Elevated Social Anxiety among Early Maturing Girls

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Abstract

Adolescence is a key period in terms of the development of anxiety psychopathology. An emerging literature suggests that early pubertal maturation is associated with enhanced vulnerability for anxiety symptomatology, although few studies have examined this association with regard to social anxiety. Accordingly, the current study was designed to further elucidate the relation between pubertal timing and social anxiety, with a focus on clarifying the role of gender. Participants were 138 adolescents (ages 12-17 years) recruited from the general community. Level of social anxiety was examined as a function of gender and within-sample pubertal timing. As expected, early-maturing girls evidenced significantly higher social anxiety as compared to on-time girls and early-maturing boys, and no other differences were found as a function of gender or developmental timing. Findings and future directions are discussed in terms of forwarding developmentally-sensitive models of social anxiety etiology and prevention.

Keywords

Adolescence is a key period in terms of the onset and intensification of psychological diagnoses and symptomatology across clinical domains (e.g., depression, panic attacks; Angold, Costello, & Worthman, 1998; Macaulay & Kleinknecht, 1989), and both empirical (Essau Conradt, & Petermann, 1999; Inderbitzen & Hope, 1995) and theoretical work (Gazelle & Rubin, 2010; Hudson & Rapee, 2000) highlight this phase in terms of social anxiety specifically. Social anxiety is characterized by an intense, pervasive fear of negative evaluation, or of acting in a manner that is potentially embarrassing while under the scrutiny of others. Elevated social anxiety can be differentiated from the diagnosis of social phobia/social anxiety disorder, which is characterized by a clinically-significant impairment in

[2]In an effort to address the specificity of these relations, complementary analyses were conducted to examine gender as a moderator of the relation between pubertal timing and depression (i.e., centered RCADS-D scores) while controlling for social anxiety (as well as additional covariates noted in the manuscript). Importantly, above the significant proportion of variance accounted for by chronological age [$F(1, 127) = 8.17, p < .01, \eta^2 = .06$] and social anxiety [$F(1, 127) = 76.56, p < .01, \eta^2 = .376$], level of depression was not significantly related to gender [$F(1, 127) = 0.07, p > .05, \eta^2 = .001$], pubertal timing [$F(2, 127) = 0.42, p > .05, \eta^2 = .007$], or the interaction between these variables, $F(2, 127) = 1.22, p > .05, \eta^2 = .019$.

functioning [American Psychiatric Association (APA), 2000]; importantly, sub-clinical social phobia, or elevated social anxiety, also can be extremely distressing (Bruch, 1989; Storch, Masia-Warner, Crisp, & Klein, 2005), may lead to the development of clinical social phobia (La Greca & Moore Harrison, 2005; Velting & Albano, 2001), and has been linked to many of the comorbid problems associated with a formal diagnosis such as substance use and depression (Essau et al., 1999; Sonntag, Wittchen, Höfler, Kessler, & Stein, 2000).

A considerable body of work exists examining social anxiety as a function of prominent factors characteristic of childhood and adolescence (e.g., cognitive, emotional, and social development; Gazelle & Rubin, 2010; Hudson & Rapee, 2000; Neal & Edelmann, 2003; Rapee, Schniering, & Hudson, 2009; Rapee & Spence, 2004), including neurological development (e.g., Mathew, Coplan, & Gorman, 2001), temperamental characteristics (e.g., behavioral inhibition, negative affectivity; Fox, Henderson, Marshall, Nichols, & Ghera, 2005; Hayward, Killen, Kraemer, & Taylor, 1998; Kagan, 2010; Kagan, Snidman, McManis, & Woodward, 2001; Pérez-Edgar & Fox, 2005), parenting behaviors (e.g., overcontrol; Hudson & Rapee, 2001; 2002), childhood illness (Hayward et al., 2008), and peer relations (e.g., Blumenthal, Leen-Feldner, Trainor, Babson, & Bunacui, 2009; La Greca & Moore Harrison, 2005). Indeed, this burgeoning literature has culminated in a call for models of social anxiety that address facets of development unique to the period of interest (e.g., early childhood, adolescence; Hayward et al., 2008; Neal & Edelmann, 2003), including factors that may distinguish the etiology and nature of social anxiety across developmental phases (Gazelle & Rubin, 2010; Hudson & Rapee, 2000).

