

# High Peer Popularity Longitudinally Predicts Adolescent Health Risk Behavior, or Does It?: An Examination of Linear and Quadratic Associations

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**Objective** In contrast to prior work, recent theory suggests that high, not low, levels of adolescent peer popularity may be associated with health risk behavior. This study examined (a) whether popularity may be uniquely associated with cigarette use, marijuana use, and sexual risk behavior, beyond the predictive effects of aggression; (b) whether the longitudinal association between popularity and health risk behavior may be curvilinear; and (c) gender moderation. **Methods** A total of 336 adolescents, initially in 10–11th grades, reported cigarette use, marijuana use, and number of sexual intercourse partners at two time points 18 months apart. Sociometric peer nominations were used to examine popularity and aggression. **Results** Longitudinal quadratic effects and gender moderation suggest that both high and low levels of popularity predict some, but not all, health risk behaviors. **Conclusions** New theoretical models can be useful for understanding the complex manner in which health risk behaviors may be reinforced within the peer context.

**Key words** adolescents; health-risk behavior; peer relations; sexual behavior; substance use.

## Introduction

Relatively recently, researchers examining adolescent peer relationships revealed a surprising finding. Although decades of prior research indicated that children who had poor reputations among peers (i.e., rejected, low status) were at greater risk than others for maladjustment outcomes, new research suggested that a distinct construct of peer status may better capture the experience of peer reputations in adolescence (Parkhurst & Hopmeyer, 1998). This newer construct was not based on adolescents' preferences of likeability (i.e., referred to as social preference), but rather adolescents' reputations of popularity (i.e., referred to as social reputation, or "peer-perceived" popularity). Likeability and popularity are only moderately correlated in adolescent samples

(e.g., Cillessen & Mayeux, 2004; Parkhurst & Hopmeyer, 1998). Surprisingly, subsequent research suggested that not low, but high levels of popularity were associated with at least one form of maladjustment—aggressive behavior (Prinstein & Cillessen, 2003; Rose, Swenson, & Waller, 2004). Preliminary data suggested that high levels of popularity also may be associated with higher levels of health risk behavior (Mayeux, Sandstrom, & Cillessen, 2008).

These innovative findings in the developmental psychology literature have important implications for pediatric psychology. Adolescents' engagement in health risk behaviors continues to be reported at alarming levels. In particular, adolescents' substance use remains an important public health concern. The Centers for

Disease Control and Prevention (2010) data indicate that approximately 20% of high school aged adolescents report cigarette and/or marijuana use each month, and these rates have remained relatively consistent for several years (Centers for Disease Control and Prevention, 1998). Adolescents' engagement in sexual risk behavior also is concerning. Over half of adolescents have lost their virginity by 11th grade, and approximately 14% of adolescents report sexual intercourse with more than four partners in high school (Centers for Disease Control and Prevention, 2010). Understanding how adolescents' health risk behavior may arise from social norms within the peer context is critical to prevention efforts.

Social psychologists have offered a rich theoretical basis for understanding individuals' adoption of risky attitudes and behavior. Several of these theories suggest that individuals reference social norms within one's interpersonal context to understand the types of behavior that may be rewarded or punished (e.g., Prototype-Willingness Theory, for instance; Gibbons, Pomery, & Gerrard, 2008; also work on descriptive and injunctive norms; Miller & Prentice, 1996). Adherence to norms that are associated with valued peers are thought to confer a heightened sense of self (i.e., a favorable identity; Harter, Stocker, & Robinson, 1996) and perhaps social rewards (Bandura, 1973). Therefore, it is especially alarming to note that recent research has suggested a link between high levels of popularity and maladaptive behavior. Implications of these results indicate that popular adolescents may be a risk group, and adolescents who aspire to be popular also may be more likely than others to engage in risk behaviors. This notion represents an important paradigm shift, from thinking about risk behavior (e.g., substance use, sexual risk behavior) as a potential consequence of poor social competence, to considering it as a correlate of social success (Allen, Porter, McFarland, Marsh, & McElhaney, 2005).

