

The Role of Early Maturation, Perceived Popularity, and Rumors in the Emergence of Internalizing Symptoms Among Adolescent Girls

Bridget M. Reynolds · Jaana Juvonen

Received: 7 April 2010 / Accepted: 25 November 2010 / Published online: 5 December 2010
© The Author(s) 2010. This article is published with open access at Springerlink.com

Abstract Despite the widely reported link between early pubertal timing and internalizing symptoms among girls, less is known about the peer reputation of earlier maturing girls. The current study assesses whether early maturation is associated with perceived popularity and/or rumors, and whether these reputational factors help account for earlier maturing girls' vulnerability to emotional distress. Drawing on three waves of data collected from an ethnically diverse sample of middle school girls ($n = 912$), hierarchical multiple regression analyses revealed that more advanced development at the start of middle school predicted peer- and teacher-reported popularity as well as increased risk of being targeted for rumors. Mediation analyses suggested that popularity among boys can put earlier developing girls at risk for rumors. Finally, rumors acted as a partial mechanism through which early maturation was associated with subsequent internalizing symptoms. Knowledge of the peer mechanisms putting earlier developing girls at risk for psychosocial maladjustment can inform intervention and prevention efforts aimed at improving adolescent well-being.

Keywords Pubertal development · Pubertal timing · Peers · Relational victimization · Perceived popularity · Internalizing symptoms

Introduction

Experiencing puberty earlier than one's peers has been linked with psychological disorders such as major depression as well as subclinical internalizing symptoms such as depressed mood and low self-worth (Ge et al. 2001, 2006; Graber et al. 1997; Nadeem and Graham 2005; Siegel et al. 1999). Although the emotional costs associated with early pubertal development have been widely observed, less research attention has focused on the *social* correlates of early maturation. Because early adolescence is not only a period of major physical change for girls, but also a time in which peer relationships become increasingly significant, a key question linking these two aspects of development is whether signs of pubertal maturation are related to one's social reputation among peers and, furthermore, whether such reputational factors might help us understand why early maturing girls display emotional adjustment problems. The purpose of the current study is to examine the reputational costs and benefits of advanced pubertal development among young teen girls. Specifically, we assess whether early maturation is associated with perceived popularity, but possibly also with increased risk for rumors and gossip and whether such reputational factors help account for some of the emotional distress experienced by earlier maturing girls.

Girls who develop earlier than most of their classmates presumably appear deviant with regards to their physical appearance, and this deviancy might influence peers' expectations and reactions toward them (Juvonen and Gross 2005). Indeed, it has been shown that both friends and parents notice and comment on the pubertal development of girls (Brooks-Gunn 1984) and that girls have little trouble categorizing their classmates in terms of relative pubertal timing (Gargiulo et al. 1987). Despite indications

B. M. Reynolds (✉) · J. Juvonen
Department of Psychology, University of California,
1285 Franz Hall, Los Angeles, CA 90095-1563, USA
e-mail: BReynoll1@ucla.edu

J. Juvonen
e-mail: Juvonen@psych.ucla.edu

that adolescents recognize each other's physical maturation, little is known about how a girl's reputation among peers might be influenced by signs of pubertal development. Because adolescence is a time during which peer relationships become increasingly associated with self assessments (e.g., Harter 1993) and negative mood (e.g., Hankin et al. 2007; Hawker and Boulton 2000), and because adolescence is widely recognized as a period of vulnerability among girls in the development of diagnosable internalizing disorders (Kessler 2003; Kessler et al. 1993, 1994), this is a significant topic to explore as it might illuminate the processes by which earlier physical maturation places girls at risk for emotional maladjustment.

Perceived Popularity and Early Maturation

To date, peer factors have been investigated primarily in terms of linking early pubertal maturation with outcomes typically perceived as negative, such as delinquency within the friendship group, association with older peers, and early sexual debut (Caspi et al. 1993; Magnusson et al. 1985; Haynie 2003; Compian et al. 2004; Phinney et al. 1990). In stark contrast, the potential social "benefits" of early maturation have not been widely investigated. The omission of factors typically viewed as positive among adolescents makes sense, inasmuch as early timing has been shown to put girls at increased risk for emotional and behavioral maladjustment. While not diminishing these important and robust findings, some evidence links early development with more desirable social outcomes, such as self-perceptions of positive peer relationships (Brooks-Gunn and Warren 1988) and self-reports of perceived popularity (McCabe and Ricciardelli 2004). The latter construct, perceived popularity, is a measure of social reputation (e.g., Mayeux et al. 2008) that differs from what is traditionally termed sociometric popularity, a measure of social preference or liking among peers (Parkhurst and Hopmeyer 1998). The focus of the current study is on perceived popularity and an attempt has been made to use such terminology throughout the article. In the interest of brevity, however, the word "popularity" is at times used in reference to the same construct.

Being the first to show signs of puberty, earlier maturing girls might be afforded a reputation of popularity among their peers. Some evidence suggests that, among early adolescents, looking "grown-up" and "adult-like" is positively associated with popularity (Faust 1960). Given the reproductive implications of puberty, girls who develop breasts and other outward indicators of sexual maturation before others might be particularly popular among boys. Findings that earlier maturing girls date and have sex at a younger age than do later maturing girls also lend support to this hypothesis (Haynie 2003; Magnusson et al. 1985;

Simmons and Blythe 1987). Thus, whether welcomed or not, girls who show signs of early physical maturation might face greater attention from peers of both genders.

Rumors and Early Maturation

While having a reputation as being popular can afford early maturing girls some social benefit, this does not preclude the occurrence of more negative peer experiences. In fact, standing out in comparison to peers, or deviating from the norm, often exposes adolescents to the risk of peer harassment (Graham and Juvonen 2002; Juvonen and Gross 2005). Some evidence suggests that early maturation might be associated with self-perceived peer difficulties (Nishina et al. 2006), self-perceived sexual harassment (Craig et al. 2001; Goldstein et al. 2007), and self-reports of physical victimization (Haynie and Piquero 2006). However, predominant reliance on self-reported social problems limits our understanding of the interpersonal difficulties observed by others. Inasmuch as social reputations involve an agreed-upon assessment of status among peers, it seems particularly important to seek the perspective of those closely embroiled in a girl's day-to-day social experiences (i.e., peers and teachers at school).

Early maturing girls may be particularly at risk for having malicious rumors spread about them given that matters relating to sexuality are a frequent topic of gossip among adolescents (Owens et al. 2000; Shute et al. 2008; Tanenbaum 2000). Romantic involvement, engagement in sexual activity, or merely *appearing* sexual could put these early adolescent girls at risk for rumors and gossip (Reynolds and Golden 2010). Popularity among boys—inasmuch as physical development captures their attention and interest—might only further exacerbate the problem. Provided that rumors and gossip are frequently-employed modes of aggression among both boys and girls (Coyne et al. 2006; Paquette and Underwood 1999; Reynolds and Juvonen 2009), and that the topic of gossip often relates to sexuality, the link between more advanced pubertal development in early adolescence and this specific type of peer harassment warrants further attention.

Social Benefits and Social Costs

The apparent paradox of early pubertal development being related to both social costs and social "benefits" begs further explanation. Given that the spreading of rumors inherently requires a social group as a mode of transmission, and that socially prominent members of a peer group appear to be prime candidates for reputational threats such as gossip (Prinstein and Cillessen 2003), it follows that the popularity of early maturing girls might, in fact, help account for some of the social costs they experience.

Indeed, it has been argued that popular adolescents are likely victims of reputational aggression because they pose a threat to others wishing to gain dominance and resources in the social hierarchy (Prinstein and Cillessen 2003). Thus, social benefits and social costs might intertwine, especially at the start of middle school when new relationships are forming and reputations being constructed.

Peer Reputation and Emotional Adjustment

In addition to becoming increasingly important sources of intimacy and support as girls transition into adolescence, relationships with peers are often a salient and central concern for girls in terms of emotional well-being (Cross and Madson 1997; Maccoby 1998). While popularity might be viewed as a social “benefit” of early development, the associated risk of being targeted for rumors and gossip among peers is likely to be an especially troublesome emotional “cost”. Indeed, research has suggested that girls are particularly vulnerable to distress following relationship conflicts and peer harassment (Crick and Nelson 2002; Paquette and Underwood 1999; Goldstein and Tisak 2004). It follows then that victimization via rumors and gossip might help partly account for the well-documented link between early development and internalizing symptoms among adolescent girls.

