DEVIANT BEHAVIOR
2019, VOL. 40, NO. 12, 1464–1479
https://doi.org/10.1080/01639625.2018.1519128

Routledge
Taylor & Francis Group

No Guts, No Glory: The Influence of Risk-taking on Adolescent Popularity

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ABSTRACT

Existing research finds adolescent popularity to be correlated with risk-taking. While a subset of this research uses longitudinal methods to examine whether part of this correlation may reflect the influence of popularity on risk-taking, research has paid insufficient attention to examining the reverse relation. Drawing on literature from a range of disciplines, we argue that a portion of the correlation reflects the positive influence of risk-taking on popularity. Using longitudinal data from a northeastern sample of adolescents, we test this argument. Net of statistical controls, we find that risk-taking among males, but not females, is associated with higher popularity, but that this relation is curvilinear, such that progressively higher levels of risk-taking yield diminishing returns in male popularity. Results provide one explanation for why male adolescents tend to take more risks in the presence of peers. Likewise, they suggest that attempts to prevent adolescent risk-taking, particularly among males, may require practitioners to move beyond conceiving of adolescent risk-taking as purely irrational behavior reflecting an ostensible inability to perceive potential consequences. Instead, results suggest that male risk-taking should be understood in the context of the salient social rewards that may make it rational from an adolescent perspective.

ARTICLE HISTORY
Received 15 January 2018
Accepted 12 August 2018

Adolescence marks a critical life-course transition during which youth not only become increasingly prone to take risks (Curry and Youngblade 2006; Ellis et al. 2012; Ernst, Romeo, and Andersen 2009; Willoughby et al. 2013), but also become increasingly concerned with social standing among peers (Coleman 1961; Ellis et al. 2012; Ernst, Romeo, and Andersen 2009; LaFontana and Cillessen 2010; Rodkin et al. 2013). During adolescence, research finds that risk-taking tends to be associated with sociometric popularity, reflecting how well-liked an individual is among peers, and with perceived popularity, reflecting the degree to which an individual is influential among peers (Cillessen and Rose 2005). While sociometric popularity tends to be positively correlated with minor forms of non-aggressive risk-taking like substance use or petty theft, it tends to be negatively correlated with aggression and hostility (Allen et al. 2005; Balsa et al. 2010; Coie, Dodge, and Coppotelli 1982; Luthar and D'Avanzo 1999; Michell and Amos 1997; Miller-Johnson et al. 2003; Prinstein and Cillessen 2003). Perceived popularity, on the other hand, appears to be positively correlated with a broader array of risk-taking behaviors ranging from substance use to physical and relational aggression (Adler and Adler 1995, 1998; Cillessen and Mayeux 2004; Farmer and Rodkin 1996; Mayeux, Sandstrom, and Cillessen 2008; Parkhurst and Hopmeyer 1998; Prinstein and Cillessen 2003; Rose, Swenson, and Waller 2004).

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Notwithstanding the wealth of research finding adolescent risk-taking to be correlated with popularity, only a small subset of the empirical literature employs longitudinal data with which to explore whether prior risk-taking is associated with later popularity or vice-versa. Among existing longitudinal studies, most attempt to model the association of prior popularity with future risk-taking. These studies suggest that sociometric and perceived popularity are both associated with future involvement in behaviors like substance use or minor delinquency (Allen et al. 2005; Mayeux, Sandstrom, and Cillessen 2008; Valente, Unger, and Anderson Johnson 2005), and that prior perceived popularity is further associated with future involvement in relational and physical aggression (Cillessen and Mayeux 2004; Prinstein and Cillessen 2003; Sandstrom and Cillessen 2006). These findings can be explained in multiple ways. First, popular adolescents may receive more invitations to social gatherings and these gatherings may provide opportunities for risk-taking behaviors like drug use or unprotected sex (Osgood et al. 1996). Second, popular adolescents may be disproportionately exposed to the subset of peers who are themselves involved in risky behavior and who therefore model or reinforce such behavior (Akers 2009; Allen et al. 2005). Third, popularity may promote physical or relational aggression aimed at protecting one's social standing (Caravita and Cillessen 2011; Cillessen and Mayeux 2004).

Whereas numerous studies have examined whether prior adolescent popularity is associated with future risk-taking, the quantitative literature has paid insufficient attention to the reverse relation. Although qualitative research provides preliminary evidence that prior risk-taking is associated with future popularity (Adler and Adler 1998; Anderson 1999; Contreras 2013; Katz 1988), "no quantitative studies [prior to 2004] have addressed the social behavioral antecedents of perceived popularity" (Rose, Swenson, and Waller 2004:380). Rose, Swenson, and Waller (2004) provide preliminary research addressing this issue, but operationalize risk-taking in terms of physical aggression (which they do not find to be independently associated with popularity) and relational aggression (e.g., spreading rumors, which may not be a clear indicator of personal risk-taking, per se). Mayeux, Sandstrom, and Cillessen (2008) likewise attempt to assess the association of adolescent risk-taking with future popularity, but they include alcohol use, cigarette smoking, and sexual activity as three separate independent variables in the same simultaneous equation model. Perhaps given the strong positive correlations[1] among these separate measures (i.e., bivariate correlations as high as .65), Mayeux, Sandstrom, and Cillessen (2008) results remain equivocal, suggesting that smoking is associated with later perceived popularity among males, but that the other putative measures of risk-taking are not. In sum, the existing literature provides relatively few studies concerning the association of prior risk-taking with future popularity, and the limited existing research has generated equivocal results.