This study was designed to further examine associations among adolescents' popularity, substance use, and sexual risk behavior. Although substantial research now suggests that high levels of popularity are associated longitudinally with higher levels of adolescents' aggressive behavior, little work has been conducted to determine whether high levels of popularity also may be associated longitudinally with other maladaptive behaviors. Recent preliminary data suggest that examination of health risk behaviors, such as cigarette or marijuana use and sexual risk behavior, may be relevant. For instance, one recent study has suggested that higher levels of adolescents' popularity are associated longitudinally with higher levels of alcohol use and also loss of virginity

(Mayeux et al., 2008). Given prior work linking high levels of popularity with aggression and a long known longitudinal association between aggressive behavior and later substance use (e.g., Hawkins, Catalano, & Miller, 1992) and sexual risk behavior (Prinstein & La Greca, 2004; Underwood, Kupersmidt, & Coie, 1996), research is needed to determine whether popularity is associated uniquely with health risk behavior, or if high levels of popularity merely are serving as a marker for aggressive behavior. Thus, a primary goal of this study was to examine popularity as a unique predictor of cigarette and marijuana use and the number of adolescents' sexual partners, after controlling for adolescents' aggression as a competing predictor.

A second goal of this study was to offer a more thorough examination of the possible links between popularity and adolescent health risk behaviors. Based on prior research and social psychology theories stated above, it was hypothesized that high levels of adolescents' popularity would be associated longitudinally with high levels of adolescents' health risk behavior. However, in pediatric psychology, it is important to consider these social psychological theories from a developmental perspective. Social psychology theories often are applied to adults, among whom a relatively consistent set of values are agreed upon as social norms. In adolescence, however, social norms are especially heterogeneous as youth select from a much wider range of reputations and behaviors that are condoned within subgroups of the peer context (Kroger, 2003). Specifically, in adolescence it is possible that multiple social norms exist within the peer context, and more than one set of social norms may involve high levels of health risk behavior. Further, these norms may vary across specific health risk behaviors (Brechwald & Prinstein, 2011).

Ethnographic research has suggested that peer reputations may be classified based on the extent to which adolescents eschew adult-prescribed values and behaviors (e.g., rule-following, studying) or adopt peer-prescribed values and behaviors (e.g., rule-breaking, substance use; Brown, 1989; Kinney, 1993; Rigsby & McDill, 1975). Adolescents who adopt behaviors that signal high peer values can be highly popular (i.e., if they maintain at least some adult-prescribed values as well; e.g., the "Jocks," or "Populars"; La Greca, Prinstein, & Fetter, 2001). Alternatively, these youth can be low in popularity, if they abandon many adult-prescribed values (e.g., the "Burnouts," La Greca et al., 2001). Based on this idea, a curvilinear association between popularity and adolescent health risk behavior should be examined. Specifically, it may be that both high and low levels of

popularity are associated longitudinally with cigarette and marijuana use and with adolescents' sexual intercourse partners.

On the other hand, there also are data to suggest an opposite curvilinear pattern, wherein popularity is associated with moderately risky behavior but perhaps not extremely risky behavior. Prinstein, Meade, and Cohen (2003) revealed that high levels of popularity were associated concurrently with engagement in oral sex and sexual intercourse. However, when the number of sexual partners was examined, *low* levels of popularity were associated concurrently with higher numbers of oral sex partners. Thus, perhaps moderately risky behaviors are more likely than extremely risky behaviors to be rewarded with high social status in the peer group.

A final consideration of this study pertained to potential gender differences in the magnitude and patterns of associations between popularity and adolescents' health risk behaviors. There is good reason to suspect that social norms vary substantially for adolescent males and females more broadly (Galambos, 2004), as well as specifically with regard to aggression and risk taking behaviors, in which males may be more likely to engage than females (Byrnes, Miller, & Schafer, 1999). If rates of these behaviors and the social norms surrounding them differ by gender, then it might be theorized that such behaviors may be differentially rewarded in the peer context. Indeed, preliminary evidence suggests that there may be gender differences in the associations between adolescents' peer status and their risky and aggressive behaviors. For instance, prior qualitative work has shown that both boys and girls describe boys' popularity as being more characterized by norms of deviance and aggression than girls' popularity (Xie, Li, Boucher, Hutchins, & Cairns, 2006), and longitudinal quantitative research shows that boys' popularity predicts later increases in relational aggression only, whereas for girls these relations are bidirectional (Rose et al., 2004). Additional qualitative findings (Warner, Weber, & Albanes, 1999) suggest that boys' marijuana use may be rewarded in the peer context, whereas girls' marijuana use may only be deemed as acceptable when viewed as "experimenting" (i.e., whereas higher levels of marijuana use are labeled as 'deviant'). Finally, associations between number of sexual partners and peer status has been shown to vary significantly by gender, such that greater numbers of sexual partners are positively correlated with boys' peer status (i.e., likeability), but negatively correlated with girls' peer status (Kreager & Staff, 2009). It may be that certain behaviors that are considered gender normative are associated with high status, but gender nonnormative

behaviors are not associated with popularity. However, very little research has directly tested gender differences in the relationship between peer status and health risk behaviors. An aim of the current study is to understand the role of gender as a moderator of the associations between adolescents' health risk behaviors and popularity.