In a separate, although related body of work, researchers have examined the role of pubertal maturation specifically, as opposed to chronological age or "adolescent" status generally, in an effort to clarify the specific characteristics of adolescence that may be related to the development of psychopathology (Alsaker, 1997; Angold, Costello, & Worthman, 1998; Leen-Feldner, Reardon, Hayward, & Smith, 2008). Puberty is a two to four-year period of profound biopsychosocial development; for example, during this relatively brief time, youth experience extensive physical growth, including developing primary and secondary sexual characteristics (e.g., breast and penis growth), reaching skeletal maturity (i.e., growth spurt), and attaining reproductive capability (Rogol, Roemmich, & Clark, 2002; Sheehy, Gasser, Molinari, & Largo, 1999). Collectively, the intensive changes that accompany this period are conceptualized to "set the stage" for the transformation of vulnerability into clinically-relevant symptomatology (Brooks-Gunn, 1984; Sanborn & Hayward, 2003).

Consistent with this theoretical perspective, available empirical work suggests pubertal development (e.g., Angold et al., 1998), and the timing of maturation in particular (e.g., Hayward et al., 1997), are important variables in terms of better understanding enhanced vulnerability to psychopathology among adolescents. For example, in a large prospective study on puberty-depressive linkages, Angold and colleagues (1998) observed that morphological development, relative to chronological age, evidenced unique incremental validity in the prediction of depressive disorders among girls. Further, there is compelling evidence that the timing of development (i.e., an adolescent's pubertal status relative to that of same-age peers), and *early* maturation specifically, is associated with enhanced vulnerability for psychological problems, particularly among girls (Reardon, Leen-Feldner, & Hayward, 2009). For example, early-maturing girls report elevations in anxious symptoms (Dorn, Hitt, & Rotenstein, 1999), panic attacks (Hayward et al., 1997), and, when prospectively assessed across a 10-year interval, eating, depressive, and anxiety disorders (Graber, Seeley, Brooks-Gunn, & Lewinsohn, 2004). Among males, the pattern is somewhat less consistent, although some studies have found early maturation is associated with increased "internalized distress" (e.g., anxiety, poor appetite; Ge, Conger, & Elder, 2001).

Drawing from these data, it makes sense that the considerable changes that characterize puberty also may contribute to heightened social anxiety. For example, morphological development includes changes that may lead to potentially embarrassing social interactions (e.g., pubic hair exposure, body odor, menstrual "accidents") and subsequent fear of and/or actual exposure to ridicule or rejection. These learning experiences may be particularly enhanced among adolescents who begin their pubertal development earlier than their peers, given they experience the characteristic biological, social, and cognitive changes prior to their peer group, and thus in relative isolation. Such a maturity gap may be unwelcome during a developmental phase characterized by increased interest in peer approval (Prinstein & La Greca, 2002; Storch, Brassard, & Masia-Warner, 2003) and a more sophisticated understanding of social relationships (Paikoff & Brooks-Gunn, 1991). Accordingly, this constellation of developmental events may intensify reactions to negative social interactions, thus setting the stage for elevated social anxiety. These effects would be expected to be more prominent among girls for at least two reasons. First, pubertal development begins approximately 1-2 years earlier for girls than for boys (Archibald et al., 2003), making early-maturing girls the first to commence puberty within their peer group. Second, the somatic changes that characterize development among girls are particularly conspicuous (e.g., breast development; Brooks-Gunn, 1984). Collectively, these factors may foster an even greater potential for negative social interactions and psychological maladjustment among girls (Alsaker, 1992).