Theoretically, however, there exists reason to predict that risk-taking promotes popularity among adolescents. Even as terms like "risk-taking" tend to have negative connotations among adults for whom they conjure images of potential harm, Byrnes, Miller, and Schafer (1999:368) rightfully observe that "people do not successfully adapt to their surroundings by avoiding all the risks they face." Entrepreneurship and financial investment may be risky in any number of ways, for example, but can also be direct sources of economic wealth for the investor. Similarly, daring adolescents may sometimes reap material and/or visceral rewards from behavior in which more conservative counterparts are not willing to engage.

The potential benefits of risk-taking, however, do not always accrue to the risk-taker alone. Rather, risk-takers often provide multiple benefits to the social groups in which they are embedded. First, risk-takers may provide protection for their associates. Gang members who are willing to fight,

[1]There remains debate about what constitutes a reasonable threshold-correlation for diagnosing collinearity problems. While some have argued that collinearity is a problem only when the absolute value of a correlation exceeds .90, others have claimed that the appropriate threshold is in the range of .50 to .70 (Booth, Niccolucci, and Schuster 1994; Dorman et al. 2012). Given this ambiguity, it remains an open question as to whether collinearity presented a problem in Mayeux, Sandstrom, and Cillessen (2008) study, but this possibility is one reason that we have opted to construct an overall risk-taking scale for our multivariate analyses rather than including multiple indicators of risk-taking as separate predictors.

for example, may be more valuable to peers than those who are not. Second, risk-takers may furnish associates with desirable resources. An adolescent who is willing to take a bottle from his or her family's liquor cabinet, for example, can provide alcohol for friends at a social gathering. Third, risk-takers may simply be more fun than their risk-avoidant counterparts, and their behavior may often serve to entertain or amuse peers. Hazing, for example, would appear to provide compelling entertainment for members of fraternities and sororities even as it sometimes leads to injury among pledges. Insofar as risk-takers provide these or other benefits to their adolescent peers, they may become more well-liked and/or more influential among them (see Rebellon 2006).

The degree to which risk promotes popularity, however, may be contingent on multiple factors. First, risk-taking may be particularly conducive to popularity during adolescence. Whereas younger children "may not yet differentiate the goals of *developing relationships* from *demonstrating status* (emphasis in original)" and "may not yet recognize the unique profiles of popular [i.e., influential] and preferred [i.e., liked] children," research suggests that youth become highly attuned to such distinctions as they enter adolescence (Rodkin et al. 2013:1139; but see Adler and Adler 1998). While adolescents may value both sociometric and perceived popularity as desirable outcomes, research suggests that they are particularly likely to value perceived popularity (Adler and Adler 1998; Cillessen and Rose 2005). To the degree that perceived popularity involves relative levels of interpersonal status, influence, prestige, or dominance, it may represent a zero-sum outcome that one actor acquires at the expense of others (Ellis et al. 2012). Ellis et al. (2012:604–605) therefore argue that "competition for peer status and acceptance may be most intense and consequential in early adolescence" and that "successful risk-taking (e.g., fighting, stealing something valuable, daredevilry, substance use, risky sports), where real danger is involved, is often admired and confers status" among adolescents' peers (see also Daly and Wilson 1988; Rebellon 2002, 2006; Zahavi and Zahavi 1997).

A second factor that may condition the degree to which risk promotes popularity is gender. In particular, male adolescents may gain greater social benefit from risk-taking than their female counterparts. From the perspective of evolutionary theory, males "have more to gain, and less to lose, from engaging in high-risk behaviors when a successful outcome can improve attractiveness or social status—and therefore potential reproductive success" (Ellis et al. 2012:611). Research, for example, suggests that females across dozens of cultures from six continents tend to value the social status of prospective male mates more than males tend to value the social status of prospective female mates (Buss 1989). Similarly, from a sociological perspective, patriarchal societies may be characterized not only by structural gender inequality in the family (e.g., Hagan, Gillis, and Simpson 1985; Blackwell and Piquero 2005; Hayslett-Mccall and Bernard (2002); but also by a broader culture of gendered behavioral expectations (Heimer and De Coster 1999). Drawing on existing theory and research (e.g., Burke 1989; Jackman 1994; Messerschmidt 1993), Heimer and De Coster (1999:282 [emphasis in original]) assert that "in patriarchal society, *femininity* often is equated with a high capacity for nurturance, a tendency toward passivity rather than aggressiveness, and physical and emotional weakness; by contrast, *masculinity*, tends to be equated with competitiveness, independence, rationality, and strength."