## Methods

### Participants

A total of 336 adolescents (208 girls and 128 boys) in 10th and 11th grade at study outset participated in the study. The ethnic distribution of the sample was 78.3% White/Caucasian, 11.8% African-American, 2.7% Latino-American, and 7.2% Other/Mixed Ethnicity within a city of middle-class socioeconomic status. According to school records, approximately 23.4% of students were eligible for free or reduced-price lunch. Approximately 17% of adolescents reported that they lived in single-parent families, including one biological parent exclusively.

### Procedures

All students in 10th and 11th grade from a suburban high school were recruited for participation ( $n = 737$ ), with the exception of students in self-contained special education classes. A letter of consent initially was mailed to each adolescent's family followed by a series of reminders and additional letters distributed directly to teens by school and research personnel. Response forms included an option for parents to grant or deny consent; adolescents were asked to return their signed response forms regardless of their parents' decision. Numerous adolescent-, teacher-, and school-based incentives were used to ensure the return of these consent forms. Consent forms were returned by 78% of families ( $n = 573$ ); of these, 93% of parents gave consent for their child's participation ( $n = 532$ ). Data were unavailable for 46 participants due to student absenteeism on the days of testing and missing data (i.e., skipped items), yielding a Time 1 sample of 486 (66% of total population). Adolescent assent was requested at the start of data collection, following written and verbal descriptions of the study procedures. All procedures were approved by the university human subjects committee.

Measures were administered at an initial time point and again 18 months later (i.e., Time 2) when all adolescents were in Grades 11 and 12. By Time 2, 95 of the Time 1 participants eligible for study analyses were unavailable for further participation, and data were missing for an additional 55 students. Attrition analyses revealed no significant differences on any study variable between adolescents who participated at one versus two time points.

A final sample of 336 adolescents therefore was included in all analyses below. All measures were administered in adolescents' classrooms as part of a study on peer relationships and psychological adjustment.

## Measures

### Peer-nominated popularity (i.e., social reputation)

A sociometric procedure was used to obtain measures of adolescents' social reputation, or "peer-perceived" popularity. Using alphabetized rosters of all grade-mates, adolescents were instructed to nominate an unlimited number of peers who were "most popular" and an unlimited number of peers who were "least popular" (LaFontana & Cillessen, 2002; Parkhurst & Hopmeyer, 1998; Prinstein et al., 2003). A sum of the number of nominations each adolescent received on each item was standardized within grade, and a standardized difference score between standardized most- and least-popular nominations was computed as adolescents' social reputation score (i.e., "popularity"). Higher levels of social reputation reflected higher popularity within the overall peer group. Sociometric assessments using these administration and scoring procedures yield the most reliable and valid indices of peer reputations (Coie & Dodge, 1983).

### Peer-nominated aggression

To reflect both overt and relational forms of aggressive behavior, adolescents nominated an unlimited number of peers for each of three peer nomination items ("Who says mean things, threatens, or physically hurts others—for instance, hitting, kicking or pushing others, teasing or calling names?"; "Who uses their friendships as a way of being mean to others—for instance, by telling people that they will not be their friend, excluding someone from their group of friends, or giving someone the 'silent treatment'?"; "Who does things to damage someone's social reputation—for instance, telling rumors about them, gossiping, and saying mean things behind their back?"). The number of nominations adolescents received for each item was summed and standardized within grade. A mean score was computed across standardized scores for all three items to reflect peer-nominated aggression,  $\alpha = .85$ , with higher scores reflecting higher levels of aggressive behavior.

### Youth risk behavior surveillance survey

Items from the Youth Risk Behavior Surveillance Survey (YRBS; Centers for Disease Control and Prevention, 1998) were used for the assessment of substance use and sexual risk behavior. Two substances were assessed: *cigarette use* ("During the past 30 days, how many

cigarettes did you smoke per day?"; responses included 0 cigarettes, 1, 2–3, 4–10, 10–20, or more than 20 cigarettes each day), and *marijuana use* ("During the past 30 days, how many times did you use marijuana?"; responses were coded 1–5, reflecting 0 times, 1–2, 3–9, 10–19, 20 or more times). The number of adolescents' sexual partners was assessed by asking, "In the past year, how many partners did you have sexual intercourse with?" Responses were coded 1–5, reflecting 0 people, 1, 2, 3–4, 5 or more people. Note that these multiple-choice style response sets are used on the YRBS based on expected ranges of risk behavior in a high school sample.

