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Contextualizing pubertal development: The combination of sexual partners' age and girls' pubertal development confers risk for externalizing but not internalizing symptoms among girls in therapeutic day schools

Shabnam Javdani^{a,*}, Naomi Sadeh^b, Hope I. White^a, Erin Emerson^c, Christopher Houck^d, Larry K. Brown^d, and Geri R. Donenberg^c

^aNew York University Steinhardt School of Culture, Education, and Human Development, United States

^bUniversity of Delaware, Department of Psychological and Brain Sciences, Newark, DE, United States

^cUniversity of Illinois at Chicago School of Public Health, Department of Medicine, Chicago, IL, United States

^dBradley Hasbro Children's Research Center, Rhode Island Hospital, Warren Alpert Medical School of Brown University, Providence, RI, United States

Abstract

Objective: Early pubertal development is associated with negative health and mental health outcomes. Research on the influence of puberty on mental health underscores a need to examine the interplay between puberty and exposure to environmental risk. This study investigates a more rarely studied aspect of girls' environments – romantic relationships with boyfriends. Specifically, this study examined sexual partner age and the timing of girls' pubertal development in relation to externalizing and internalizing symptoms among female students attending therapeutic day schools in the United States, a population at elevated risk for negative mental health outcomes.

Methods: A total of 121 13 to 19-year-old adolescent girls (Mean age = 15.4; SD = 1.5) reported on the relative age of their past 3 sexual partners, their age of pubertal onset, and mental health challenges via clinical assessments of externalizing and internalizing symptoms.

Results: Forty-three percent of participants qualified for at least one mental health diagnosis. Earlier pubertal onset predicted greater internalizing symptoms, and this effect did not depend on the age of girls' sexual partners. However, early-developing girls who also reported having a sexual partner more than 2 years older than them were at increased risk for externalizing symptoms.

Conclusions: Findings underscore that sexual relationships are an important risk factor for early-developing girls already at risk for mental health problems. Early developing girls with older

*Corresponding author. 246 Greene Street; New York, NY, 10003, United States. shabnam.javdani@nyu.edu (S. Javdani).

Author note

A full report is available upon request.

partners may experience stronger social pressure to stay in relationships that expose them to partner violence and delinquency-related pressure, which combine with interpersonal stress to predict externalizing symptoms.

Keywords

Mental health; Externalizing; Internalizing; Adolescents/youth; Romantic sexual partners; Pubertal development

The developmental transition of puberty signifies not only physical changes in an adolescent girl's body, but also affects interpersonal relationships as girls' perceptions of themselves and others' perceptions of them shift in tandem with their physical development (Stattin & Magnusson, 1990; Susman et al., 2010). Early pubertal development has been associated with a host of negative health and mental health-related outcomes (see Mendle, Turkheimer, & Emery, 2007 and Negri & Susman, 2011 for a reviews). For girls in particular, early puberty is associated with lower perceived competence in academic, social, and physical domains (Negri, Hillman, & Dorn, 2011), which predict serious adjustment problems and mental health challenges that can persist into adulthood (Graber, Lewinsohn, Seeley, & Brooks-Gunn, 1997; Toffol, Koponen, Luoto, & Partonen, 2014).

Though accumulating evidence supports this pattern of general risk, research on the direct influence of pubertal development on specific mental health symptoms produces mixed findings if mental health is construed too broadly or the interplay between puberty and exposure to environmental risk is not considered. In the current study, we differentiate between internalizing and externalizing symptoms. Consistent with established definitions (Garnefski, Kraaij, & van Etten, 2005), we define internalizing as a range of experiences, thoughts, and feelings that relate to depression and anxiety, which may not be readily observable. In contrast, externalizing refers to experiences and behaviors that are typically outwardly expressed and relate to aggression and what adults may classify as "acting out".

A body of research has examined the direct influence of pubertal development on internalizing and externalizing symptoms in girls. Meta-analytic evidence suggests that early puberty has a small but significant effect in increasing risk for externalizing and internalizing experiences in both boys and girls (Dimler & Natsuaki, 2015; Ullsperger & Nikolas, 2017). However, the influence of early puberty for girls is small (effect sizes between 0.18 and 0.22), may diminish over time (Graber, Seeley, Brooks-Gunn, & Lewinsohn, 2004), and is particularly weak and inconsistent for internalizing problems (Marceau, Neiderhiser, Lichtenstein, & Reiss, 2012). Further, meta-analytic studies have not examined the interplay between pubertal development and exposure to stressful or risky environments that can amplify the risks of puberty, particularly for racially diverse youth (Ge, Brody, Conger, Simons, & Murry, 2002).