In turn, cultural conceptions of masculinity and femininity may account for females' greater propensity to feel ashamed for their own risk-taking behavior (Blackwell 2000; Finley and Grasmick 1985) and to be more concerned than males with the potentially negative social ramifications of such behavior (Gilligan 1982; Richards and Tittle 1981). Beyond encouraging adolescents to behave in "gender-appropriate" ways, such norms may lead adolescents to view risk-taking behavior more favorably among male peers and, by extension, to bestow higher social standing to risk-taking males than to risk-taking females. In sum, then, sociological theory and evolutionary theory both suggest that risk-taking may increase popularity for males, but evolutionary theory suggests that this relation should remain even after adjusting statistically for adherence to masculine/feminine cultural norms while sociological theory instead suggests that risk-taking should no longer be related to male popularity upon adjusting statistically for adherence to such norms.

Finally, aside from being contingent on age and gender, the relation between risk-taking and popularity may be stronger when the risk-taking in question poses personal, rather than collective, danger. An adolescent's daredevilry may sometimes provide his or her peers with entertainment, for example, but may severely injure those peers if it involves recklessly driving a car in which they are passengers. To the degree that progressively higher levels of individual risk-taking begin to endanger an individual's associates rather than endangering him or her alone, the relation between risk-taking and popularity may be curvilinear. In particular, progressively higher levels of risk may yield diminishing increases, and eventual decreases, in popularity (Rebellon 2002).

Current study

In light of the preceding discussion, the present study uses primary data from a longitudinal study of adolescents in a northeastern state to examine the relation between risk-taking and popularity. In particular, it tests three hypotheses derived from the above discussion:

Hypothesis 1: Risk-taking at one point in time will be associated with popularity at a later point in time.

Hypothesis 2: The positive relation between risk-taking and popularity will be stronger for males than females and will remain for males even after adjusting statistically for controls, including adherence to culturally-prescribed masculine and feminine gender-norms.

Hypothesis 3: The positive relation between risk-taking and popularity will be curvilinear, such that risk-taking beyond a certain point will yield diminishing returns in popularity.

Method

Data

Our data come from a convenience sample of adolescents who participated in the New Hampshire Youth Study (NHYS), a multi-wave longitudinal study of delinquency and rule-violating behavior among youth in southern New Hampshire (see Cohn et al. 2010). The specific data used in this study were collected during the fall of 2007, spring of 2008, and fall of 2008, with approximately six months between waves. We will refer to these waves as time 1 (T1; fall 2007), time 2 (T2; spring 2008), and time 3 (T3; fall 2008). Out of the 1,054 individuals who returned parental consent forms (see Cohn et al. 2010), 941 completed questionnaires at T1, 828 at T2, and 867 at T3.

Participants

Only participants who provided complete data for all three collection periods were included in the analyses, for a total of 661 participants. In comparison to these 661 participants, those not included in our analysis were statistically similar in terms of their gender and race composition, their T1 reports of parental education, their perceptions of family income, and their self-reported popularity at T1. However, whereas the 661 participants included in our analysis reported a mean age of 13.55 at T1, those not included reported a significantly higher mean age of 14.15 ($p < .01$). Of those included in our analysis, 58.7% were females and 19.8% reported being of minority racial/ethnic status.

Procedure

Similar procedures were used at each data collection period. All procedures were reviewed and approved by an Institutional Review Board. Informed consent was obtained from all participants included in the study. Participants completed questionnaires in mass testing sessions at their school (see Cohn et al. 2010 for a more detailed discussion of school selection and collection procedures). Participants were given verbal instruction on how to complete the questionnaire and were assured that all of their responses would be kept confidential. The questionnaire took approximately 30–45 minutes to complete. To reduce fatigue, participations were given a short break after completing the first half of the questionnaire. When they were finished, participants signed out with the researchers and were given a $10 gift certificate to a national book store, thanked for their time, and sent back to their regularly-scheduled classes.

Measures

Individual items for each scale can be found in Table 1 or the Appendix. Unless otherwise noted, all items used a 4-point Likert response option (0: *Strongly disagree*; 3: *Strongly agree*) and were re-coded (when necessary) so that higher scores signified a higher amount of the measured attribute. Scales were created by averaging the items.

Popularity

Seven items were available in our data to assess how popular participants perceived themselves to be among their peers. We note that research finds self-reported measures of popularity among peers to be correlated with a range of risk-taking behaviors in much the same way as measures derived from peer nominations (Alexander et al. 2001; Mayeux and Cillessen 2008; Tucker et al. 2011). We interpret our items as being more akin to network measures of perceived popularity than sociometric popularity because, among middle-school and high-school students, "*popular* refers to being visible and prestigious" more than to being liked (Cillessen and Marks 2011:30 [emphasis in original]). All seven of our self-reported popularity items were included at both T1 (M = 1.94, SD = .69, α = .88) and T3 (M = 1.92, SD = .67, α = .89).

Risk-taking

We use a 4-item risk-taking subscale from Grasmick et al.'s (1993) measure of self-control to measure participants' preference for risky behavior at T1 (M = 1.39, SD = .79, α = .84). In addition, we constructed a squared term by multiplying risk-taking by itself (M = 2.56, SD = 2.34) in order to examine whether the relation between risk-taking and popularity is curvilinear. Table 1 presents a

Table 1. Exploratory factor analysis of risk-taking and popularity items.