As expected, in this normative sample frequencies of cigarette and marijuana use were positively skewed, particularly at Time 1 (skewness = 4.2 and 3.7, respectively); thus, a log transformation was applied for use in statistical analyses. Log transformed variables for cigarette and marijuana use had lower skew (i.e., 3.4 and 2.6, respectively). Similarly, inspection of residuals from analyses of untransformed variables revealed distributions with higher skew (skewness of residuals for cigarette and marijuana use = 2.5 and 1.8, respectively) than the distributions of residuals from analyses of transformed variables (1.8 and 1.2, respectively). Although these results suggest a non-normally distributed dependent measure (confirmed by statistically significant tests of normality,  $p < .001$ ), this is to be expected in analyses of health risk behavior in a community sample. Alternate transformations did not reveal distributions of residuals more normally shaped. Thus, all analyses were conducted with substance use variables log transformed at both time points.

## Data Analyses

Three hierarchical multiple regression analyses were conducted to examine main study hypotheses. Each model included adolescents' Time 2 level of health risk behavior as a criterion measure and controlled for the corresponding health risk behavior at Time 1 on an initial step (i.e., to examine residual change over time). To examine main study hypotheses, adolescents' gender and peer-reported aggressive behavior were entered on a second step and popularity was entered subsequently on Step 3 to examine its contribution as a statistical predictor of health risk behavior after controlling for the predictive value of aggressive behavior. On Step 4, a product term between popularity and gender was entered to examine gender moderation. Quadratic effects of popularity were examined as incremental predictors above and beyond linear effects. On Step 5 a quadratic product term (i.e., popularity squared) was entered. A three-way interaction (popularity  $\times$  popularity  $\times$  gender) was entered on a sixth



step to examine gender moderation of quadratic effects. All predictors were centered before computing product terms; tolerance and VIF statistics suggested no concerns with multicollinearity. Visual inspection of predicted value  $\times$  standardized residual plots revealed no evidence of heteroscedasticity. Testing of influential observations was conducted both by bootstrapping analyses and regression diagnostics. For all analyses, no evidence was revealed to suggest that any case was overly influential in estimating parameter values (i.e., all  $|DFFIT|$  statistics  $< 1$ , all  $|DFBetas| < 1$ ).

In the presence of a significant moderator effect, post hoc probing was conducted in accordance with typical guidelines (Aiken & West, 1991). This included: (a) computation of new product terms at different levels of the moderator variable; (b) computation of simple slope estimates; and (c) examining the statistical significance of these slopes at different levels of the moderator variable. This approach was used to probe both linear and quadratic effects (Aiken & West, 1991). Simple slope calculations for quadratic  $\times$  dichotomous term (i.e., gender) interactions are conducted in a very similar manner to tests of linear  $\times$  dichotomous term interactions. Specifically, crossproduct terms were calculated between centered variables representing both popularity and gender. Popularity was centered at seven equally-spaced points ( $\pm 1$  SD between  $-3$  and  $3$  SDs from the mean of popularity scores) to examine effects across different levels of popularity. Similarly, the dummy-coded gender variable was alternately centered to yield estimates for males and females. In each simple slope analysis, all two- and three-way interaction effects were computed between centered variables. Regression analyses including all cross-product terms yield an estimate of the association between popularity and the dependent variable at different

points of popularity and for each gender. The significance of this simple slope is determined by a  $t$ -test (Aiken & West, 1991).

## Results

### Preliminary Analyses

Means and standard deviations for all variables, as well as correlations among these variables, are presented in Table I. Moderate stability was revealed for each type of adolescents' health risk behavior.