The Current Study

The current study examines the processes and associations discussed above among an ethnically diverse sample of girls from primarily low socioeconomic backgrounds and attending public middle schools in a large metropolitan area. Most of the foundational research on pubertal timing has been conducted with middle class Caucasian adolescents (for a review see Mendle et al. 2007), with a much smaller body of recent work focusing on the psychosocial correlates of early pubertal maturation among girls from more diverse ethnic and socioeconomic backgrounds. Ge and colleagues, for instance, found that early maturation is linked to internalizing symptoms among African American adolescents residing in rural and suburban neighborhoods (Ge et al. 2001, 2003, 2006) and have called for additional research on African American adolescents living in urban environments. Nadeem and Graham (2005) found that early maturing Latina and African American girls who were harassed by peers reported elevated depressive symptoms and low self-worth concurrently in sixth grade, but highlighted the need for longitudinal analyses of these constructs. The current study builds on this research by examining the psychosocial correlates of pubertal timing longitudinally among a

diverse, primarily ethnic minority sample of adolescent girls living in an urban environment.

At three time points across the first 2 years of middle school, participants responded to self-report measures of physical development and internalizing problems. Additionally, peer nominations of perceived popularity and malicious rumors were solicited and teachers rated girls’ physical attractiveness and perceived popularity among boys and girls. Thus, the current study capitalizes on multiple informants as well as a 3-wave longitudinal design to test associations between early pubertal timing, peer reputation, and psychological distress among an ethnically diverse sample of girls transitioning through the emotionally “risky” period of early adolescence.

Four main hypotheses are addressed in the current study. First, it is hypothesized that being more advanced in pubertal development compared to peers at the start of middle school will be associated with peer- and teacher-reported popularity (especially popularity among boys). Teacher-reported physical attractiveness will be controlled in each analysis, as it presumably correlates with popularity among both boys and girls (Eder 1985; Feingold 1992; Langlois et al. 2000), thereby allowing an assessment of the unique contributions of physical maturation to perceived popularity among peers. Second, it is hypothesized that more advanced development relative to other girls in school will be associated with concurrent and future peer-reported harassment via malicious rumors and gossip. Although seemingly at odds with one another, our first two hypotheses are congruent inasmuch as popularity does not necessarily protect earlier maturing girls from more negative social experiences (Cillessen and Mayeux 2004). In fact, a model is next proposed whereby earlier physical development could be related to both perceived popularity and peer harassment via malicious rumors and gossip.

Building upon and linking the first two hypotheses, it is proposed that popularity among boys at the start of middle school might help explain the link between more advanced pubertal development and rumors. Attention and popularity among boys, combined with the often sexualized nature of gossip among this age group and the physical salience of sexual development, would appear to render earlier maturing girls prime targets for rumors and gossip. Lastly, given the well-established link between peer harassment and emotional distress (Juvonen and Graham 2001), a mediation model is proposed in which rumors and gossip help explain the association between early physical maturation and internalizing symptoms. Specifically, it is hypothesized that the harassment via rumors and gossip experienced by earlier developing girls will partially account for the link between early pubertal maturation and subsequent depressive symptoms and low self-worth. Figure 1 illustrates the two hypothesized mediation

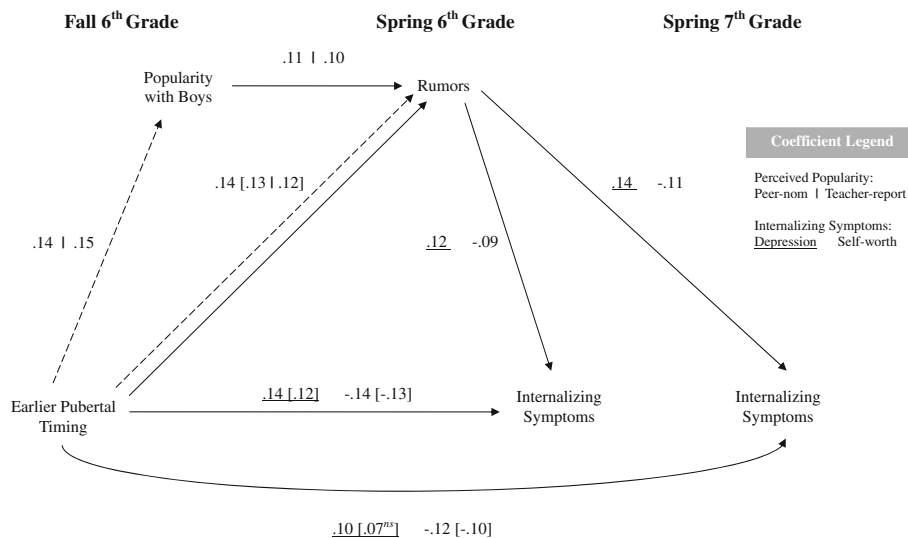


Fig. 1 The two mediation models are displayed. The first model (*dashed arrows*) predicts that popularity among boys at the start of middle school will partially mediate the link between earlier pubertal development and rumor nominations received from peers in the spring of 6th grade. The second model (*solid arrows*) predicts that rumor nominations received in the spring of 6th grade will partially account for the link between earlier pubertal development and internalizing symptoms reported in both the spring of 6th grade, as well as an entire school year later in the spring of 7th grade. In

analyses involving perceived popularity, peer-nomination coefficients are displayed to the *left* of the *bar* and teacher-report to the *right*. For models of internalizing symptoms, coefficients for depression are *underlined* and those for self-worth are not. *Numbers in brackets* represent the remaining direct effect of pubertal timing after controlling the relevant mediator. Unless otherwise indicated by a *superscript* ^{ns}, coefficients are statistically significant (see Tables 2, 3, 4, and 5 for *p*-values)

models. The model on the left side of the figure (*dashed lines*) corresponds with the prediction that earlier maturing girls are more likely targets of rumors and gossip partially because of their popularity among boys. The model on the right side of the figure (*solid lines*) suggests that rumors might, in turn, help account for some of the psychological distress experienced by earlier maturing girls.

Methods

Participants

The participants in this study were recruited as part of a larger longitudinal study of peer relations in middle school (Graham et al. 2003; Juvonen et al. 2003). At wave one, the participants were students in the 6th grade of 11 public middle schools in the Los Angeles metropolitan area. The schools consisted primarily of students with low SES backgrounds, with student eligibility for free or reduced-price meal programs ranging from 39.5 to 86.7% across all schools. A total of 1,244 girls providing parental consent and youth assent had self-, teacher-, and/or peer-report data available for at least one of the waves.

The sample for the current study includes girls who completed the pubertal development measure, reported an ethnic group affiliation, and had teacher-reported

attractiveness data in the fall of 6th grade, when they started middle school. A total of 139 girls were excluded from the overall sample because they were missing pubertal development data. An additional group of 64 girls from the original sample who did not provide a race/ethnicity ($n = 26$) or who identified their ethnic affiliation as “other” ($n = 38$) was deemed too small and too heterogeneous to include in the final analysis sample. Because the analyses reported here controlled teacher-reported attractiveness and employed list-wise deletion, a further 129 girls missing data on that item were not included, leaving the final analysis sample of 912 participants (mean age = 11.54 years, $SD = .36$). According to self-identified ethnic affiliation, the final sample was ethnically diverse: 49% Latina, 30% black, 11% Asian, and 10% white.

The final analysis sample was compared to the original sample on all wave-one study measures available (i.e., non-missing) for each participant. The analysis sample did not differ from the larger study sample on pubertal timing, age, teacher- and peer-reported measures of popularity among boys and girls, or peer-nominated rumors. Compared to the participants otherwise meeting the selection criteria for the current study, the 129 girls without teacher-reported attractiveness data were more likely to be Latina, $\chi^2 = 5.71$, $p < .05$ and less likely to be Black, $\chi^2 = 16.04$, $p < .001$ than were girls in the final analysis sample. Given that inclusion in the final sample was not random across

ethnic groups, ethnicity is controlled in all analyses reported below. Participants without attractiveness data, but otherwise meeting the selection criteria, did not differ from the girls included in the final analysis sample on pubertal timing, age, teacher- or peer-reported popularity with girls and boys, or peer-nominated rumors.

Procedures

Sixth grade students were recruited from 99 classrooms distributed across 11 middle schools. Students took home consent forms in both English and Spanish that described the study to their parents and they were asked to return the consent forms, with a parent's signature either granting or declining permission for their child to participate in the study. To increase the informed consent form return rate, all students who returned their signed parent consent form, with or without parental permission to participate, were entered in a raffle (2 prizes per class, approximately \$5 each). Across the 11 participating schools, 75% of the consent forms distributed to students were returned. Of those students who returned a signed parent consent form, 91% received permission to participate in the study. There were no differences across schools in return rates or in the percentage of students who were granted permission to participate.