		Popularity	Risk- taking
1.	I spend a lot of time with other kids after school.	**.80**	.08
2.	I spend a lot of time with other kids on weekends.	**.72**	.09
3.	I spend a lot of time with other kids on weeknights.	**.73**	.18
4.	Kids my age invite me to do things with them.	**.78**	−.04
5.	I am popular among males my age.	**.71**	.22
6.	I am popular among females my age.	**.75**	.10
7.	Kids my age think I'm fun.	**.76**	.01
8.	I like to test myself every now and then by doing something a little risky.	.04	**.77**
9.	Sometimes I will take a risk just for the fun of it.	.14	**.87**
10.	I sometimes find it exciting to do things for which I might get in trouble.	.11	**.85**
11.	Excitement and adventure are more important to me than security.	.08	**.77**
Eigenvalue		4.38	2.40
% of variance		39.84%	21.81%

factor analysis demonstrating the reliability and discriminant validity of our popularity and risk-taking measures.

Demographics

Participants reported their age, sex, and race. Given that a large majority of the sample was white, we collapsed race into a dichotomous variable (0 = non-white; 1 = white). We included two measures of socioeconomic status in our analysis because ethnographic research suggests popularity among adolescents to be associated with family wealth (Eder 1985). The first measure asked participants to report the educational background of each parent (1: *Less than high school*; 6: *Professional/ Graduate Degree*). For youth who reported values for two parents, we averaged the two items to create a consistent range across two-parent and single-parent families (M = 3.58, SD = 1.26). The second measure was a single item asking participants to rate how much money they believed their family has (1: *Very little money available*; 5: *Lots of money available*). These two measures of SES were kept separate in multivariate analysis because they were not highly correlated with each other (r = .27) and could therefore have differential influences on popularity.

Additional controls

In addition to demographics, we included a number of other controls that could potentially be associated with popularity among males, females, or both. We describe these measures below, and likewise provide a rationale for their inclusion in multivariate analyses.

Selfishness. The first control was a 4-item measure of selfishness (M = .90, SD = .67, α = .79) taken from Grasmick et al.'s (1993) measure of self-control. This scale assessed participants' propensity to be self-centered and indifferent to the needs of others. Research (e.g., Grasmick et al. 1993) finds that selfishness is correlated with risk-taking. Therefore, if selfishness were *negatively* related to popularity, omitting a statistical control for selfishness might artificially suppress a positive relation between risk-taking and popularity.

Self-esteem and mastery. The second control was a 3-item measure of self-esteem (M = 2.27, SD = .66, α = .84) and the third was a 6-item measure of mastery (M = 1.94, SD = .55, α = .69), which indicated the extent to which participants felt a sense of personal control over life circumstances (Pearlin and Schooler 1978). We control for these measures to guard against the possibility that risk-taking could be more common among those with high levels of self-esteem and/or mastery, and that a positive relation between risk-taking and popularity might actually reflect the influence of self-esteem and/or mastery on popularity.

Masculinity and femininity. The fourth and fifth controls were a 5-item measure of masculinity (M = 2.21, SD = .53, α = .71) and a 6-item measure of femininity (M = 1.88, SD = .58, α = .74), which assessed participants' adherence to masculine and feminine characteristics (adapted from: Bem 1974; Spence and Helmreich 1978). We include these controls for a number of reasons. First, sociological theory and research have long suggested a link between masculinity and risky behavior among males (Messerschmidt 1993; Parsons 1964). Second, the gender socialization literature suggests that dominant norms in multiple cultures encourage masculine traits like assertiveness and confidence among males while encouraging feminine traits like cooperation and humility among females (Barrett and White 2002; Van Gundy et al. 2005). Third, the concept of masculinity involves traits like assertiveness, independence, and ambition, none of which necessarily involve pursuing dangerous behavior, per se (see e.g., Donnelly and Twenge 2017).[2] Fourth, controlling for a masculinity

[2]After eliminating one masculinity item concerning risk-taking, a factor analysis of our remaining masculinity and risk-taking items (available upon request) generated two clear factors, with all items loading higher than .60 on their intended factor and lower than .10 on the alternative factor. Our risk-taking and masculinity scales are comprised of items included in the factor analysis (these items are listed in the Appendix).

scale that aims to operationalize culturally-prescribed gender norms allows us to evaluate whether any positive relation between risk-taking and popularity among males is better explained by evolutionary or sociological theory (both of which predict a positive relation, but each of which makes that prediction for very different reasons, as described above). Finally, controlling for masculinity and femininity allows us to adjust for age and/or period effects that have been noted in the existing literature on adolescence. In particular, research suggests that male adherence to traditional masculine gender roles tends to increase in middle-school (Rogers, DeLay, and Martin 2017) and that female adherence to feminine gender roles has been decreasing over time since the 1990s (Donnelly and Twenge 2017). In sum, we include measures of masculinity and femininity in order to examine, as best our data allow, whether risk-taking is associated with popularity for reasons that may, as per evolutionary theory, extend beyond cultural norms stemming from gender socialization.[3] Table 2 provides descriptive statistics for all control variables, disaggregated by gender.