### Linear and Curvilinear Longitudinal Associations Between Popularity and Health Risk Behaviors

Three hierarchical regressions were conducted to examine the linear and quadratic effects of popularity on cigarette use, marijuana use, and the number of adolescents' sexual intercourse partners, respectively (Tables II and III). Results for cigarette use revealed several significant effects. Since no three-way interaction (i.e., quadratic effect  $\times$  gender) was revealed, results before this term was entered into the model were interpreted and probed post hoc (i.e., see statistics at Step 5 in Table II). As can be seen in the table, results revealed that higher levels of aggression were associated longitudinally with higher frequencies of cigarette use. After accounting for this effect, results also revealed a linear effect of popularity on cigarette use moderated by gender (males:  $b = .05$   $SE b = .02$ ,  $\beta = .25$ ,  $t = 2.42$ ,  $p < .05$ ; females:  $b = -.02$   $SE b = .01$ ,  $\beta = -.08$ ,  $t = -1.46$ , NS), as well as a significant quadratic longitudinal effect of popularity, not moderated by gender. Note that a regression analysis yields a single line of best fit; thus linear and quadratic effects must be interpreted conjointly. In other words, the presence of a significant linear effect modifies the shape of the quadratic effect and vice versa.

Table I. Correlations, Mean (SD) Among All Study Variables

	Time 1					Time 2		
	Cigarette use <sup>1</sup>	Marijuana use <sup>1</sup>	Sex partners	Popularity	Aggression	Cigarette use <sup>1</sup>	Marijuana use <sup>1</sup>	Sex partners
Time 1								
Cigarette use		.37**	.20**	.28**	.39**	.60**	.15*	.17*
Marijuana use			.36**	.17*	.25**	.33**	.46**	.21**
Sex partners				.20**	.26**	.20**	.25**	.49**
Popularity					.42**	.18*	.20**	.23**
Aggression						.32**	.18*	.24**
Time 2								
Cigarette use							.33**	.39**
Marijuana use								.34**
Mean (SD)	1.22 (.83)	1.22 (.64)	1.53 (.96)	-.02 (1.00)	-.04 (.71)	1.46 (1.18)	1.52 (.97)	1.85 (1.04)

<sup>1</sup>Means (SD) of untransformed variables. \* $p < .01$ ; \*\* $p < .001$ .

Table II. Regression Results Examining Linear and Quadratic Associations Among Popularity, Cigarette and Marijuana Use

Predictors	Cigarette use					Marijuana use				
	Step statistics			Final statistics		Step statistics			Final statistics	
	$\Delta R^2$	$b$ (SE $b$ )	$\beta$	$t$	$\beta$	$b$ (SE $b$ )	$t$	$\beta$	$b$ (SE $b$ )	$T$
Step 1	.37***	.84 (.06)	.61	14.12***	.61	.84 (.06)	13.07***	.46	.66 (.07)	9.44***
Time 1 variable										
Step 2	.01	.00 (.02)	.00	0.06	.03	.01 (.02)	0.72	-.09	-.04 (.02)	-1.91
Gender (male=0)										
Aggression		.03 (.01)	.10	2.06*	.13	.04 (.02)	2.42*	.09	.03 (.02)	1.70
Step 3	.00	-.00 (.01)	-.02	-0.38	.25	.05 (.02)	2.29*	.14	.03 (.01)	2.58*
Popularity (pop)										
Step 4	.02***	-.07 (.02)	-.30	-2.90**	-.34	-.08 (.02)	-3.30**	-.33	-.08 (.03)	-2.95**
Popularity $\times$ gender										
Step 5	.02***	-.01 (.00)	-.15	-3.05**	-.16	-.01 (.00)	-3.22**	.01	.00 (.00)	0.20
Popularity $\times$ popularity										
Step 6	.01				-.08	-.02 (.01)	-1.60		-.02 (.02)	-1.22
Pop $\times$ pop $\times$ gender										
Total $R^2$	.41***									

Note. \* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ .

The significant gender interaction for the linear effect of popularity suggests that the overall line of best fit differs by gender, despite the lack of a gender difference in the magnitude of the quadratic effect (see Figure 1).

Results from post hoc probing indicated that among males, there was a significant positive slope between popularity and later cigarette use only at average levels of popularity (i.e., at the mean),  $b = .05$  SE  $b = .02$ ,  $t = 2.26$ ;  $p < .05$ , and almost at high levels (i.e., +1 SD) of popularity,  $b = .07$  SE  $b = .04$ ,  $t = 1.85$ ;  $p = .07$ , but not at low levels (i.e., -1 SD) of popularity,  $b = .03$  SE  $b = .03$ ,  $t = .85$ ; NS. For girls, there was a significant negative slope between popularity and later cigarette use at high and average levels of popularity,  $b = -.05$  and  $-.03$ , SE  $b = .02$  and  $.01$ ,  $t$ 's =  $-3.20$  and  $-2.38$ , respectively,  $p$ 's  $< .05$ , but not at low levels of popularity,  $b = -.01$  SE  $b = .01$ ,  $t = -.60$ ; NS.