Data for the current study were collected in the fall and spring semesters of 6th grade and again in the spring semester of 7th grade, resulting in three waves. At each wave, study measures were assembled in booklet form and were group administered, along with a collection of other measures that are not used here, at a time when students were in their nonacademic classes. Students were provided folders to put up around their workspace to prevent others from seeing their answers. All instructions and questionnaire items, aside from the items pertaining to pubertal development, were read aloud by a graduate researcher as students followed along and responded on their own questionnaires. The pubertal development scale appeared approximately in the middle of the larger survey and, when the administrators reached the measure, they informed participants that the next set of questions was private and was to be completed individually. The graduate researchers then walked around the room and helped participants that had questions or appeared to be struggling with the measure. Once all students had completed the measure, the administrators resumed reading aloud the remainder of the survey items. Homeroom teachers responded to a short survey for each participant in the class and were given a small monetary gift for each survey completed. Adolescents were also given a small award (e.g., a pencil and an eraser) in gratitude for their participation in the study at each wave and their

classroom received \$5 for each student to be used for classroom supplies.

Measures

Self-perceived pubertal development was measured in the fall semester of 6th grade, along with ethnicity, teacher-reported attractiveness and popularity, and peer-nominated popularity and rumors. During the spring of 6th grade, popularity measures were again gathered through peer nomination and teacher-report, in addition to peer nominations of rumors and self-reported internalizing symptoms (depressive symptoms and low self-worth). Lastly, depressive symptoms and low self-worth were again assessed in the spring semester of 7th grade.

Self-Report Measures

Self-Perceived Pubertal Development

Pubertal development was assessed with the Pubertal Development Scale (PDS; Petersen et al. 1988). The PDS allows participants to report on their growth in five areas specific to each gender. For each question, participants indicated whether development *has not yet started*; *barely started*; *definitely started, but is not finished*; and *seems completed*. Girls were asked to report the extent to which they had experienced a growth spurt, body hair growth, skin changes like pimples, and breast growth. Responses were coded on 4-point scales from 1 = *has not yet started* to 4 = *seems completed*. Girls also reported whether or not they had begun to menstruate by indicating either *yes* or *no*. This item was recoded to put it on the same scale as the other four items such that “yes” was equivalent to *seems completed* and “no” was equivalent to *has not yet started*. The 4-point ratings for each of the items were summed and averaged to form a scale score indicating overall self-perceived pubertal development, with higher scores representing greater development ($\alpha = .72$). The PDS has well-established validity and reliability for research involving large samples of students in which physical assessment is not always feasible or permitted by schools (Schmitz et al. 2004; Dorn et al. 2006). It is correlated with both parent and physician reports of physical maturation, as well as hormonal indicators of pubertal development (Brooks-Gunn et al. 1987; Shirtcliff et al. 2009). The alpha observed in the current study is similar to that reported in other studies involving diverse samples (e.g., Ge et al. 2006; Siegel et al. 1999).

To assess pubertal timing, average PDS scores were standardized within school and grade. The resulting continuous pubertal development scores therefore represent each girl's maturational timing relative to other girls in her

school. Higher scores indicate earlier pubertal timing given that participants were closely age-spaced and that pubertal development was measured early on, in the fall of 6th grade.

Global Self-Worth

The 6-item general self-perception subscale of the Self-Perceived Profile for Children (SPPC; Harter 1985) was used to measure global self-worth. Students were presented with two statements separated by the word “but”, with each statement reflecting high or low self-worth. Respondents choose one alternative and then decide whether it is “really true for me” or “sort of true for me”, which creates 4-point scales that are summed and averaged across items, with higher scores representing greater self-worth. This instrument is widely used in adolescent research and it has good psychometric properties. In the current study, alpha was .82 and .88 in the spring of 6th and 7th grade, respectively.

Depressive Symptoms

The Short Form of the Children’s Depression Inventory (CDI; Kovacs, 1992) was used to assess depressive affect. For each item, respondents were presented with three sentences that describe “how kids might feel” and were asked to choose the sentence that best described how they had been feeling during the past 2 weeks. For example, an adolescent would be presented with the following three sentences and asked to choose one: “I am sad once in awhile” (response coded as 0); “I am sad many times” (response coded as 1); and “I am sad all the time” (response coded as 2). Scores were summed and averaged across items, such that higher scores represented greater depressive symptoms. The ten items with the strongest factor loadings from the original CDI (Kovacs 1985) comprise the Short Form. Four of the items assess negative self-esteem, three tap negative mood, two assess anhedonia, and one item pertains to ineffectiveness (Kovacs 1992). These items correlate well with the long version ($r = .89$ in Kovacs 1992) and they have good internal consistency ($\alpha = .86$ in spring 6th; $\alpha = .81$ in spring seventh).

Peer-Report Measures

Perceived Popularity

A roster listing the names of all of the students in a girl’s class, alphabetically and by gender, was provided to each participant to assist in the peer-nomination process. In response to the question, “who are the coolest kids?”

participants were asked to nominate up to four of their classmates. Both same- and other-sex nominations were permitted. The number of nominations each participant received from boys and girls were then summed, separately, and standardized within classroom to form a score for perceived popularity among girls and a separate score for perceived popularity among boys. The terms “perceived popularity” and “popularity” are used interchangeably throughout the current report to refer to these standardized scores.

Rumors

Participants were asked to nominate up to four classmates, using the roster as an aid, fitting the following description: “Who do kids spread nasty rumors about?” The number of nominations each participant received from her male and female peers was summed and standardized within classroom to form a single score (representing consensus on whether the girl was targeted with rumors). Higher scores indicate a stronger reputation as a target of rumors.

Teacher-Report Measures

Popularity

Homeroom teachers rated the popularity of participants on a shortened version of the Interpersonal Competence Scale (ICS-T; Cairns et al. 1995). Teachers were asked to rate the participant’s popularity with boys and girls, separately, on two items presented on a 7-point scale. The scale anchors were unique to each item such that 1 = not popular with boys [*girls*] and 7 = very popular with boys [*girls*]. Reports were examined separately by item to indicate popularity with the same- and opposite-sex peers, with higher scores indicating more popularity. Teacher ratings of perceived popularity with girls ($r = .28$, $p < .001$) and boys ($r = .26$, $p < .001$) were significantly correlated with peer-nominations of perceived popularity in the fall of sixth grade, as well as the spring of sixth grade (girls $r = .30$, $p < .001$; boys $r = .32$, $p < .001$).

Physical Attractiveness

Finally, teachers were asked to rate, on a 7-point scale from “very good-looking” to “not good-looking”, the physical attractiveness of each participant. Responses were reverse coded such that higher scores on this item represent greater perceived attractiveness. This variable was used to control for concurrent physical attractiveness in analyses of pubertal timing and is of demonstrated validity inasmuch as different homeroom teachers tended to agree in their

assessments of girls’ physical appearance from 6th to 7th grades ($r = .38, p < .001$).

Results

Descriptive Information

Table 1 presents descriptive statistics for all variables included in the analyses. Mean scores suggest that the girls in this study reported, on average, internalizing symptoms within a normal range. The average participant received approximately two popularity nominations from peers and one rumor nomination at each wave. At the beginning of 6th grade, the average self-perceived pubertal development score was 2.13 (SD = .63), indicating that girls, on average, reported their physical development as just beginning. This average score is similar to that reported among 10–12 year old African American females (Ge et al. 2003, 2006) and slightly lower than that reported among 7th grade white girls (Ge et al. 2001). There were no significant ethnic group differences in average PDS scores, $F(3, 908) = 1.49, MSE = .40, n.s.$

Perceived popularity and Early Maturation

The first hypothesis states that more advanced pubertal development compared to peers at the start of middle school will be associated with peer- and teacher-reported perceived popularity in both the fall and the spring of 6th grade. Two sets of hierarchical multiple regression analyses were computed to predict indicators of same-sex and opposite-sex popularity based on peer nominations and

teacher-ratings while controlling ethnicity and teacher-reported attractiveness at Step 1 of the analyses. Ethnicity was dummy coded such that Latinas (the largest group) served as the reference point for the contrasts.

Peer-Nominated Popularity

Popularity nominations received from boys and girls in the fall served as the outcome variables, respectively, in two regression analyses. As shown in Table 2, girls’ more advanced physical development in the fall of 6th grade was associated with greater perceptions of popularity both among boys ($\beta = .14, p < .001$) and among girls ($\beta = .14, p < .001$) in the fall of 6th grade. Results of two similar hierarchical multiple regression analyses indicated a prospective association between more advanced pubertal development at the start of the school year and perceived popularity among boys ($\beta = .09, p < .01$) and among girls ($\beta = .09, p < .01$) at the end of the school year, controlling ethnicity and attractiveness (see Table 2).