Analytic strategy

Our multivariate analyses include six ordinary least squares (OLS) regressions assessing the relation between risk-taking and popularity. The first four models pool participants of both genders into the same analyses and three of these models use interaction terms (following Aiken and West 1991) to examine whether the relation between risk-taking and popularity differs by gender. The latter three models likewise use a risk-taking-squared term to examine whether the relation between risk-taking and popularity is curvilinear. If our prediction is correct, the effect of risk-taking (particularly for males) should be positive, but the effect of risk-taking-squared should be negative, reflecting the diminishing returns of risk-taking on popularity (particularly for males). As an alternative means of comparing our predictors' effects across gender, two further regressions are run separately for males versus females, and including all predictors other than gender and our interaction terms.

Table 2. Descriptive statistics separated by sex.

	Males (n = 273)			Females (n = 388)			
	M	SD	Skew	M	SD	Skew	Group Difference[a]
Outcome							
Popularity(T3)	1.90	.71	−.37	1.93	.63	−.36	$F(1, 659) = .29$, *n.s.*
Predictors							
Risk-taking(T1)	1.55	.78	−.15	1.28	.78	.19	$F(1, 659) = 18.82$, $p < .001$
Risk-taking-SQ(T1)	3.00	2.43	.94	2.25	2.23.	1.34	$F(1, 659) = 16.87$, $p < .001$
Controls							
Age(T1)	13.48	1.59	.48	13.61	1.59	.22	$F(1, 659) = 1.07$, *n.s.*
Parent Education(T1)	3.67	1.25	.04	3.52	1.27	.10	$F(1, 659) = 2.33$, *n.s.*
Family Money(T1)	3.14	.89	−.25	3.27	.86	−.17	$F(1, 659) = 3.19$, *n.s.*
Selfishness(T1)	1.07	.70	.61	.78	.62	.75	$F(1, 659) = 31.59$, $p < .001$
Mastery(T2)	1.84	.56	.16	2.00	.55	.05	$F(1, 659) = 13.31$, $p < .001$
Self-esteem(T2)	2.33	.65	−.75	2.22	.68	−.88	$F(1, 659) = 4.60$, $p < .05$
Masculinity(T2)	2.23	.55	−.53	2.19.	.51	−.23	$F(1, 659) = .80$, n.s.
Femininity(T2)	1.63	.59	−.11	2.01.	.51	−.49	$F(1, 659) = 97.14$, $p < .001$
Popularity(T1)	1.93	.72	−.52	1.94	.66	−.38	$F(1, 659) = .03$, *n.s.*

[a]One-way ANOVA with sex as independent variable.

[3]While we have included masculinity and femininity measures in order to provide as stringent a test as we are able of the relationship that risk-taking bears with popularity independent of masculinity or femininity, we note that supplemental analyses (available upon request) found substantively identical results for all multivariate analyses regardless of whether we included masculinity and femininity in our equations.

Table 3. Risk-taking as a predictor of popularity.

Results

Table 3 begins by examining the relation between risk-taking and popularity after adjusting statistically for demographics. Results are presented in Model 1 and indicate that family money is significantly related to popularity. In light of prior research suggesting family wealth to be associated with adolescent popularity (Eder 1985), this finding suggests further evidence that, in terms of issues impinging directly upon popularity, adolescents in our convenience sample are not fundamentally different from adolescents more generally. Net of demographics, results reveal that respondents who report more risk-taking tend to report higher levels of popularity. Model 1 also includes a squared risk-taking term to examine our prediction that risk-taking yields diminishing returns in popularity. The valence of this term is negative, as would be expected according to our prediction, but the coefficient fails to achieve statistical significance. Model 2 incorporates two interaction terms to examine whether the relation between risk-taking and popularity differs by gender. The gender X risk-taking interaction is significantly positive, but the main effect of risk-taking is no longer significant. The gender X risk-taking-squared coefficient is negative and marginally significant. Together, these results suggest that risk-taking in our sample is only related to popularity among males and provide preliminary support for the curvilinear effect that we predicted among males.

Model 3 examines whether the relation between risk-taking and popularity among males remains upon adjusting statistically for mastery, self-esteem, masculinity, femininity, and selfishness. Results reveal that popularity tends to be higher among those individuals with higher levels of masculinity and higher levels of femininity. Independent of these variables, the gender X risk-taking interaction remains significant and the gender X risk-taking-squared remains marginally significant. These findings are particularly notable insofar as they suggest that risk-taking among males may be associated with popularity over and above the influence of adherence to traditionally masculine gender-norms. Model 4 adds a lagged measure of popularity to the equation estimated in Model 3. The positive and significant coefficient linking T1 and T3 popularity suggests some amount of stability in popularity. Family money, masculinity, and femininity remain independently associated with popularity. Even after adjusting for these variables, however, the gender X risk-taking interaction term remains significantly associated with T3 popularity and the gender X risk-taking-squared interaction actually becomes larger in magnitude, achieving statistical significance at the conventional level of $p < .05$ (two-tailed). These results support our prediction that risk-taking yields diminishing and, beyond a certain point, negative returns in popularity among males.