Despite a theoretical basis for expecting pubertal maturation to relate to social anxiety, only a few studies have directly investigated the relation between pubertal development and social anxiety among youth (Blumenthal et al., 2009; Deardorff et al., 2007; Ge, Brody, Conger, & Simons, 2006), and a discernable pattern is not yet clear. Deardorff and colleagues (2007) examined the relation between pubertal development and self-reported social anxiety in a sample of 106 adolescents (52% girls) initially recruited at birth from well newborn nurseries and later assessed at ages 9.5 and 11 years. Pubertal status predicted social anxiety symptoms among girls only, such that girls who were nonpubertal at ages 9.5 and 11 years evidenced the lowest levels of social anxiety, and those who were pubertal at both assessments evidenced the highest levels. While providing direct support for the role of morphologic status in predicting social anxiety among girls, these data also are suggestive of a timing effect (i.e., girls who evidenced advanced development in comparison to same-age peers also reported the highest social anxiety). Interestingly, however, Ge and colleagues (2006) observed an opposite pattern of results among a multi-site, community-based sample of 867 African American boys and girls (ages 10-12 years; 53.9% girls), finding that early maturation predicted symptoms of social anxiety, as indexed via parent and child clinical interview, among *boys* but not girls. Finally, in a community-based sample of 167 adolescents (47% girls) ages 10-17 years, Blumenthal and colleagues (2009) found no main effect of self-reported pubertal timing, although results indicated that, after controlling for depressive symptoms, the combination of problematic peer relations (e.g., victimization, neglect) and early pubertal development was positively associated with self-reported social anxiety symptoms. Importantly, gender was not examined as a potential moderator in this study. Collectively, there is a theoretical and emerging empirical basis for expecting early maturation to relate to elevated social anxiety, but the literature base is small, findings are mixed, and the role of gender is unclear.

With this backdrop, the current study was designed to further elucidate the relation between pubertal timing and social anxiety with a focus on clarifying the role of gender. Drawing from the larger literature suggesting girls may be particularly vulnerable to the effects of early maturation (Reardon et al., 2009), it was hypothesized that early-maturing girls would evidence the highest levels of social anxiety relative to all other variable combinations (e.g., early-maturing boys, on-time girls).

Method

Participants

Participants were 138 adolescents (n = 68 girls) ages 12 to 17 years (M = 15.79, SD = 1.62) recruited from the community who took part in a larger laboratory-based investigation focused on adolescent emotional vulnerability (N = 180; M_{age} = 15.67, SD = 1.63; n = 83 girls) [1]. Importantly, selected participants (i.e., those who completed all measures examined in the current study) did not differ significantly from the larger sample in terms of demographic (e.g., gender, parental education) or psychological indices (e.g., treatment history, social anxiety). Approximately 13% of youth (n = 10 girls) were categorized as early developers, 72% as on-time (n = 45 girls), and 15% (n = 13 girls) as late. The ethnic and racial composition of the sample reflected the make-up of the local community (Southern Midwest United States): 14.5% Hispanic/Latino, 76.8% Caucasian, 13% African American, 4.4% Native American, 1.4% Asian, and 4.4% "other." Parents who accompanied participants to the laboratory (73.9% biological mothers) reported a median family income of $36,000 ($M$ = $52,220.19, SD = $43, 642.32). Parental education history was as follows: 10.8% did not complete high school, 23.9% received a high school diploma or equivalent degree, 27.5% completed some college, 21% held Associate's or Bachelor's degrees, 6.5% reported some graduate or professional schooling, and 10.1% completed graduate or professional school. Sixty-three percent of parents reported being married or living with someone, 23.2% were divorced, 8.7% separated, 3.6% never married, and 1.4% widowed. Please see Table 1 for additional sample characteristics (e.g., parent-reported internalizing problems). Finally, data pertaining to language spoken in the home were not collected in the current study. Because the larger investigation involved physical exertion as part of the laboratory protocol, exclusionary criteria were as follows: 1) chronic breathing problems (e.g., asthma), 2) heart problems, 3) pregnancy, 4) the inability to provide written informed assent, and 5) lifetime history of panic disorder.