Teacher-Reported popularity

The concurrent association between pubertal maturation and teacher-reported popularity among boys and girls in the fall of 6th grade was tested via two hierarchical multiple regression analyses. When entered at step two in each model, more advanced pubertal development was associated with higher teacher-reported popularity among boys ($\beta = .15, p < .001$) and among girls ($\beta = .08, p < .01$) in the fall of 6th grade, controlling ethnicity and teacher-reported attractiveness at step one (see Table 2). Similarly, in regression analyses modeling advanced pubertal

Table 1 Means and standard deviations for study variables separated by wave and source

Variable	Fall 6th grade			Spring 6th grade			Spring 7th grade		
	M	SD	n	M	SD	n	M	SD	n
Self-report									
Pubertal timing	2.14	.64	912						
Self-worth				3.25	.71	787	3.22	.75	705
Depressive symptoms				.26	.32	798	.27	.34	710
Teacher-report									
Attractiveness	4.80	1.48	912						
Popularity among boys	4.01	1.42	884	3.99	1.51	799			
Popularity among girls	4.87	1.38	895	4.84	1.35	794			
Peer-report									
Popularity among boys	.22	.60	912	.21	.64	858			
Popularity among girls	1.50	1.74	912	1.57	2.03	858			
Rumors	.88	1.47	912	1.03	1.81	857			

Means for pubertal timing, peer-nominated popularity and peer-nominated rumors are based on unstandardized scores

* $p < .05$, ** $p < .01$

Table 2 Summary of hierarchical regression analyses predicting peer-nominated and teacher-reported popularity among boys and girls in the fall and spring of 6th grade

Variable	Fall 6th grade				Spring 6th grade			
	Among boys		Among girls		Among boys		Among girls	
	β	SE	β	SE	β	SE	β	SE
Peer nominated popularity								
Asian	-.06	.09	-.03	.10	.01	.10	-.01	.11
Black	-.02	.06	.02	.07	.00	.07	-.01	.07
White	-.02	.10	-.02	.11	.05	.11	-.01	.12
Attractiveness	.10**	.02	.23***	.02	.16***	.02	.15***	.02
Pubertal timing	.14***	.03	.14***	.03	.09**	.03	.09**	.03
R^2	.03		.07		.04		.03	
Teacher reported popularity								
Asian	-.05	.14	.04	.14	-.11**	.16	-.02	.15
Black	.03	.09	.02	.10	-.05	.11	-.04	.10
White	.02	.14	.07*	.15	-.02	.18	.04	.16
Attractiveness	.53***	.03	.43***	.03	.44***	.03	.40***	.03
Pubertal timing	.15***	.04	.08**	.04	.14***	.05	.07*	.04
R^2	.30		.20		.21		.16	

* $p < .05$, ** $p < .01$, *** $p < .001$

maturation as a prospective predictor of teacher-reported popularity in the spring of 6th grade, more advanced development in the fall predicted greater perceptions of popularity among boys ($\beta = .14$, $p < .001$) and among girls ($\beta = .07$, $p < .05$) in the spring after controlling ethnicity and attractiveness.

In support of the first hypothesis, results suggest that being more physically developed compared to other girls in school at the start of 6th grade is associated, via converging views, with greater popularity among both boys and girls at the beginning and end of 6th grade. Thus, earlier maturation seems to confer some concurrent and subsequent benefits. Beyond the variance accounted for by stability in perceived popularity from fall to spring of 6th grade, earlier pubertal timing continued to significantly predict only teacher-reported popularity among boys ($\beta = .07$, $p < .05$). According to teacher perceptions, then, early maturing girls increased in popularity with boys across the first year of middle school.

Rumors and Early Maturation

The second hypothesis states that relatively advanced pubertal development will be associated with rumors among peers. Two hierarchical multiple regression analyses, controlling ethnicity and attractiveness at step one, tested the concurrent and prospective association between advanced pubertal maturation and peer-nominated rumors. As shown in Table 3, more advanced physical

Table 3 Summary of hierarchical regression analyses predicting rumors in the fall and spring of 6th grade

Variable	Fall 6th grade		Spring 6th grade	
	β	SE	β	SE
Asian	.01	.10	.02	.11
Black	.13***	.07	.05	.07
White	.10**	.11	.06	.12
Attractiveness	-.09**	.02	-.07*	.02
Pubertal timing	.11**	.03	.14***	.03
R^2	.04		.03	

* $p < .05$, ** $p < .01$, *** $p < .001$

development compared to peers in the fall of 6th grade predicted rumors concurrently in the fall ($\beta = .11$, $p < .01$) and prospectively in the spring of that same year ($\beta = .14$, $p < .001$), controlling ethnicity and attractiveness. Compared to Latina girls, black and white girls had a stronger reputation as targets of rumors in the fall of 6th grade ($\beta = .13$, $p < .001$; $\beta = .10$, $p < .01$, respectively); however, ethnicity was not significantly related to rumors in the spring of that year. Greater physical attractiveness, as rated by teachers, was associated with a lower degree of rumors in the fall ($\beta = -.09$, $p < .01$) and spring of 6th grade ($\beta = -.07$, $p < .05$).

In support of the second hypothesis, girls who reported more advanced development compared to peers at the start of middle school had a stronger reputation as the target of rumors both concurrently in the fall of 6th grade, as well as

a semester later in the spring. Furthermore, change models suggest that earlier pubertal maturation continues to predict rumors in the spring of 6th grade ($\beta = .08, p < .01$) even after fall rumors are controlled in statistical analyses. Thus, earlier maturing girls experienced increases in peer nominations of rumors across the first year of middle school.

Social Benefits and Social Costs

The third hypothesis predicted that popularity among boys, in particular, would serve as a partial mediator of the association between advanced pubertal development and future rumors. As presented above and in Table 2, analyses revealed that more advanced pubertal development compared to peers in the fall of 6th grade was significantly associated with a stronger reputation of popularity among boys at that same wave ($\beta = .14, p < .001$). Table 4 shows that popularity among boys, in turn, predicted rumors in the spring of 6th grade, after controlling pubertal timing, ethnicity, and attractiveness ($\beta = .11, p < .01$). Next, as reported above, more advanced pubertal development in the fall significantly predicted rumors in the spring of 6th grade ($\beta = .14, p < .001$). Finally, the association between pubertal timing and rumors decreased when popularity

among boys was taken into account ($\beta = .13, p < .01$), indicating that having a reputation among boys as being more popular partially helps explain the link between advanced pubertal development at the start of middle school and rumors at the end of the first school year.

Teacher-reported popularity among boys in the fall was also examined at a multivariate level via hierarchical regression as a potential mediator of the link between earlier pubertal maturation and rumors. Results indicated that more advanced pubertal development in the fall of 6th grade was associated with teacher reports of popularity among boys at the same wave ($\beta = .15, p < .001$), which were in turn associated with rumors in the spring ($\beta = .10, p < .05$), controlling pubertal timing (see Table 4). Similar to the findings based on peer nominations, the strength of the association between earlier pubertal maturation and rumors in the spring ($\beta = .14, p < .001$) decreased when teacher-reported popularity among boys was included as a predictor in the model ($\beta = .12, p < .01$), providing evidence from another perspective that popularity among boys is a partial mediator of the link between relatively advanced timing in the fall and the receipt of more rumor nominations from peers in the spring of sixth grade.

A bootstrapping method of testing the significance and effect-size of mediation empirically generates sampling distributions of the indirect effects by taking a sample (with replacement) of size n from the full data set and calculating the indirect effects in each of the samples (Preacher and Hayes 2004, 2008). Point estimates and 95% confidence intervals for the indirect effects are generated and significant mediation is implied when the 95% confidence interval for the indirect effect does not contain zero. Employing this procedure (with $n = 5,000$ bootstrap samples) to examine mediation in the model based on peer-reports of popularity among boys yielded a 95% bias corrected and accelerated confidence interval (BCa CI) of .003 through .030. Because this interval does not contain 0, the indirect effect was significant, indicating that a stronger reputation among boys partially explains the link between pubertal maturation and later rumors. Repeating this procedure for the model focusing on teacher-reported popularity among boys also revealed the indirect effect to be significantly different from zero (BCa CI of .003 through .029). Thus, being relatively earlier maturing than other girls at the start of middle school predicts popularity among boys (as reported by both peers and teachers), which in turn helps explain the link between early pubertal timing and rumors at the end of 6th grade.