Models 5 and 6 repeat the general strategy of Model 4, but disaggregate our sample by gender. In part, we do this because the gender socialization literature that we cite above suggests to us that variables like masculinity and femininity might be differentially associated with popularity among males versus females. Even though we standardized risk-taking and risk-taking-squared in models 2–4 before constructing interaction terms (see Aiken and West 1991), adding further interaction terms could potentially generate collinearity problems. Disaggregating our sample by gender therefore affords us an alternative means, subject to less collinearity, of evaluating the predictors of popularity among males versus females. Several results from Models 5 and 6 are noteworthy. First, prior popularity is associated with future popularity across both genders. Applying the Paternoster et al. (1998) formula for comparing coefficients across samples reveals a non-significant z-value of –.62, suggesting that prior popularity is significantly, but equally, associated with later popularity for males and females in our study. Second, masculinity is significantly associated with popularity among males but not females (although the associated z-score of 1.31 falls below the 1.96 value that would bolster support for a significant difference by gender). Third, femininity is positively associated with

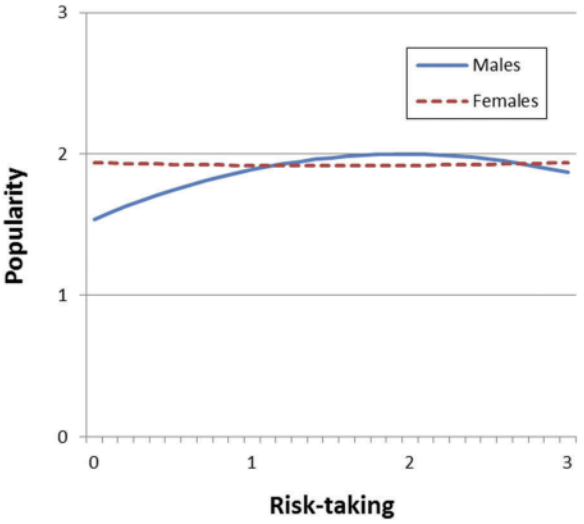

Figure 1. Popularity as a function of risk taking.

popularity among females but not males (although the associated z-score of -.76 once again falls below an absolute value of 1.96).

Most important for the present purposes, however, Model 5 suggests a strong positive relation between risk-taking and popularity among males, while Model 6 suggests no such relation among females. Further, the z-score of 2.50 that is generated in a comparison of risk-taking coefficients across gender is well-above 1.96, thus bolstering the conclusion that risk-taking is more strongly associated with popularity among males. Of note, the relation between risk-taking and popularity among males exists independently of the relation between masculinity and popularity, thus suggesting that risk-taking males tend to perceive higher levels of popularity than their risk-averse counterparts for reasons over and above their adherence to traditional gender-norms. Further, Model 5 reveals a significant and negative risk-taking-squared coefficient among males, but Model 6 fails to reveal a significant coefficient among females (z = -2.03). Finally, Figure 1 provides a graph of the gendered relation between risk-taking and popularity, derived from Models 5 and 6, and holding all control variables constant at their sex-disaggregated means. In support of our third hypothesis, this graph suggests that more risk-taking is associated with popularity only up to a point for males but that, beyond that point, further risk-taking tends to detract from popularity.

Discussion

Among the most historically-enduring questions that adults have about adolescents is why adolescents are so prone to engage in dangerous and seemingly irrational behavior. To date, the most commonly invoked answer may be that adolescents lack a fully-developed capacity to perceive the potential costs of their behavior accurately (Scott and Steinberg 2008). It may, however, be the case that adolescent males are disproportionately risk-prone not only because they misperceive the potential costs of their behavior, but also because they have observed that risk-taking generates beneficial outcomes. Given that adolescents place high value on their standing among peers (Adler and Adler 1998; Cillessen and Rose 2005), popularity among peers may be one such outcome. Because the existing literature has paid insufficient empirical attention to this possibility, the present study addresses it using multiple waves of primary data collected from adolescents in a northeastern state. Results reveal a positive and curvilinear relation between risk-taking and popularity among male, but not female, adolescents. Further, results suggest that this relation reflects something

empirically distinctive from the independent association that we find between male adherence to traditional gender norms and popularity.

In light of its results, the present study suggests several implications for the broader literature concerning adolescent risk-taking. First, results help explain why adolescents have been found to take more risks in the presence of peers (see Gardner and Steinberg 2005). On the one hand, laboratory research provides a partial explanation by demonstrating that peer presence sensitizes the limbic region of the adolescent brain to the prospect of reward (e.g. Albert, Chein, and Steinberg 2013; Chein et al. 2011). On the other hand, these laboratory studies do not explain *why* peer presence would sensitize the adolescent brain to the prospect of reward. The present findings provide one potential answer that has been largely neglected in the quantitative adolescence and delinquency literatures. In particular, the present study's results are consistent with the possibility that male risk-taking in social situations generates a *social* outcome (i.e., popularity) that they value (e.g., Adler and Adler 1998; Cillessen and Rose 2005), *over and above* whatever material or visceral rewards risk-taking may generate. In some sense, risk-taking may therefore be more rational for adolescent males when they are surrounded by an audience.