Measures

Pubertal timing—Pubertal timing was established through the standardization of maturational status by age and gender within the sample, and the trichotomization of timing (i.e., early, on-time, late) based on conventional cut-offs [i.e., ±1 standard deviation (SD); Flannery, Rowe, & Gulley, 1993; Ge et al., 2006]. Specifically, pubertal status was assessed via the well-established Tanner staging system (Morris & Udry, 1980; Tanner, 1962). Participants were shown drawings of sex-appropriate secondary sex characteristics depicting development across five stages of puberty (i.e., breasts and pubic hair for girls; genitalia and pubic hair for boys), from which they selected the picture of each characteristic that best reflects their own development. Consistent with the larger literature (e.g., Angold et al., 1998; Deardorff et al., 2007; Hayward et al., 1997), ratings for these dimensions [ranging from Tanner stage I (immature) to Tanner stage V (mature)] were averaged and rounded up to the next integer, providing a summary measure referred to as the Sexual Maturity Index (SMI; Hayward et al., 1992). Within-sample timing was calculated by regressing SMI rating on participant age (separately for boys and girls), using the combined residuals obtained as a measure of developmental timing. Higher (positive) scores represent earlier maturation, and lower (negative) scores indicate later development, as compared to same-age peers within the sample (Dorn, Susman, & Ponirakis, 2003; Ellis & Garber, 2000). Finally, residuals were trichotomized such that values greater than one SD above the mean were classified as "early," and values less than one SD below the mean as "late" (e.g., Flannery et al., 1993; Ge et al., 2006).

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[1]Importantly, this sample is independent from that examined in prior work from this research team (Blumenthal et al., 2009).

Social anxiety—The Revised Child Anxiety and Depression Scale - Social phobia subscale (RCADS-SP; Chorpita, Yim, Moffitt, Umemoto, & Francis, 2000) was used to index social anxiety. This 9-item subscale includes items tapping into affective (e.g., "I feel afraid that I will make a fool out of myself in front of other people/when I have to talk in front of my class") and cognitive (e.g., "I worry what other people think of me/when I think I have done poorly at something") facets of social anxiety which participants rate on a four-point Likert-type scale (0 = never to 3 = always) how often each statement reflects how they feel. The RCADS was designed to reflect the dimensions of several DSM-IV defined anxiety and depressive disorders among youth; Chorpita and colleagues (2000) report an initial alpha coefficient of .81 for the social phobia subscale (α = .86 in the current sample), and r = .85 for one week test-retest reliability (youth ages 13-18 years).

Covariates—Given theoretical and empirical evidence suggesting important overlap with the primary predictor and criterion variables, chronological age (Essau et al., 1999; Hayward, 2003), race, ethnicity (Hayward, Gotlib, Schraedley, & Litt, 1999; Michael & Eccels, 2003), level of depression (Essau et al., 1999) and overall level of anxiety (Beidel, Turner, & Morris, 1999; Reardon et al., 2009) were selected as covariates. Level of depression was assessed via the 10-item RCADS-Depression subscale (RCADS-D; Chorpita et al., 2000; α = .84 in the current sample). The widely used Child Behavior Checklist/6-18 – Anxiety subscale (CBCL; Achenbach & Rescorla, 2001) was utilized to assess overall level of anxiety. Parental report of child behavior on this six-item subscale provides a dimensional measure of anxiety consistent with the DSM-IV (APA, 2000; Achenbach, Dumenci, & Rescorla, 2001); normalized t-scores are based on age- and gender-specific norms. The CBCL is a well established measure (Achenbach, Dumenci, & Rescorla, 2001; Achenbach & Rescorla, 2001; Hughes & Melson, 2008; α = .70 in the current sample).

Procedure

Study procedures were approved by the University Institutional Review Board. Interested adolescents and parents responding to postings placed throughout the community (e.g., flyers, radio advertisement) contacted the laboratory and were fully informed about the study. Specifically, parents and youth were informed of the study aims, protocol length, and content (i.e., questionnaires, interview, laboratory tasks including voluntary hyperventilation), and specific questions (e.g., content of questionnaires) were addressed. Youth were then screened for exclusionary criteria, and eligible youth were scheduled for the laboratory assessment, whereupon written informed assent and parental consent (for child participation) were obtained. Written assent and consent forms described study aims and general procedure, limits on confidentiality, potential risks (e.g., discussing sensitive topics) and benefits of participation, as well as the voluntary nature of all tasks (e.g., right to refuse or withdraw without penalty). Once parents and youth indicated that they had fully read the forms, a trained researcher verbally reviewed the information, and any questions were addressed. Thereafter, participants completed a randomly-ordered battery of questionnaires, including those described above, and engaged in a series of laboratory tasks not pertinent to the current manuscript. Finally, participants and parents were fully debriefed, and youth were compensated $45.