Table 4 Summary of hierarchical regression analyses testing peer- and teacher- reported popularity among boys as a mediator of the link between pubertal timing and rumors

Variable	Peer-nomination			Teacher-report		
	β	SE	ΔR^2	β	SE	ΔR^2
Step 1						
Asian	.02	.11		.02	.11	
Black	.05	.08		.05	.08	
White	.05	.12		.05	.12	
Attractiveness	-.08*	.02	.009	-.08*	.02	.009
Step 2						
Asian	.02	.11		.02	.11	
Black	.05	.07		.05	.07	
White	.06	.12		.06	.12	
Attractiveness	-.07*	.02		-.07*	.02	
Pubertal timing	.14***	.03	.02***	.14***	.03	.02***
Step 3						
Asian	.03	.11		.01	.11	
Black	.05	.07		.05	.08	
White	.06	.12		.06	.12	
Attractiveness	-.09*	.02		-.13*	.03	
Pubertal timing	.13**	.03		.12**	.03	
Boy popularity	.11**	.04	.01**	.10*	.03	.01*
R^2	.04			.04		

Pubertal timing and popularity among boys were assessed in the fall of 6th grade, and rumors were assessed in the spring of 6th grade

* $p < .05$, ** $p < .01$, *** $p < .001$

Social Reputation and Emotional Adjustment

The final hypothesis stated that peer-nominated rumors would be a partial mediator of the link between early

pubertal maturation and the internalizing symptoms of depression and low self-worth. First focusing on depressive symptoms, it was predicted that rumors in the spring of 6th grade would partially mediate the link between pubertal timing measured in the fall of 6th grade and depressive symptoms reported both in the spring of 6th grade, as well as in the spring of the following school year. As can be seen in Table 5, pubertal timing was significantly associated with depressive symptoms reported in the spring of 6th grade ($\beta = .14, p < .001$). Pubertal timing was also shown, in Table 3, to significantly predict rumors in the spring of 6th grade ($\beta = .14, p < .001$), which in turn are associated with depressive symptoms reported in the spring of 6th grade, controlling for pubertal timing ($\beta = .14, p < .001$). Finally, the effect of pubertal timing on depressive symptoms in the spring of 6th grade was lowered when rumors were taken into account ($\beta = .12, p < .01$). More advanced development compared to peers in the fall of 6th grade was also linked with greater reports of depressive symptoms in the spring of the following school year ($\beta = .10, p < .01$). The strength of the association between pubertal development and depressive symptoms reported in the spring of 7th grade decreased to

non-significance when rumors were included in the model ($\beta = .07, ns$).

A bootstrapping method (with $n = 5,000$ bootstrap samples) was employed to examine the significance of the reported mediation. The model examining depressive symptoms in the spring of 6th grade (BCa CI of .002 through .013) and the model examining depressive symptoms in spring of 7th grade (BCa CI of .002 through .014) both indicated that the indirect effect was significantly different from zero. Thus, rumors in the spring of 6th grade partially account for the association between pubertal timing and depressive symptoms. This was true when symptoms were measured in the spring of 6th grade, shortly after pubertal timing was assessed, and when symptoms were measured an entire year later.

Mediation analyses were repeated with self-worth as the dependent variable instead of depressive symptoms (see Table 5). More advanced development in the fall of 6th grade was associated with lower self-worth in the spring of that year ($\beta = -.14, p < .001$), as well as the following spring ($\beta = -.12, p < .01$). Rumors in the spring of 6th grade were also associated with low self-worth that same wave ($\beta = -.11, p < .01$), and a year later ($\beta = -.09$,

Table 5 Summary of hierarchical regression analyses testing rumors as a mediator of the link between pubertal timing and internalizing symptoms reported in the spring of 6th and 7th grades

Variable	Spring 6th grade						Spring 7th grade					
	Depressive symptoms			Self-worth			Depressive symptoms			Self-worth		
	β	SE	ΔR^2	β	SE	ΔR^2	β	SE	ΔR^2	β	SE	ΔR^2
Step 1												
Asian	-.01	.04		.00	.09		.03	.04		-.11**	.09	
Black	-.05	.03		.05	.06		-.11**	.03		.13**	.07	
White	.00	.04		.04	.09		-.08*	.05		.10*	.11	
Attractiveness	-.05	.01	.005	.08*	.02	.01	.03	.01	.02*	-.04	.02	.04***
Step 2												
Asian	.00	.04		-.01	.09		.04	.04		-.11**	.09	
Black	-.05	.03		.05	.06		-.11*	.03		.13**	.07	
White	.01	.04		.03	.09		-.07	.05		.10*	.10	
Attractiveness	-.04	.01		.07	.02		.03	.01		-.04	.02	
Pubertal timing	.14***	.01	.02***	-.14***	.03	.02***	.10**	.01	.01*	-.12**	.03	.01**
Step 3												
Asian	-.01	.04		.00	.09		.02	.04		-.11**	.09	
Black	-.05	.03		.06	.06		-.11**	.03		.13**	.07	
White	.00	.04		.04	.09		-.08	.05		.10*	.10	
Attractiveness	-.03	.01		.06	.02		.04	.01		-.04	.02	
Pubertal timing	.12**	.01		-.13**	.03		.07	.01		-.10*	.03	
Rumors	.14***	.01	.02***	-.11**	.03	.01**	.12**	.02	.01**	-.09*	.03	.01*
R^2	.04			.04			.04			.06		

Pubertal timing was measured in the fall of 6th grade and rumors were assessed in the spring of 6th grade

* $p < .05$, ** $p < .01$, *** $p < .001$

$p < .05$), controlling pubertal timing. Finally, the strength of the relationship between pubertal timing and low self-worth decreased when rumors were accounted for in the regression model predicting low self-worth in the spring of 6th grade ($\beta = -.13$, $p < .001$), and the spring of 7th grade ($\beta = -.10$, $p < .01$).

A bootstrapping method of testing the significance of mediation (with $n = 5,000$ bootstrap samples) was employed to examine the model predicting self-worth in the spring of 6th grade (BCa CI: $-.024$ to $-.003$) and the spring of 7th grade (BCa CI: $-.024$ to $-.002$). Indirect effects were found to differ significantly from zero in both models, indicating partial mediation. Thus, rumors in the spring of 6th grade partially accounted for the association between pubertal timing and low self-worth, both when self-worth was measured in the spring of 6th grade, shortly after pubertal timing was assessed, and when it was measured an entire year later.

Discussion

The association between early pubertal timing and internalizing symptoms among girls has gained substantial support in the adolescent development literature. However, much less research attention has focused on the social correlates of early maturation and, in particular, the peer reputation of earlier maturing girls. The current study examined the associations between early pubertal timing, perceived popularity, and peer-nominated rumors, and tested whether these reputational factors help account for some of the emotional distress experienced by earlier maturing girls. In support of the hypothesized relationships, it was found that more advanced development in comparison to other girls at the start of middle school was associated with increased popularity, as well as increased risk for rumors. Linking these two findings, results of mediation analyses supported the hypothesis that popularity among boys, in particular, puts early developing girls at risk for peer victimization via malicious rumors and gossip. That is, popularity with boys helped explain why early maturing girls might be targeted for rumors. Finally, the hypothesis that rumors, in turn, might help account for early maturing girls' increased risk for internalizing symptoms was substantiated. Rumors were associated with both concurrent and future emotional maladjustment and, partly, acted as a mechanism through which earlier pubertal development was associated with subsequent depressive symptoms and low self-worth.

Perceived Popularity and Early Maturation

Results were in line with previous findings indicating that pubertal development is a noticeable and salient

characteristic within adolescent peer groups (Brooks-Gunn 1984; Gargiulo et al. 1987), and added to this work by showing that earlier maturation is associated with—now questionable—social “benefits”. There has been a paucity of research focusing on potentially positive social correlates of early maturation. The link between early pubertal timing and popularity, for instance, has received only limited research attention, primarily in the form of investigations relying on self-report (Brooks-Gunn and Warren 1988; McCabe and Ricciardelli 2004). The results of the current study lend strength to self-report findings linking early pubertal timing and popularity by demonstrating that earlier maturing girls are, indeed, considered “cool” among the actual peers involved in the formation of social reputation. Reports made by both boys and girls were in agreement regarding the popularity of more advanced developing girls. Teachers, seemingly privy to student dynamics, followed suit and, moreover, perceived *increases* in earlier maturing girls' popularity with boys across the school year. The convergence of findings based on peer- and teacher-reports of popularity provides confidence in results linking earlier development with greater perceived popularity, especially among boys.

Potential Costs Associated with Perceived Popularity

Popularity, in the case of earlier maturing girls, is not necessarily a positive social outcome, however. Although it is typically valued and desired among adolescents (Cillessen and Mayeux 2004; Eder 1985), this kind of social visibility could be risky for earlier maturing girls, as it is linked with potentially damaging social costs. Results of the current study suggest that popularity, with boys in particular, can be detrimental to psychosocial adjustment; a stronger reputation of perceived popularity among opposite-sex peers partially accounted for the link between more advanced physical maturation at the start of middle school and having a reputation as the target of nasty rumors and gossip at the end of the first academic year. A stronger reputation of popularity among girls, on the other hand, was unrelated to malicious rumors and gossip when ethnicity and physical attractiveness were controlled.

Why might perceived popularity among boys lead to rumors about early maturing girls? Previous research addressing the nature of earlier developing girls' involvement with boys might help shed some light on this question. Early maturing girls perceive themselves to be popular with boys (McCabe et al. 2002); however, the nature of the popularity does not appear to be strictly platonic (Compián et al. 2004). Girls who mature early are more likely to be involved in a romantic relationship at a young age, to view having a boyfriend as important, to initiate dating earlier than other girls, and to have an earlier

onset of sexual activity (Compián et al. 2004; Halpern et al. 1999; Haynie 2003; Lam et al. 2002; Phinney et al. 1990). More advanced developing girls' involvement with boys and their associated reputation of popularity among them might, therefore, have more to do with emerging sexuality and reproductive maturity, traits that are likely to solicit envy in other girls.

