prior research has shown that peer-nominated popularity is associated with recent marijuana use among 11–13 year olds (Ennett et al., 2006), and self-rated popularity is associated with marijuana use among high school seniors (Diego et al., 2003). In the present study, both peer-nominated and self-rated popularity were associated with lifetime marijuana use, but only the latter was associated with current marijuana use or current heavy drinking. It may be that middle school students who are current drug users and heavier drinkers (drinking five more or drinks in a row), the most severe forms of substance use that we examined, are less integrated into their school environment and have stronger connections outside of school with peers who support their substance use. There is some evidence of this from the Ennett et al. (2006) study: when asked to identify up to their five closest friends, 13-year-old marijuana users named more friends outside of their school than did non-users. Compared to the peer-nominated measure of popularity, our self-report measure may be more strongly related to current marijuana use and heavy drinking because it captures some of these important out-of-school friendships.

This study has a number of limitations that should be noted. First, results are based on a sample of predominantly Hispanic middle school students living in the greater Los Angeles area. Although we consider this mostly Hispanic sample to be a unique and important feature of the study, results may nonetheless not generalize to adolescents who differ on ethnicity (or age or geographic area). Second, results are based on cross-sectional data and thus it is not possible to disentangle the temporal association between popularity and substance use (e.g., does being popular encourage an adolescent to engage in substance use, or does substance use lead an adolescent to become popular?). Third, we obtained self-reported alcohol, cigarette, and marijuana use, of which the limitations are well-documented, although possibly exaggerated (Chan, 2008). We used a number of procedures during the survey to increase the validity of self-reported substance use such as discussing confidentiality, using scan forms to fill in answers, and having study staff (rather than teachers) conduct the survey administration and collect the forms from students. Our self-reported substance use data match data from national surveys, giving us confidence that the current data are valid.

One implication of our findings is that the effectiveness of school-based drug prevention programs may be enhanced by focusing additional effort on promoting anti-drug attitudes and behaviors among the popular students. The popular students on campus, because of their high visibility and larger network of friends, may be particularly influential in establishing social norms for substance use (Valente et al., 2005). If the popular students espouse anti-drug attitudes and behaviors, this may have a significant ripple effect in terms of deterring substance use among the other students on campus. Indeed, this is one of the ideas behind the use of peer leaders in the delivery of school-based drug prevention programs. More generally, our results suggest that it may be important for middle school prevention programs to address the pressures that youth face to be popular and how this pressure may be linked to substance use.

In considering the role of popularity in adolescent substance use, it is important to consider the youth culture in which adolescents live. One of the most significant changes in youth culture over the past decade is the increased use of social networking sites. Although the ways in which the use of such sites may affect the association between popularity and substance use are unknown, use of social networking sites may change how youth perceive their own and their peers' popularity, as well as how they think about the connection between popularity and substance use. An interesting direction for future research is to examine whether self-rated and peer-nominated popularity are influenced by an adolescent's use of social networking sites, as well as whether the use of such sites moderates the associations between popularity and substance use.

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