Analytic Approach

An analysis of covariance was conducted to examine gender as a moderator of the relation between pubertal timing and social anxiety. Gender (0 = male; 1 = female) and pubertal timing (0 = early; 1 = on-time; 2 = late) were entered as fixed factors, and centered RCADS-SP scores were entered as the dependent variable. Chronological age, centered RCADS-D scores, CBCL-Anxiety t-scores, ethnicity, and race were entered as covariates. Effect size was indexed via eta squared (η^2). Follow-up analyses were conducted to examine timing

effects within each gender (e.g., early girls vs. on-time girls), and gender effects within each timing group (e.g., on-time girls vs. on-time boys).

Results

Please see Tables 1 and 2 for sample characteristics (e.g., treatment history; social anxiety) as a function of developmental timing and gender. For example, a positive history of psychological treatment was reported by 26.3% of on-time, 23.8% late-maturing and 11.1% of early-maturing youth, although these differences were not statistically significant. Further, levels of social anxiety and depression in the current sample were slightly lower, although comparable, to other community-based work in this area. For instance, Chorpita and colleagues (2000) reported mean depression scores of 7.64-9.36 for girls ($M = 7.86$ in the current sample), $M = 6.71$-7.44 for boys ($M = 5.07$ in the current sample), $M = 11.61$-13.01 for social anxiety among girls ($M = 9.50$ in the current sample), and $M = 9.77$-11.68 among boys ($M = 6.54$ in the current sample). Preliminary analyses indicated that social anxiety was significantly, positively correlated with parent-reported anxiety ($r = .18$, $p < .05$) and self-reported level of depression ($r = .66$, $p < .01$), but not chronological age ($r = .11$, $p > .05$). An independent-samples t-test [ethnicity; $t(136) = 0.85$, $p > ,05$] and an analysis of variance [race; $F(4, 133) = 2.04$, $p > .05$] demonstrated no significant differences in social anxiety as a function of race or ethnicity.

In the final model, level of depression was the only significant covariate (all other ps > .05, $\eta^2 < .00$), accounting for a large proportion of the variance in social anxiety, $F(1, 127) = 76.56$, $p < .01$; $\eta^2 = .376$. Primary analyses demonstrated a main effect of gender [$F(1, 127) = 9.21$, $p < .01$; $\eta^2 = .068$], such that girls reported elevated social anxiety [uncentered $M = 9.22$, $SE = 0.58$, 95% Confidence Interval (CI): 8.05-10.38] as compared to boys (uncentered $M = 6.50$, $SE = 0.66$, 95% CI: 5.18-7.81). In relation to pubertal timing, no main effect was observed [$F(2, 127) = 0.03$, $p > .05$, $\eta^2 = .001$]; however, as predicted there was a significant interaction between gender and pubertal timing, $F(2, 127) = 4.81$, $p < .05$, $\eta^2 = .07$. As can be seen in Figure 1, early-maturing girls evidenced elevated social anxiety as compared to all other groups. Planned comparisons demonstrated that social anxiety was significantly higher among early-maturing girls as compared to on-time girls and early-maturing boys. Further, on-time and late maturers did not differ as a function of gender, late-maturing girls did not differ from on-time or early-maturing girls, and no differences were found among boys as a function of developmental timing (please see Table 2).[b]

Discussion

The current study was designed to build upon and uniquely extend the existing literature regarding the relation between pubertal maturation and social anxiety (i.e., Blumenthal et al., 2009; Deardorff et al., 2007; Ge et al., 2006). Specifically, social anxiety was examined as a function of gender and pubertal timing. As predicted, early-maturing girls evidenced the highest level of social anxiety. More specifically, findings indicated that 1) elevated social anxiety was evidenced by early-maturing girls as compared to early-maturing boys and on-time maturing girls, 2) on-time and late maturers did not differ as a function of gender, 3) late-maturing girls did not differ from either on-time or early-maturing girls, and 4) social anxiety among boys did not differ as a function of developmental timing.