Because romantic and sexual involvement are not the norm as early in adolescence as sixth grade (Miller et al. 1997), and because norm violations increase the risk of peer harassment (Graham and Juvonen 2002; Juvonen and Gross 2005), earlier maturing girls might, specifically, be vulnerable to rumors and gossip pertaining to their sexual development and activity (Craig et al. 2001). Qualitative evidence provides some support for this claim: girls have indicated that the size of their breasts can put them at risk for rumors and harassment, that they are often presumed to be sexually promiscuous based solely upon outward signs of sexual maturity, and that matters involving sexuality and sexual activity are the frequent topic of rumors and gossip among both male and female peer groups (Reynolds and Golden 2010; Shute et al. 2008). Popularity with boys and experimentation with sexuality, in addition to the development of observable signs of physical maturation before most other girls in one's grade, therefore, could serve to push more advanced developing girls even further into the social limelight. All of these factors could, in turn, lead to increased risk for rumors. Indeed, previous research has suggested that socially prominent or popular girls tend to be the targets for rumors and gossip more often than are their less-popular peers (Prinstein and Cillessen 2003). Thus, as the current results suggest, the apparent social "benefits" of early pubertal maturation might be intricately intertwined with the social costs of being more physically developed compared to other girls at the start of middle school.

From an evolutionary perspective, a sexually mature physical appearance, dating popularity, and sexual involvement with boys can flag a girl as a potential rival for male romantic interest and, thus, bring about indirect harassment via malicious rumors and gossip. Indeed, previous work has suggested that peer envy over physical appearance and dating history is associated with various forms of indirect harassment (Owens et al. 2000). A greater number of romantic partners and a history of sexual experience, in addition to having a boyfriend at an early age, have also been linked with indirect harassment such as rumors and gossip (Vaillancourt et al. 2003; Leenaaris et al. 2008). Evolutionary psychologists suggest that such characteristics signal the ability to attract male interest and a willingness to compete for sexual partners, both of which are prime attributes of a potential reproductive rival.

Pubertal Timing, Rumors, and Emotional Distress

Results showing an association between early maturation and rumors are in line with previous findings suggesting that early maturing girls are at risk for social victimization, sexual harassment, and physical victimization (Craig et al. 2001; Haynie and Piquero 2006; Goldstein et al. 2007). Furthering the knowledge gleaned from previous investigations, the current study shows that pubertal timing predicts *increases* in rumors from fall to spring of sixth grade. Moreover, having employed a peer-nomination procedure to capture this specific facet of a girl's reputation contributes to the mainly self-report literature linking early maturation and peer harassment. Given that rumors inherently require a social group for transmission and, furthermore, are not always immediately apparent to the victim, the use of a peer nomination procedure is not only a valid but also a particularly warranted approach in this type of work.

As one of the most prevalent behaviors categorized under the umbrella term "relational aggression", rumors represent an indirect form of harassment that utilizes social relationships as a main vehicle of harm (Cairns and Cairns 1994; Crick and Grotpeter 1995; Paquette and Underwood 1999). Whether early pubertal timing is related to other forms of relational aggression such as social exclusion and friendship withdrawal, and whether these types of experiences contribute to the emotional adjustment of early maturing girls represents an interesting avenue for future research. This is especially the case given evidence that girls differentiate between subtypes of relational aggression when forming attributions about their own victimization experiences and that such attributions are associated with feelings reported at the time of the incident (Reynolds and Repetti 2010). Additionally, given a positive correlation between relational aggression and relational victimization (Crick et al. 2001), it could be the case that early maturing girls are not only more likely targets of rumors and gossip but also perpetrators of this type of behavior. Future research efforts aimed at teasing apart the effects of relational aggression versus victimization could start by controlling for one versus the other in statistical analyses.

The results of the current study are particularly unique in terms of linking early maturation, rumors, and emotional adjustment. In line with findings from the literature on bullying and victimization (Juvonen and Graham 2001; Nadeem and Graham 2005; Hawker and Boulton 2000), it was found that having a reputation as the target of nasty rumors and gossip was associated with greater depressive symptoms and lower self-worth. Most noteworthy, though, is the novel evidence the current study provides for the role of rumors and gossip in helping to explain the link between early pubertal timing and internalizing symptoms. Indeed, rumors helped account for internalizing symptoms reported

both a semester after the assessment of pubertal development as well as an entire school year later.

Being one of the first studies to examine peer victimization as a mechanism through which more advanced pubertal development might lead to emotional maladjustment, the results reported here should be interpreted with caution until they are replicated in future research and among samples from a variety of demographic backgrounds. Nonetheless, various aspects of the study design bolster confidence in the findings. For example, by relying on peer-, teacher- and self-reports in each analysis, the chance of bias associated with shared-method variance was substantially reduced. This strategy also allowed for a more objective examination of social reputation compared to studies including only self-report indices. Reputation was assessed via outside informants that were assumedly wise to collective social dynamics and, in the case of peer-nominated reputation, was based on the perspectives of and agreement between multiple individuals directly involved in the unfolding of such social dynamics. The ability to control attractiveness, which allowed for the separation of physical maturation and general physical appearance, was also unique to the study. It is noteworthy that earlier pubertal development continued to predict social reputation even after the variance associated with the effect of physical attractiveness was controlled. Finally, the three-wave longitudinal design spanning the first 2 years of middle school, when earlier pubertal development is presumably most socially salient, and the large ethnically diverse sample of urban adolescents further attest to the rigor of the study and provide increased confidence in the findings.

Limitations and Future Directions

While providing new insights into the psychosocial development of early maturing girls, the current study is not without limitations that should be addressed in future research. For example, although it is customary to assess pubertal timing at the first wave of a study, growing evidence suggests that pubertal timing is not a stable individual characteristic and that girls can often be placed into different timing groups (e.g., on-time vs. early) depending on when measurements are taken (Dorn et al. 2006; Ge et al. 2003; Reynolds and Juvonen 2010). Early adolescence, when differences between relatively advanced developing girls and their peers are most salient, is perhaps the most ideal time to assess early pubertal maturation. Late maturation, on the other hand, would become salient later on, when most other girls are in the midst of or have completed pubertal development. Whether peer victimization occurs among less developed girls at this stage, and in what forms, remains a topic for future investigation. Additionally, research examining whether the associations

found here hold true even as most other girls are starting to develop would be particularly interesting.

Self-perceived development on five indicators of puberty was assessed in the current study and average scores were standardized within school and grade to come to a measurement of relative pubertal timing. Whether results would differ if only the more socially visible indicators of development were assessed or if self-perceived pubertal timing were to be directly measured are questions warranting further exploration. In addition, future research attention would be beneficial in gaining a better understanding of the appropriate comparison groups for the standardization of timing measures. Traditionally, researchers use an age-based index of pubertal timing that compares adolescents with same-sex peers of a similar chronological age. The current study assumed that one of the most socially salient reference groups for adolescents is girls attending the same school, and enrolled in the same grade. Because a girl's social reputation was of interest and because adolescents tend to be institutionally clustered with peers according to school grade, this seemed to be an appropriate reference group.

Although not a main focus of study, teacher-rated physical attractiveness was included as a control in all analyses and, given the novelty of this approach, a comment on the validity of such ratings seems warranted. Teachers might base attractiveness ratings on slightly different standards than would peers and obtaining such information from either source could raise concerns regarding potential confounds. Nonetheless, because blind observational coding was not a viable option, we believe that our unique teacher-reported attractiveness data, albeit controversial, is valid inasmuch as different teachers tended to agree in their assessments of students across sixth and seventh grades. Moreover, ratings of attractiveness were associated with peer-nominated popularity, as would be expected based on previous research (Eder 1985; Feingold 1992; Langlois et al. 2000). The negative correlation between attractiveness and rumors in the current study is intriguing and deserving of further research attention.

Lastly, although the effects in the current study were consistent across informants and across time, the magnitudes were small. The associations described here are undoubtedly complex, with a multitude of factors contributing to variance in the outcomes. Further, according to Judd and Kenny (1981), it is often unrealistic to assume that a relationship between a predictor and a dependent variable can be completely explained by one mediator because psychosocial behaviors, naturally, have a wide variety of causes. Nonetheless, even seemingly small effects can provide important contributions to scientific knowledge (see Rosenthal 1994) and can have a significant

impact on social policy or in other applied contexts (McCartney and Rosenthal 2000).