Results for marijuana use revealed a significant linear longitudinal effect between popularity and later marijuana use that was moderated by gender. For males, higher levels of popularity were associated with higher levels of Time 2 marijuana use, after controlling for initial marijuana use,  $b = .09$  SE  $b = .02$ ,  $\beta = .44$ ,  $t = 3.81$ ,  $p < .001$ . No significant associations were revealed for females,  $b = .02$  SE  $b = .01$ ,  $\beta = .07$ ,  $t = 1.30$ , NS, and no quadratic effects were revealed.

Results for the number of adolescents' sexual intercourse partners revealed both linear and quadratic effects of popularity that were each moderated by gender. Post hoc probing revealed no significant slopes for females, all  $b$ 's  $< .10$ ,  $t$ 's  $< 1.20$ , NS. For males, results revealed a significant positive slope between popularity and the number of adolescents' sexual partners at high,  $b = .86$ , SE  $b = .22$ ,  $t = 3.94$ ,  $p < .001$ , and average levels of popularity,  $b = .55$ , SE  $b = .12$ ,  $t = 4.48$ ,  $p < .05$ , but not at low levels of popularity,  $b = .25$ , SE  $b = .17$ ,  $t = 1.47$ , NS (Figure 2).

### Discussion

Decades of research have focused on youth experiencing social difficulties, particularly within the overall peer group, as targets for substance use and sexual risk behavior prevention efforts. However, recent work has suggested that adolescents who fare well among peers may be at risk for health risk behavior. This apparent contradiction is largely explained by the difference between constructs of likeability and popularity. Note that many highly popular adolescents are strongly disliked by many of their peers (Parkhurst & Hopmeyer, 1998). This study stringently

Table III. Regression Results Examining Linear and Quadratic Associations Among Popularity and Number of Sexual Intercourse Partners

Predictors	Sex partners						
	Step statistics				Final statistics		
	$\Delta R^2$	$b (SE b)$	$\beta$	$t$	$b (SE b)$	$\beta$	$t$
Step 1	.24***						
Time 1 variable		.54 (.05)	.49	10.08***	.45 (.05)	.41	8.35***
Step 2	.02**						
Gender (male = 0)		-.19 (.10)	-.09	-1.78	-.14 (.11)	-.06	-1.26**
Aggression		.21 (.07)	.14	2.79**	.11 (.09)	.07	1.22
Step 3	.01*						
Popularity (pop)		.12 (.06)	.12	2.19*	.56 (.12)	.53	4.48***
Step 4	.03***						
Popularity $\times$ gender		-.46 (.13)	-.19	-3.60***	-.51 (.13)	-.44	-3.92***
Step 5	.00						
Popularity $\times$ popularity		-.01 (.02)	-.02	-.42	-.01 (.02)	-.03	.64
Step 6	.01*						
Pop $\times$ pop $\times$ gender					-.16 (.08)	-.11	-2.12*
Total $R^2$	.31***						

Note. \* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ .

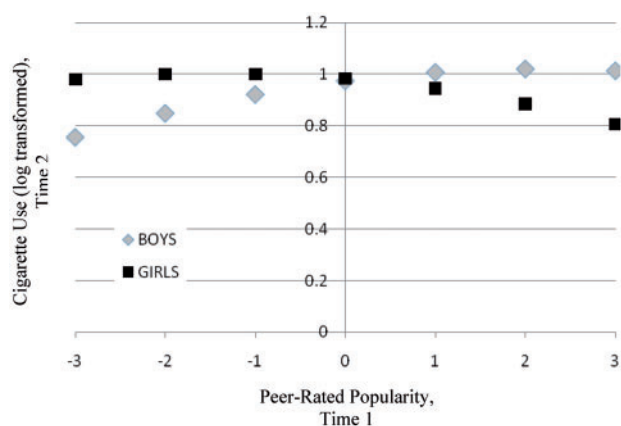


Figure 1. Quadratic Longitudinal Associations Between Popularity and Adolescent Cigarette Use for Boys and Girls.

examined associations between popularity and health risk behavior by (a) examining popularity as a predictor of cigarette use, marijuana use, and sexual risk behavior, above and beyond the predictive effects of adolescents' aggressive behavior; (b) examining linear and quadratic effects between popularity and health risk behavior; and (c) examining gender as a moderator of associations. Results suggested that the association between peer status and health risk behavior may be more complex and nuanced than discussed in prior research. These findings, and subsequent replications of this work, will have important implications for prevention efforts and our understanding of why adolescents engage in risk behaviors.