The current findings converge with the considerable body of work suggesting that early-maturing girls evidence elevated anxiety generally (Reardon et al., 2009), and replicates prior work suggesting early maturation among girls (but not boys) relates to social anxiety specifically (Deardorff et al., 2007). Collectively, this body of work suggests that early-maturing girls may not be prepared for the psychosocial changes that accompany

morphological development, thus increasing risk for the development of anxiety psychopathology (Ge, Conger, & Elder, 1996; Hayward, 2003). Further, given the importance of social comparison and peer approval (Prinstein & LaGreca, 2002; Storch et al., 2003), prominence of social evaluation (e.g., imaginary audience) and sense of isolation (e.g., personal fable) that characterize this developmental phase (Elkind, 1967; Schwartz, Maynard, & Uzelac, 2008), early-developing girls, whose disparate maturation is particularly evident to the peer group, may be especially vulnerable to the development of social anxiety. Indeed, research suggests that peer relationships, particularly those with older adolescents, may be a critical variable to consider in terms of psychological maladjustment among early maturers (e.g., Graber, 2003; Stattin, & Magnusson, 1990). These speculations regarding potential mechanisms that may account for enhanced vulnerability to social anxiety among early-maturing girls await empirical verification in future work.

While the current findings are consistent with those observed by Deardoff and colleagues (2007), they stand in contrast to those reported by Ge and colleagues (2006), who found early maturation was associated with elevated internalizing symptoms, including social anxiety among boys, and increased internalizing symptoms (i.e., depression and generalized anxiety) but *not* social anxiety among girls. In addition to the fact that Ge and colleagues (2006) examined a relatively young sample (i.e., M_{age} = 10.5 years), a key difference that may explain this discrepancy is that their sample was exclusively African American. There is a growing literature suggesting the presence of ethnic and racial differences in the relation between puberty-related variables (e.g., status, timing) and psychological outcomes, particularly among girls (Hayward et al., 1999; Michael & Eccles, 2003). For instance, in a national probability sample of more than 3,000 adolescents, Hayward and colleagues (1999) found that advanced pubertal status predicted elevated depressive symptoms among Caucasian, but not African American girls. The authors interpret these findings as suggestive of the idea that African American girls may not experience some of the negative consequences associated with physical maturation (e.g., worsening body image), and thus may be less susceptible to associated outcomes (e.g., depression, anxiety). Although differences in social anxiety as a function of ethnicity or race were not observed in the current largely Caucasian sample, specific minority groups were underrepresented. This sample constraint also precluded analyses regarding the relation between maturational timing and gender across specific ethnic/racial groups; future research directly examining these relations, as well as relevant factors (e.g., parental response to developmental events) that may contribute to differences across groups is warranted.

Of interest, social anxiety among late-maturing girls fell between both early and on-time maturing girls, and was not significantly different from either group. Broadly, these findings are consistent with extant literature suggesting that late-maturing girls evidence reduced risk for anxiety psychopathology as compared to early maturers (Reardon et al., 2009). For instance, Ge and colleagues (1996) found that early maturation, as compared to both on-time and late maturation, was concurrently and prospectively related to elevated anxiety and distress among girls. Nevertheless, in light of the current finding that late-maturing girls did not differ significantly from *either* on-time or early maturers, the particular role of late maturation in terms of social anxiety remains unclear; future research would benefit from assessing the role of theoretically relevant risk (e.g., low self-esteem, peer neglect) and protective factors (e.g., social status gained via athletic involvement, greater preparation for the changes that accompany puberty) which may increase or minimize vulnerability to social anxiety problems among late-maturing girls.