Results of the current study have potentially important implications for prevention and intervention efforts aimed at easing the psychological burden associated with early maturation among adolescent girls. It is important for educators, parents and practitioners to understand how the timing of pubertal development places girls at risk for victimization by peers, particularly in light of their reputation as popular among boys, and how this might contribute to earlier maturing girls' vulnerability to emotional distress. Perceived popularity and rumors could be targeted in isolation or in conjunction to make intervention and prevention efforts maximally effective. Given that adolescence is the developmental period in which peers become increasingly important sources of support and validation, and in which internalizing disorders typically develop among girls, such efforts will be particularly important.

Acknowledgments This study was funded by grants from the National Science Foundation (BCS-9911525) and the William T. Grant Foundation (99100463) awarded to Sandra Graham and Jaana Juvonen and a Ruth L. Kirschstein National Research Service Award (NRSA) to Bridget Reynolds (F31 MH074244). We thank Drs. Sandra Graham, Rena Repetti, Andrew Fuligni, and Ted Robles for their comments and advice on earlier drafts of this paper. We would also like to thank Mike Robinson, the Peer Project, and the Relationships and Health Lab for their invaluable feedback and support.

Open Access This article is distributed under the terms of the Creative Commons Attribution Noncommercial License which permits any noncommercial use, distribution, and reproduction in any medium, provided the original author(s) and source are credited.

References

- Achenbach, T. M. (1991). *Manual for the teacher's report form and 1991 profile*. Burlington, VT: University of Vermont, Department of Psychiatry.
- Brooks-Gunn, J. (1984). The psychological significance of different pubertal events to young girls. *Journal of Early Adolescence, 4*, 315–327.
- Brooks-Gunn, J., & Warren, M. P. (1988). The psychological significance of secondary sexual characteristics in 9- to 11-year-old girls. *Child Development, 59*, 161–169.
- Brooks-Gunn, J., Warren, M. P., Rosso, J., & Gargiulo, J. (1987). Validity of self-report measures of girls' pubertal status. *Child Development, 58*, 829–841.
- Cairns, R. B., & Cairns, B. D. (1994). *Lifelines and risks: Pathways of youth in our time*. New York: Cambridge University Press.
- Cairns, R. B., Leung, M. C., Gest, S. D., & Cairns, B. D. (1995). A brief method for assessing social development: Structure, reliability, stability, and developmental validity of the Interpersonal Competence Scale. *Behavior Research and Therapy, 33*, 725–736.
- Caspi, A., Lynam, D., Moffitt, T. E., & Silva, P. A. (1993). Unraveling girls' delinquency: Biological, dispositional, and contextual contributions to adolescent misbehavior. *Developmental Psychology, 29*, 19–30.
- Cillessen, A. H. N., & Mayeux, L. (2004). From censure to reinforcement: Developmental changes in the association between aggression and social status. *Child Development, 75*, 147–163.
- Compián, L., Gowen, L. K., & Hayward, C. (2004). Peripubertal girls' romantic and platonic involvement with boys: Associations with body image and depression symptoms. *Journal of Research on Adolescence, 14*, 23–47.
- Coyne, S. M., Archer, J., & Eslea, M. (2006). "We're not friends anymore! Unless": The frequency and harmfulness of indirect, relational, and social aggression. *Aggressive Behavior, 32*, 294–307.
- Craig, W. M., Pepler, D., Connolly, J., & Henderson, K. (2001). Developmental context of peer harassment in early adolescence: The role of puberty and the peer group. In J. Juvonen & S. Graham (Eds.), *Peer harassment in school: The plight of the vulnerable and victimized* (pp. 242–261). New York: The Guilford Press.
- Crick, N. R., & Grotpeter, J. K. (1995). Relational aggression, gender, and social-psychological adjustment. *Child Development, 66*, 710–722.
- Crick, N. R., & Nelson, D. A. (2002). Relational and physical victimization within friendships: Nobody told me there'd be friends like these. *Journal of Abnormal Child Psychology, 30*, 599–607.
- Crick, N. R., Nelson, D. A., Morales, J. R., Cullerton-Sen, C., Casas, J. F., & Hickman, S. (2001). Relational victimization in childhood and adolescence: I hurt you through the grapevine. In J. Juvonen & S. Graham (Eds.), *School-based peer harassment: The plight of the vulnerable and victimized* (pp. 196–214). New York: Guilford Press.
- Cross, S. E., & Madson, L. (1997). Models of the self: Self-construals and gender. *Psychological Bulletin, 122*, 5–37.
- Dorn, L. D., Dahl, R. E., Woodward, H. J., & Biro, F. (2006). Defining the boundaries of early adolescence: A user's guide to assessing pubertal status and pubertal timing research with adolescents. *Applied Developmental Science, 10*, 30–56.
- Eder, D. (1985). The cycle of popularity: Interpersonal relations among female adolescents. *Sociology of Education, 5*, 154–165.
- Faust, M. (1960). Developmental maturity as a determinant of prestige in adolescent girls. *Child Development, 31*, 173–184.
- Feingold, A. (1992). Good-looking people are not what we think. *Psychological Bulletin, 111*, 304–341.
- Gargiulo, J., Brooks-Gunn, J., Attie, I., & Warren, M. P. (1987). Girls' dating behavior as a function of social context and maturation. *Developmental Psychology, 23*, 730–737.
- Ge, X., Brody, G. H., Conger, R. D., & Simons, R. L. (2006). Pubertal maturation and African American children's internalizing and externalizing symptoms. *Journal of Youth and Adolescence, 35*, 531–540.
- Ge, X., Conger, R. D., & Elder, G. H. (2001). Pubertal transition, stressful life events, and the emergence of gender differences in adolescent depressive symptoms. *Developmental Psychology, 37*, 404–417.
- Ge, X., Kim, I. J., Brody, G. H., Conger, R. D., Simons, R. L., Gibbons, F. X., et al. (2003). It's about timing and change: Pubertal transition effects on symptoms of major depression among African American youths. *Developmental Psychology, 39*, 430–439.
- Goldstein, S. E., Malanchuk, O., Davis-Kean, P. E., & Eccles, J. S. (2007). Risk factors of sexual harassment by peers: A longitudinal investigation of African American and European American adolescents. *Journal of Research on Adolescence, 17*, 285–300.