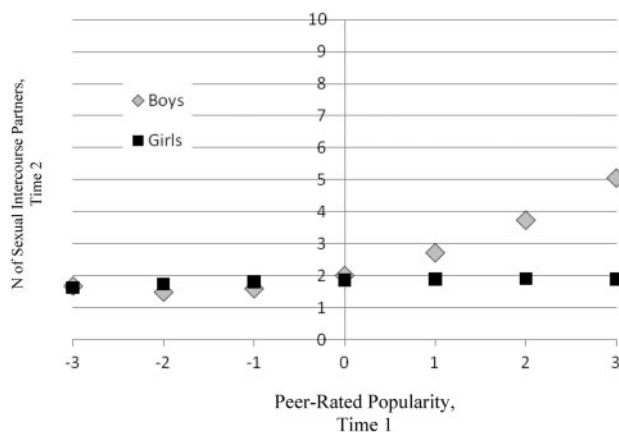


Figure 2. Quadratic Longitudinal Associations Between Popularity and the Number of Adolescents' Sexual Intercourse Partners for Boys and Girls.

In prior work, researchers have revealed that higher levels of adolescents' peer popularity (i.e., social reputation/peer-perceived popularity, dominance, etc.) are associated with increases in overt and relationally aggressive behavior (Cillessen & Rose, 2005; Prinstein & Cillessen, 2003; Rose et al., 2004). Since aggressive behavior often is predictive of engagement in substance use and sexual risk behavior (Hawkins et al., 1992; Prinstein & La Greca, 2004), it is important for research to examine whether popularity is associated uniquely with health risk behavior, or whether popularity may merely be serving as a proxy for other known predictors of health risk, such as aggression. Findings from this study, therefore, offer an important contribution to the literature. Results

suggested that adolescents' peer-reported aggressive behavior indeed was associated longitudinally with increases in adolescents' cigarette use and the number of adolescents' sexual intercourse partners. After controlling for this result, and the association between popularity and aggression, popularity emerged as a predictor of cigarette use, marijuana use, and sexual risk behavior. Thus, popularity may be an important construct to consider when predicting which adolescents may be at greatest risk for engaging in these specific health risk behaviors.

However, it also will be important to recognize that the association between popularity and health risk behavior is not as straightforward as previously was thought. Significant quadratic associations and gender moderation results suggest that the peer context may be very particular about health risk behaviors that are associated with different positions on the peer status hierarchy. Similarly, differential relations may be expected between popularity and various specific health risk behaviors, including those studied here (i.e., cigarette use, marijuana use, and sexual risk), as well as other possible adolescent risk behaviors (e.g., use of other substances, delinquency).

For marijuana use, results were relatively easy to interpret. Among males, higher levels of popularity were associated with higher levels of later marijuana use, after controlling for prior marijuana use; however, no significant results were revealed for females. As boys' level of popularity increases, several factors also may increase, such as access to social gatherings at which illegal substances are available and used, expectations to engage in risky or "mature" behaviors (Moffitt, 1997), and concerns about maintaining high levels of status, which adolescents often believe can be facilitated by increasing their engagement in risk behavior (Rancourt & Prinstein, 2009). Additionally, research suggests that members of popular crowds may be more likely to come from wealthier families, and this access to wealth may lead to increased access to, and opportunities to, engage in substance use (Mayeux et al., 2008). Increasing levels of girls' popularity likely are accompanied by similar access, expectations, and pressures. However, risk behaviors signal different social messages and serve distinct social functions across gender and ethnic groups. Thus, marijuana use may be considered acceptable (i.e., "cool") more for boys than girls, as suggested by prior qualitative research (Warner et al., 1999).

A somewhat different pattern emerged for the prediction of cigarette use, however. The quadratic association between popularity and later cigarette use suggested that popularity may be related to later cigarette use uniquely at