As with any cross-sectional design, a third variable may account for observed relations. For instance, a positive history of psychological treatment was reported by a greater proportion of on-time and late-maturing adolescents as compared to early-maturing youth, which

introduces the alternative explanation that the reduced social anxiety observed among non-early maturers in the current sample may reflect greater treatment utilization. However, the assessment of this variable was relatively crude (i.e., a single self-report assessment of overall treatment utilization) and group differences were not statistically significant. Nonetheless, the general pattern of findings suggests it may be important to consider the role of treatment utilization; multi-informant techniques to comprehensively detail lifetime diagnostic and treatment history (e.g., parental report; medical records), particularly in the context of longitudinal designs, is warranted in future work.

There are a number of limitations that must be considered in the interpretation of the present findings. First, the current study was correlational in nature, employing self-report data from a community-based sample of relatively healthy adolescents. As such, research employing laboratory-based methods (e.g., examining psychophysiological responding to a social stress task as a function of maturational timing), as well as extending this research to clinical samples of youth is warranted. Relatedly, the assessment of social anxiety (i.e., RCADS) did not address physiological (e.g., sweating), or behavioral (e.g., avoidance) responding, or the degree to which fears varied across social contexts (e.g., with adults, familiar peers); assessment tools designed to examine multiple facets of social anxiety (e.g., Social Phobia and Anxiety Inventory for Children; Beidel, Turner, & Morris, 1995) would significantly enhance this line of work. Further, the measure of pubertal timing employed in the current study was based upon data drawn from self-reported pubertal status (i.e., Tanner stage), and thus could be vulnerable to perception biases, particularly among youth with heightened social anxiety (e.g., distorted body image; Gross & Rosen, 1988; Herpertz- Dahlmann et al., 2001). Importantly, adolescents' perception of their own pubertal timing is only moderately correlated with more objective indices (e.g., *r's* range from .28 to .56; Dorn, Dahl, Woodward, & Biro, 2006), suggesting that measures of perceived pubertal timing tap a distinct dimension of pubertal development (e.g., meaning making; Brooks-Gunn, 1984) not otherwise explained by actual, or objective, timing alone. Accordingly, the inclusion of additional sources of information regarding maturational timing and status (e.g., medical examination; parental report) would not only reduce concerns related to shared method variance, but also aid in parsing apart the importance of actual versus perceived timing of maturation.

Further, given variability in the onset and rate of morphological development across individuals (e.g., the onset of adrenarche, the first stage of puberty, typically begins around age 6-9 years among girls; Archibald et al., 2003), extension to a younger cohort as well as longitudinal designs focused on delineating how these processes play out over time is warranted. For example, these preliminary data set the stage for a cross-sequential design that would both limit potential cohort effects as well as allow for the assessment of social anxiety across developmental trajectories. It also is important to note that the current sample included youth recruited from the community who contacted the laboratory and chose to participate for a monetary reward. As such, findings must be considered in light of a potential self-selection bias including, but not limited to, the possibility that youth who are experiencing elevated social anxiety may be less likely to participate in a laboratory-based study. Indeed, social anxiety was slightly lower in the current sample compared to other community-based samples; future research would benefit from employing sampling strategies designed to address this issue (e.g., random sampling; screening and selecting youth based on symptom level).

The above limitations notwithstanding, the current study adds to the existing literature concerning the relation between maturational timing and social anxiety among youth. As researchers are increasingly looking to developmental factors (e.g., childhood illness; Hayward et al., 2008) in an effort to better understand the onset and maintenance of

adolescent social anxiety, future work designed to delineate the specific features of pubertal timing that confer risk for social anxiety will be an important contribution to the design of such developmentally-sensitive models, with the ultimate goal of informing targeted prevention and intervention efforts designed to preclude or reduce adolescent social anxiety.