Second, by shedding new light on why it might be that peer presence sensitizes male adolescents to the prospect of reward, our results also suggest broader implications for theories of social learning (Akers 2009; Bandura 1973). While tests of such theories traditionally tend to focus on whether adolescents imitate the behavior of their peers (e.g., Young et al. 2014), the learning paradigm also predicts that behavior increases as a function of the degree to which it yields reinforcing outcomes. Existing statements of learning theory, however, have been the subject of intense criticism insofar as they provide only limited guidance concerning what specific stimuli they believe to be most or least reinforcing (for two key examples of such critiques, see: Halbasch 1979; Sampson 1999). Given limited theoretical guidance, empirical research has employed somewhat vague measures of reinforcement, such as the degree to which respondents anticipate that hypothetical risk-taking would meet with "peer approval." Risk-taking and peer approval, however, bear little empirical correlation (see Akers 2009). Further, it remains an open question as to what it means for peers to "approve" of behavior. Plumridge, Fitzgerald, and Abel (2002), for example, find that some youth may technically approve of smoking *behavior* even as they view some smokers themselves as "wannabes" of low social status. Approving of a given behavior may therefore be very different from granting status to those who engage in it. Likewise, reinforcement may not technically be indicated by how an adolescent anticipates that peers *would* react in response to a hypothetical behavior. Instead, it may be better indicated by how peers *have* reacted following an individual's actual behavior (Rebellon 2006). The present study therefore shifts its focus away from whether behavior is correlated with anticipated peer approval and instead examines whether a preference for risky behavior is associated with the experience of a specific outcome (i.e., popularity) that adolescents are known to value highly. Results not only provide what we feel to be compelling evidence that risk-taking is associated with perceived popularity for male adolescents, but also provide a model of how future research might evaluate the reinforcement hypothesis by using risk-taking as an independent variable that may be positively related to valued outcomes (whether social or non-social).

Third, by unveiling a curvilinear relation between risk-taking and popularity, our results yield implications for the generality of risky behavior. On the one hand, theorists like Gottfredson and Hirschi (1990) conceive of all forms of deviance as indicators of the same underlying construct. By extension, they argue that the same etiological forces are uniformly responsible for all forms of deviance. On the other hand, faced with the question of why so many individuals engage in some forms of deviance while avoiding others, Hirschi and Gottfredson (2002) essentially concede that they have no answer. Rather than attempt to formulate a clear answer to this question, they argue that what matters more is that individuals who engage in one type of deviance are statistically more *likely* to engage in other forms. Our results, however, suggest one potential reason that individuals who engage in high levels of some risk-taking behaviors do not always engage in equally high levels of others (Rebellon and Waldman 2003). In particular, our findings are consistent with the notion that behaviors posing low or moderate

levels of risk for males are likely to confer status, while those posing extremely high levels of risk may lead peers to begin withdrawing status (see also Allen et al. 2005). This finding, in turn, may reflect the fact that progressively higher levels of risk-taking can begin to pose a danger to the risk-taker's associates rather than to the risk-taker alone (Rebellon 2002). Skateboarding stunts, for example, may pose a risk of only modest physical injury to the skateboarder while entertaining peer audiences. Experimenting with the construction of pipe bombs, on the other hand, poses the risk of severe physical injury and, further, this high level of risk extends not only to the bomb maker, but also to any surrounding audience. Despite the likelihood that all forms of risk-taking behavior share certain etiological origins (see Gottfredson and Hirschi 1990), the differential social consequences of progressively more risky behavior therefore provide one explanation for why some youth engage in relatively mild forms of risk-taking like alcohol use, but not in more severe forms of risk-taking like armed robbery.

Notwithstanding the above implications of our results, a number of limitations merit mention and suggest avenues for further research. First, our data do not contain peer nominations and therefore do not allow for a direct assessment of whether respondent perceptions of personal popularity correspond precisely with peer ratings. On the one hand, research suggests that adolescent perceptions of peers may diverge substantially from objective peer characteristics (Young et al. 2014). On the other hand, however, we note that only a minority of our popularity items asked respondents to estimate how subjectively popular they perceived themselves to be in the minds of their peers. Rather, most of our items (including the two with the highest factor loadings) probed more concrete issues like how much time they spent among peers and how often their peers invited them to social gatherings. Further, prior research finds that self-reported measures of popularity are related to risk-taking in ways similar to measures derived from peer nominations (Alexander et al. 2001; Mayeux and Cillessen 2008; Tucker et al. 2011). Even insofar as respondent perceptions of peer popularity might not overlap perfectly with actual peer ratings or beliefs, however, we submit that adolescents' perceptions of their own popularity may have important consequences. We therefore encourage further research aimed at identifying how much adolescent perceptions of their own popularity come from actual peer ratings versus alternative potential sources.