- Goldstein, S. E., & Tisak, M. S. (2004). Adolescents' outcome expectancies about relational aggression within acquaintanceships, friendships, and dating relationships. *Journal of Adolescence*, *27*, 283–302.
- Graber, J. A., Lewinsohn, P. M., Seeley, J. R., & Brooks-Gunn, J. (1997). Is psychopathology associated with the timing of pubertal development? *Journal of the American Academy of Child & Adolescent Psychiatry*, *36*, 1768–1776.
- Graham, S., Bellmore, A., & Juvonen, J. (2003). Peer victimization in middle school: When self- and peer views diverge. *Journal of Applied School Psychology*, *19*, 117–137.
- Graham, S., & Juvonen, J. (2002). Ethnicity, peer harassment, and adjustment in middle school: An exploratory study. *Journal of Early Adolescence*, *22*, 173–199.
- Halpern, C. T., Udry, J. R., Campbell, B., & Suchindran, C. (1999). Effects of body fat on weight concerns, dating, and sexual activity: A longitudinal analysis of black and white adolescent females. *Developmental Psychology*, *35*, 721–736.
- Hankin, B. L., Mermelstein, R., & Roesch, L. (2007). Sex differences in adolescent depression: Stress exposure and reactivity models. *Child Development*, *78*, 279–295.
- Harter, S. (1993). Causes and consequences of low self-esteem in children and adolescents. In: Baumeister R. (Ed.), *Self-esteem: The puzzle of low self-regard* (pp. 87–116). New York: Plenum Press.
- Harter, S. (1985). *The self-perception profile for children: Revision of the perceived competence scale for children, manual*. Denver: University of Denver.
- Hawker, D. S. J., & Boulton, M. J. (2000). Twenty years' research on peer victimization and psychosocial maladjustment: A meta-analytic review of cross-sectional studies. *Journal of Child Psychology and Psychiatry*, *41*, 441–455.
- Haynie, D. L. (2003). Contexts of risk? Explaining the link between girls' pubertal development and their delinquency involvement. *Social Forces*, *82*, 355–397.
- Haynie, D. L., & Piquero, A. R. (2006). Pubertal development and physical victimization in adolescence. *Journal of Research in Crime and Delinquency*, *43*, 3–35.
- Judd, C. M., & Kenny, D. A. (1981). Process analysis: Estimating mediation in treatment evaluation. *Evaluation Review*, *5*, 602–619.
- Juvonen, J., & Graham, S. (2001). *Peer harassment in school: The plight of the vulnerable and victimized*. New York: Guilford.
- Juvonen, J., Graham, S., & Schuster, M. (2003). Bullying among young adolescents: The strong, the weak, and the troubled. *Pediatrics*, *112*, 1231–1247.
- Juvonen, J., & Gross, E. F. (2005). The rejected and the bullied: Lessons about social misfits from developmental psychology. In K. D. Williams, J. P. Forgas, & W. von Hippel (Eds.), *The social outcast: Ostracism, social exclusion, rejection, and bullying*. New York: Psychology Press.
- Kessler, R. C. (2003). Epidemiology of women and depression. *Journal of Affective Disorders*, *74*, 5–13.
- Kessler, R. C., McGonagle, K. A., Nelson, C. B., Hughes, M., Swartz, M., & Blazer, D. G. (1994). Sex and depression in the National Comorbidity Survey. II: Cohort effects. *Journal of Affective Disorders*, *30*, 15–26.
- Kessler, R. C., McGonagle, K. A., Swartz, M., Blazer, D. G., & Nelson, C. B. (1993). Sex and depression in the National Comorbidity Survey. I: Lifetime prevalence, chronicity and recurrence. *Journal of Affective Disorders*, *29*, 85–96.
- Kovacs, M. (1985). The children's depression inventory: A self-rated depression scale for school-aged youngsters. *Psychopharmacology Bulletin*, *21*, 995–998.
- Kovacs, M. (1992). *Children's depression inventory*. North Tonawanda, NY: Multi-Health Systems.
- LaGreca, A., & Lopez, N. (1998). Social anxiety among adolescents: Linkages with peer relations and friendships. *Journal of Abnormal Child Psychology*, *26*, 83–94.
- Lam, T. H., Shi, H. J., Ho, L. M., Stewart, S. M., & Fan, S. (2002). Timing of pubertal maturation and heterosexual behavior among Hong Kong Chinese adolescents. *Archives of Sexual Behavior*, *31*, 359–366.
- Langlois, J. H., Kalakanis, L., Rubenstein, A. J., Larson, A., Hallam, M., & Smoot, M. (2000). Maxims or myths of beauty? A meta-analytic and theoretical review. *Psychological Bulletin*, *126*, 390–423.
- Leenaaris, L. S., Dane, A. V., & Marini, Z. A. (2008). Evolutionary perspective on indirect victimization in adolescence: The role of attractiveness, dating, and sexual behavior. *Aggressive Behavior*, *34*, 404–415.
- Maccoby, E. E. (1998). *The two sexes: Growing up apart, coming together*. Cambridge, MA: Harvard University Press.
- Magnusson, D., Strattin, H., & Allen, V. L. (1985). Biological maturation and social development: A longitudinal study of some adjustment processes from mid-adolescence to adulthood. *Journal of Youth and Adolescence*, *14*, 267–283.
- Mayeux, L., Sandstrom, M. J., & Cillessen, A. H. N. (2008). Is being popular a risky proposition?. *Journal of Research on Adolescence*, *18*, 49–74.
- McCabe, M., & Ricciardelli, L. (2004). A longitudinal study of pubertal timing and extreme body change behaviors among adolescent boys and girls. *Adolescence*, *39*(153), 145.
- McCabe, M. P., Ricciardelli, L. A., & Finemore, J. (2002). The role of puberty, media, and popularity with peers as strategies to increase weight, decrease weight and increase muscle tone among adolescent boys and girls. *Journal of Psychosomatic Research*, *52*, 145–153.
- McCartney, K., & Rosenthal, R. (2000). Effect size, practical importance, and social policy for children. *Child Development*, *71*, 173–180.
- Mendle, J., Turkheimer, E., & Emery, R. E. (2007). Detrimental psychological outcomes associated with early pubertal timing in adolescent girls. *Developmental Review*, *27*, 151–171.
- Miller, B. C., Norton, M. C., Curtis, T., Hill, E. J., Schvaneveldt, P., & Young, M. H. (1997). The timing of sexual intercourse among adolescents: Family, peer, and other antecedents. *Youth and Society*, *29*, 54–83.
- Nadeem, E., & Graham, S. (2005). Early puberty, peer victimization, and internalizing symptoms in ethnic minority adolescents. *Journal of Early Adolescence*, *25*, 197–222.
- Nishina, A., Ammon, N. Y., Bellmore, A. D., & Graham, S. (2006). Body dissatisfaction and physical development among ethnic minority adolescents. *Journal of Youth Adolescence*, *35*, 179–191.
- O'Dea, J. A., & Abraham, S. (1999). Association between self-concept and body weight, gender, and pubertal development among male and female adolescents. *Adolescence*, *34*, 69–79.
- Owens, L., Shute, R., & Slee, P. (2000). "Guess what I just heard": Indirect aggression among teenage girls. *Aggressive Behavior*, *26*, 67–83.
- Paquette, J. A., & Underwood, M. K. (1999). Gender differences in young adolescents' experiences of peer victimization: Social and physical aggression. *Merrill-Palmer Quarterly*, *45*, 242–266.
- Parkhurst, J. T., & Hopmeyer, A. G. (1998). Sociometric popularity and peer-perceived popularity: Two distinct dimensions of peer status. *Journal of Early Adolescence*, *18*, 125–144.
- Petersen, A. C., Crockett, L., Richards, M., & Boxer, A. (1988). A self-report measure of pubertal status: Reliability, validity, and initial norms. *Journal of Youth and Adolescence*, *17*, 117–133.
- Phinney, V. G., Jensen, L. C., Olsen, J. A., & Cundick, B. (1990). The relationship between early development and psychosexual behaviors in adolescent females. *Adolescence*, *25*, 321–332.

- Preacher, K. J., & Hayes, A. F. (2004). SPSS and SAS procedures for estimating indirect effects in simple mediation models. *Behavior Research Methods, Instruments, & Computers*, *36*, 717–731.
- Preacher, K. J., & Hayes, A. F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in simple and multiple mediator models. *Behavior Research Methods*, *40*, 879–891.
- Prinstein, M. J., & Cillessen, A. H. N. (2003). Forms and functions of adolescent peer aggression associated with high levels of peer status. *Merrill-Palmer Quarterly*, *49*, 310–342.
- Reynolds, B. M., & Golden, C. (2010). *An experiential analysis of the use of sexual insults and gossip in high school*. Unpublished Manuscript.
- Reynolds, B. M., & Juvonen, J. (2009). Relational aggression and victimization: Does research support the gender assumptions? In T. A. Kinney & M. Pörhölä (Eds.), *Anti- and pro-social communication: Theories, methods and applications*. New York, NY: Peter Lang Publishers.
- Reynolds, B. M., & Juvonen, J. (2010). *Pubertal timing fluctuations across middle school: Implications for girls' psychological health*. Manuscript submitted for publication.
- Reynolds, B. M., & Repetti, R. L. (2010). Teenage girls' perceptions of the functions of relationally aggressive behaviors. *Psychology in the Schools*, *47*(3), 282–296.
- Rosenthal, R. (1994). Parametric measures of effect size. In H. Cooper & L. V. Hedges (Eds.), *The handbook of research synthesis* (pp. 231–244). New York: Russell Sage Foundation.
- Schmitz, K. E., Hovell, M. F., Nichols, J. F., Irvin, V. L., Keating, K., Simon, G. M., et al. (2004). A validation study of early adolescents' pubertal self-assessments. *Journal of Early Adolescence*, *24*, 357–384.
- Shirtcliff, E. A., Dahl, R. E., & Pollak, S. D. (2009). Pubertal development: Correspondence between hormonal and physical development. *Child Development*, *80*, 327–337.
- Shute, R., Owens, L., & Slee, P. (2008). Everyday victimization of adolescent girls by boys: Sexual harassment, bullying or aggression? *Sex Roles*, *58*, 477–489.
- Siegel, J. M., Yancey, A. K., Aneshensel, C. S., & Schuler, R. (1999). Body image, perceived pubertal timing, and adolescent mental health. *Journal of Adolescent Health*, *25*, 155–165.
- Simmons, R. G., & Blythe, D. A. (1987). *Moving into adolescence: The impact of pubertal change and school context*. New York: Aldine De Gruyter.
- Tanenbaum, L. (2000). *Slut! growing up female with a bad reputation*. New York, NY: HarperCollins Publishers, Inc.
- Vaillancourt, T., Brendgen, M., Boivin, M., & Tremblay, R. E. (2003). A longitudinal confirmatory analysis of indirect and physical aggression: Evidence of two factors over time? *Child Development*, *74*, 1628–1638.

Author Biographies

Bridget M. Reynolds is a Postdoctoral Fellow in Health Psychology at the University of California, Los Angeles. She received her Ph.D. in Psychology from the University of California, Los Angeles, with a primary focus in Developmental Psychology and concentrations in psychopathology and quantitative methods. Her research interests pertain to the interplay between pubertal development, peer relationships, and adolescent physical and mental health.

Jaana Juvonen is a Professor and Chair of the Developmental Psychology Program at University of California, Los Angeles. She received her Ph.D. in Educational Psychology from the University of California, Los Angeles. Her area of expertise is in young adolescent peer relationships and school adjustment.