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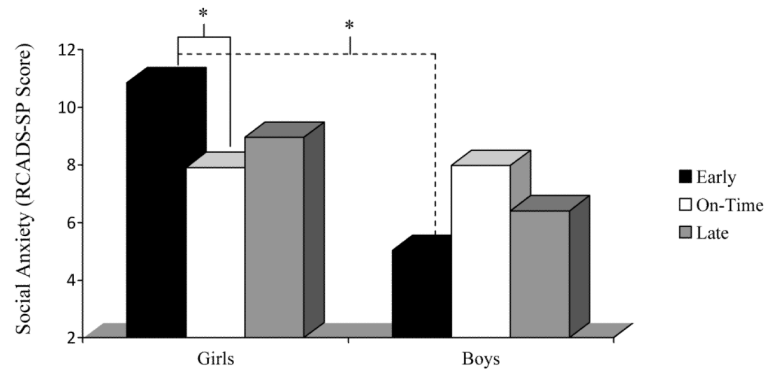
Figure 1.
Social anxiety as a function of gender and maturational timing (uncentered data).
Note: $N = 138$ ($n = 18$ early, $n = 99$ on-time, $n = 21$ late; $n = 68$ girls). RCADS-SP: Revised
Child Anxiety and Depression Scale – Social Phobia subscale (Chorpita et al., 2001).
* Follow-up analyses significant at $p > .05$.

Table1

Demographic and Psychological Characteristics as a Function of Pubertal Timing and Gender

	Early	On-Time	Late	Girls	Boys	Total
% Girls	55.6	45.5	61.9	-	-	49.3
% Early/Late	-	-	-	14.7/ 19.1	11.4/ 11.4	13.0/ 15.2
% Caucasian	61.1	75.8	95.2	83.8	70.0	76.8
RCADS-D *M (SD)*	6.16 (5.59)	6.36 (4.21)	7.09 (4.68)	7.86 (4.50)	5.07 (3.98)	6.44 (4.45)
CBCL–Anxiety *M (SD)*	55.94 (8.39)	55.24 (7.24)	55.86 (6.86)	56.18 (8.06)	54.70 (6.44)	55.43 (7.29)
% ≥ 70	11.2	9.0	4.8	13.3	4.3	8.6
CBCL- Internalizing *M (SD)*	54.78 (10.56)	51.62 (11.02)	52.67 (11.63)	53.97 (12.02)	50.46 (9.75)	52.19 (11.03)
% ≥ 70	11.2	8.0	9.6	13.2	4.2	8.6
CBCL–Total *M (SD)*	54.28 (10.21)	53.10 (11.57)	52.19 (8.87)	54.60 (11.27)	51.67 (10.56)	53.12 (10.98)
% ≥ 70	11.2	9.0	0	11.7	4.2	7.8
% Positive Treatment History[a]	11.1	26.3	23.8	29.4	18.6	23.9
% Currently in Treatment[b]	5.6	6.1	0	5.9	4.3	5.1

Note. *n* = 138.

[a] Percent providing affirmative responses to "Have you ever seen a mental health professional for psychological problems?"

[b] Percent providing affirmative responses to "If yes, are you currently in therapy?" RCADS-D: Revised Child Anxiety and Depression Scale – Depression subscale (Chorpita et al., 2000). CBCL: Child Behavior Checklist/6-18 *t*-score (Achenbach & Rescorla, 2001) -Anxiety: Anxiety Problems subscale, -Internalizing: Internalizing Problems subscale, -Total: Total Problems subscale.

Table 2

Social Anxiety as a Function of Gender and Maturational Timing (uncentered data)

	Early *M (SE)*	On-Time *M (SE)*	Late *M (SE)*	Early vs. On-Time 95% CI[a]	Late vs. On-Time 95% CI[a]	Early vs. Late 95% CI[b]
Girls	10.85 (1.22)	7.91 (0.57)	8.96 (1.06)	0.29– 5.58[*]	-1.31– 3.42	-1.27– 5.04
Boys	5.03 (1.41)	7.98 (0.54)	6.41 (1.33)	−5.96– 0.05	−4.45– 1.30	−5.26– 2.50
Gender 95% CI[c]	2.13– 9.49[*]	−1.66– 1.51	−0.79– 5.90	--	--	--

Note: N = 138 (n = 68 girls). 95% CI: 95% Confidence interval for mean difference. Social anxiety symptoms as measured by the Revised Child Anxiety and Depression Scale – Social Phobia subscale (Chorpita et al., 2001).

[a] Reference group = within gender on-time maturation group.

[b] Reference group = within gender late maturation group.

[c] Reference group = within timing group (i.e., early, on-time, late) boys.

[*] Significant at *p* < .05