This study draws from two related theoretical foundations to inform this knowledge base. The first implies that risky environmental contexts amplify the stress associated with key developmental milestones, including puberty, and suggests that individual-level risk factors are accentuated during periods of social change (Caspi & Moffitt, 1991; Ge, Natsuaki, Jin, & Biehl, 2011; Haynie, 2003). Research has generally supported this pattern, suggesting that

girls' environments and the relationships that form within them heighten the risks of early puberty (Dimler & Natsuaki, 2015; Ge et al., 2011; Mendle et al., 2007). The second theoretical framework incorporates a gendered lens to understand the particular social and environmental risks that influence girls' mental health. This framework centralizes the social implications attached to biological sex and views gender as a structural variable that organizes roles and opportunities in girls' environments and relationships (Anderson, 2005; Javdani, Sadeh, & Verona, 2011). Taken together, these frameworks underscore the importance of examining the influence of relational contexts during puberty – a time of biological and social change – and attending to the gendered dimensions of these contexts.

In their seminal work, Stattin and Magnusson (1990) highlight the importance of the interpersonal relationships of early-developing girls, focusing on friendship group characteristics. Their results suggest that the presence of older girls and older boys explained the association between early pubertal timing and problem behaviors such as minor delinquency and drinking. They suggest that early pubertal timing may change the way girls perceive themselves and are perceived by others, making early maturing girls more susceptible to peer influence. In particular, greater social and emotional maturity is attributed to early-developing girls based on their physical maturity (Eichorn, 1975), and these girls are more likely to associate with older peers because they experience rejection from, and develop lower-quality attachments to, their same-age peers (Haynie, Giordano, Manning, & Longmore, 2005; Javdani Rodriguez, Nichols, Emerson, & Donenberg, 2014; Stattin & Magnusson, 1990). Subsequent research underscores that male peers in particular model delinquent behavior within girls' mixed-sex friendship groups and encourage girls to engage in risky acts (Agnew & Brezina, 1997; Caspi, Lynam, Moffitt, & Silva, 1993; Moffitt, Caspi, Rutter, & Silva, 2001). Findings from twin studies corroborate these patterns and underscore that non-shared environments (e.g., relationships outside of girls' homes) heighten the risk of early puberty in girls, after accounting for genetic factors (Harden & Mendle, 2012). It thus seems that non-shared environments composed of peers who are older and male exacerbate risks of early puberty; but the evidence base remains mixed and limited. Little work has examined internalizing symptoms, and some studies on externalizing symptoms find no evidence that older friends (Haynie, 2003) or older male friends (Negri et al., 2011) amplify pubertal risk.

To address this research gap, the current study investigates a more rarely studied aspect of girls' non-shared environments – their romantic relationships with boyfriends. Support for doing so is justified by research finding that older boyfriends increase girls' problem behaviors above the influence of individual psychosocial risk factors (Young & d'Arcy, 2005). Further, early developing girls start dating older romantic partners earlier (Kim, Smith, & Palermi, 1997; Moore, Harden, & Mendle, 2014), have more sexual partners (Copeland et al., 2010), and experience more romantic partner stress (Llewellyn, Rudolph, & Roisman, 2012).

Although these findings underscore the need to examine the influence of romantic partnerships on girls' mental health, few studies have investigated romantic partnerships for early developing girls. These studies suggest that girls' involvement in romantic relationships explains the link between their early pubertal development and party deviance

(e.g. substance use and truancy; Haynie, 2003) and that older male romantic partners introduce girls to contexts that do not match their social and emotional maturity and heighten exposure to gender based violence (Miller, 2008). Further, sexual experiences promote risk prospectively for externalizing symptoms only if girls experienced early puberty (Javdani, Rodriguez, Nichols, Emerson, & Donenberg, 2014). These findings corroborate the only study to examine the role of romantic partner age in explaining the risk of puberty for girls. Informed by a community-based sample, this study finds that older male partners uniquely predict engagement in risky sex and substance use for early-developing girls (Halpern, Kaestle, & Hallfors, 2007).