different levels of popularity. A significant linear effect of popularity, moderated by gender, in combination with this unmoderated quadratic effect, revealed a slightly different pattern of findings for boys and girls. For boys at average levels of popularity only, higher levels of popularity were associated with higher levels of later cigarette use. In other words, much like for marijuana use, increasing levels of popularity were associated with increases in cigarette use. However, it is interesting that this effect was restricted to average levels of popularity. Although data were not analyzed using discrete categories of adolescents, the results suggest that there may be subgroups of adolescents for whom different social rules apply. Among boys lower on the status hierarchy, there may be differences in access to cigarettes or pressures to use substances that do not apply as strongly to boys at higher levels of the hierarchy. In contrast, among boys at high levels of popularity, there was no significant association between popularity and cigarette use. Perhaps among the highest status boys, cigarette use does not signal high status as strongly. In fact, lower use of cigarettes among (often popular) athletes may affect the meaning of cigarette use within the peer environment. Among average status youth, cigarette use may signal rebellion, risky behavior, and disenfranchisement with adult values. But among higher status youth, cigarette use may signal poor fitness/health and poorer physical agility. Thus, the same risk behavior (i.e., cigarette use) may have different "meanings" and thus be used for different reasons among adolescents at different positions within the peer hierarchy.

A similar longitudinal, quadratic pattern between popularity and cigarette use was revealed for girls. However, the lack of a simultaneous linear effect for girls altered the pattern of results. At very low levels of girls' popularity, a positive association between popularity and later cigarette use emerged. More dramatically, a negative association between popularity and later cigarette use emerged for girls at average and high levels of popularity. Results clearly suggest that among girls in particular, cigarette use may signal something quite undesirable in the high status peer context. Again, results are suggestive of subgroups of adolescents; within the subgroup of popular girls, the higher status social norm appears to promote refraining from cigarette use.

Perhaps the most striking results from these analyses pertained to quadratic effects and gender moderation of the association between popularity and sexual risk behavior. In this study, sexual risk behavior was operationalized as the number of adolescents' sexual intercourse partners. Among girls, there was no significant longitudinal association between girls' popularity and the number of their



sexual intercourse partners; however, among boys at high and average levels of popularity, results suggested that higher levels of popularity predicted more sexual intercourse partners over time, after controlling for initial levels of sexual behavior. Conventional lore would suggest that adolescent boys high in popularity may have more opportunities than others to attract sexual partners given their status in the peer context as well as other attributes that correlate with high popularity (e.g., increased social opportunities to meet others, physical appearance). Some popular boys, more so than girls, also likely develop reputations of sexual promiscuity that may offer additional opportunities to engage in continued sexual behavior. Among boys low in popularity, however, popularity does not seem to similarly confer additional opportunities to engage in sexual activity. In sum, results on sexual risk behavior, as with results on cigarette use, help to elucidate how similar behaviors may have different meanings within different subgroups of peers. Prevention efforts aiming to reduce health risk behaviors would best address the heterogeneity within groups of adolescents that are at risk for health risk behavior engagement, and use varying health promotion messages to address the different meanings that these behaviors may serve to different subgroups of the larger peer context.

Thus, the current study offers an updated outlook on the associations between health risk behaviors and peer status. The examination of quadratic associations yielded novel results and richer conceptualizations of the types of adolescents at risk for substance use and sexual risk behaviors. However, this study will require replication. Such future work will benefit by addressing some of the most significant limitations of this study. For instance, the opportunity to examine behaviors across an 18-month time period allowed for long-term prediction of behavior; however, this somewhat extended time interval was associated with elevated attrition in this study. The current study's recruitment and retention rates may limit the extent to which findings can be generalized, and a self-selection bias of participants cannot be ruled out. Further, the impact of such bias could be particularly relevant, insofar as adolescent health risk behaviors are typically not normally distributed in the population. Although findings indicated that the retained sample was representative of the larger population from which it was drawn, research with larger and more stable samples will be required. In addition, more ethnically heterogeneous samples and samples with different aged youth sorely are needed as it is expected that social norms could vary considerably across ethnic groups and developmental periods (e.g., early-, mid-, and late-adolescence) within the same

peer context. A sample with adequate power to systematically examine such effects is needed. Last, it is important for future work to more directly examine some of the hypotheses regarding adolescent subgroups and proposed mechanisms that have been raised above in the interpretation of these data, as well as possible differential relations among popularity, health risk behaviors, and various subtypes of aggression (e.g., physical, relational). Further exploration of data using statistical applications designed to reveal subgroups will be important as work in this area progresses.

Overall, this study suggested that high levels of popularity indeed are associated with an increased risk for engagement in some risk behaviors (e.g., marijuana use), and for some other risk behaviors (e.g., cigarette use and number of sexual partners), at least for a subset of adolescents. Findings suggest health risk behaviors may convey different social signals depending on who engages in these behaviors. Prevention efforts should recognize that different approaches may be needed to address the different groups of adolescents at risk.

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