A second, and related, limitation stems from our popularity measure's inability to definitively distinguish perceived popularity (i.e., influence) from sociometric popularity (i.e., being well-liked). We have interpreted our measure as being more akin to perceived popularity because multiple items include explicit reference to being "popular," which adolescents tend to interpret as an indicator of influence (Cillessen and Marks 2011). Nonetheless, even as none of the items available in our data explicitly reference being "liked", it remains very plausible that items concerning "time with other kids" are indicators of being liked just as much as they are indicators of being influential (i.e., adolescents might logically be expected to spend more time with peers they like). Given both of the above-described limits in our data, we believe that the existing literature would benefit from further research extending our general research strategy to include network measures of both perceived and sociometric popularity derived from peer nominations.

Third, while our results are consistent with the notion that increases in popularity serve to reinforce risk-taking among males, we have not attempted to test all the predictions that might reasonably extend from learning theory's conceptualization of the reinforcement process. Although our analysis suggests that high levels of risk-taking among adolescent males are associated with higher levels of popularity, it does not provide direct evidence concerning whether popularity promotes further risk-taking, as is implied by the reinforcement hypothesis. Technically, a full test of the reinforcement hypothesis would require us to address both issues. Such a test, for example, might consist of a simultaneous equation model estimating the reciprocal relation between risk-taking and popularity (see Rebellon 2006). Our T3 data do not contain measures of risk-taking with which to estimate such a model, but even were such a measure available, it might prove difficult to provide definitive support for the reinforcement hypothesis outside of a controlled laboratory setting. Even supposing that survey research found risk-taking and popularity to be reciprocally related over time, the structural coefficient linking popularity with risk-taking might reasonably be interpreted as evidence of processes other than reinforcement. It might just as reasonably be

interpreted, for example, as evidence that popularity increases exposure to risk-taking opportunities or risk-taking peer models. Future research in controlled laboratory settings might therefore build on Gardner and Steinberg (2005) research program to examine whether peer audiences are particularly likely to influence adolescent risk-taking when they actively reward it with either perceived or sociometric popularity. Further, such research might attempt to evaluate whether the social reinforcement of adolescent risk-taking involves conscious or unconscious learning (Lewicki, Hill, and Czyzewska 1992).

Finally, our data do not come from a representative sample and we cannot be certain whether our results are generalizable. Nonetheless, our risk-taking measure bears bivariate relations with variables like sex and popularity that mirror those found in many other samples from many other regions. Given that these relations are not unique to our data, one might reasonably suggest that the longitudinal relation between risk-taking and popularity in our sample may likewise be reflective of a general phenomenon. Further, the evolutionary and developmental psychology literatures (Ellis et al. 2012; Steinberg 2008) that informed our a priori hypotheses suggest that results like ours should emerge across all adolescent samples. Many of the studies cited above draw on these literatures to argue, if sometimes implicitly, that their results likely extend beyond their convenience samples. Similarly, even as certain characteristics of our sample, such as its racial composition, may differ from that of the national population, we simultaneously see no a priori reason to predict that the relation between risk-taking and popularity should fundamentally differ across adolescent samples from different regions.

Even if our sample were representative of adolescents throughout the nation, however, it remains possible that something about American culture that is not captured in our measures of masculine/feminine norms leads adolescent males to be socialized in such a way as to uniquely reward and promote risk-taking behavior. Therefore, future research should not merely attempt to replicate our findings among representative samples within the United States, but also among samples from divergent cultures. Doing so would provide one means of discerning the degree to which our results concerning the status acquisition hypothesis reflect a fundamental aspect of human development versus the degree to which they reflect an aspect of American or Western culture. We submit, however, that the two are not mutually exclusive possibilities and that the valence of the relations unveiled herein may be relatively universal even as their magnitude may be contingent on cultural forces. While future research will be needed to address these issues more fully, our results suggest that peer audiences in laboratory settings may increase the adolescent brain's anticipation of reward (Chein et al. 2011) partly because adolescent males already tend to learn (consciously or unconsciously) what we find in the present paper: that a degree of risk-taking can yield valued social benefits despite its potential physical costs.

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Appendix

Selfishness

(1) I try to look out for myself first, even if it means making things difficult for others.
(2) I'm not very sensitive to other people when they are having a problem.
(3) If things I do upset people, it's their problem, not mine.
(4) I will try to get things I want even when I know it's causing problems.

Self-esteem

(1) I have a number of good qualities.
(2) I take a positive attitude toward myself.
(3) On the whole I am satisfied with myself.

Mastery

(1) I have little control over things that happen to me. (reverse-coded)
(2) There is really no way I can solve some of my problems. (reverse-coded)
(3) I can do just about anything I really set my mind to.
(4) I often feel helpless dealing with problems. (reverse-coded)
(5) What happens in the future mostly depends on me.
(6) There is little I can do to change things in my life. (reverse-coded)

Masculinity

(1) I am a strong person.
(2) I tend to be a 'leader.'
(3) I am good at making decisions.
(4) I don't give up easily.
(5) I'm very confident in myself.

Femininity

(1) I am good at soothing other people's feelings.
(2) I can be pretty emotional.
(3) My feelings are easily hurt.
(4) I am a gentle person.
(5) I have a lot of sympathy for other people.
(6) I understand what other people are feeling.