No studies have examined the degree to which a) older romantic partners amplify the impact of early pubertal development by directly testing an interaction between partners and puberty, or b) investigated this influence on broadband mental health, while distinguishing between internalizing and externalizing symptoms. This study addresses these gaps by examining the degree to which: 1) age of pubertal onset and age of male romantic partners confer risk for internalizing and externalizing symptoms and 2) age of puberty moderates the relationship between partner age and both indices of mental health. We focus on a clinical sample of youth attending therapeutic day schools and utilize validated mental health assessment techniques. We hypothesize that early-developing girls who also have older male partners are at increased risk for both internalizing and externalizing symptoms.

1. Methods

1.1. Participants and procedures

Data were collected through Project Balance, a two-site (Chicago, IL and Providence, RI), three-arm randomized controlled trial to reduce risky sexual behavior among youth in therapeutic day schools (Brown et al., 2010; Donenberg, Emerson, Brown, Houck, & Mackesy-Amity, 2012). Teens were compensated \$25 for participation in a 75-min assessment. Institutional review boards at University of Illinois at Chicago and the Rhode Island Hospital approved all study procedures. Because of the focus on pubertal development (specifically menarche) only girls ($N = 126$) were included. Five girls who did not report heterosexual relationships were excluded, yielding a total sample size of 121.

Girls ranged in age from 13 to 19 (Mean = 15.39; SD = 1.46), 43% were White, 22% Black, 12% biracial, and 12% Latina. Girls were in grades 7–12 (Mean = 9.89, SD = 1.41).

1.2. Measures

1.2.1. Partner age—The AIDS Risk Behavior Assessment (ARBA) (Donenberg, Emerson, Bryant, Wilson, & Weber-Shifrin, 2001) is a computerized self-administered interview assessing nonabusive sexual interactions. Partner Age was calculated by collapsing across responses for oral and vaginal/anal sex for girls' past three sexual partners (Table 1).

1.2.2. Pubertal onset—Pubertal onset was assessed by an open-ended item assessing age of first menses (i.e., "how old were you when you got your first period?"; Wallenius et al., 2010). Participants indicated age of menarche, which ranged from 9 to 15 years (Mean = 11.71, SD = 1.68). First menses prior to age 11 (36%) was classified as early pubertal onset

(versus after age 11 = 64%) based on standard classifications for diverse samples (Chumlea et al., 2003).

1.2.3. Mental health—Externalizing and Internalizing symptoms were assessed using The Strengths and Difficulties Questionnaire (SDQ) and the Computerized Diagnostic Interview Schedule for Children (C-DISC). The SDQ is a brief screening for emotional and conduct problems (Goodman, Meltzer, & Bailey, 1998) with demonstrated construct validity (Goodman, 2001; Goodman et al., 1998). The emotional and conduct problems scales each consist of five items ranging from 0 to 10 and assess internalizing (e.g., “I am unhappy, down-hearted or tearful”) and externalizing (e.g., “I fight a lot”), respectively. The C-DISC is a comprehensive and widely-used structured interview of mental health disorders for children and adolescents, using DSM-IV criteria (Shaffer, Fisher, Lucas, Dulcan, & Schwab-Stone, 2000). An Externalizing symptom composite was created by standardizing symptom percentages for conduct disorder, oppositional defiance disorder, and SDQ conduct problems scale. An Internalizing symptom composite standardized across major depressive disorder, generalized anxiety disorder, and the SDQ emotional problems scale (Table 1). The individual subscales comprising each composite variable all demonstrate adequate inter-item internal consistency (Cronbach’s $\alpha > 0.70$). Further each individual subscale is significantly associated with the other subscales that comprise the internalizing composite ($r_s > 0.50$, $p_s < .01$) and the externalizing composite ($r_s > 0.40$, $p_s < .01$).

1.3. Data analysis

An a priori power analysis based on an anticipated small effect size (0.15; Halpern et al., 2007; Haynie et al., 2005) and 5 total predictors supports a minimum required sample size of 96 for 80% power. Two sets of linear regressions were conducted, regressing either Externalizing or Internalizing symptoms on the same set of predictors. Sequentially, these predictors included partner age, age of pubertal onset, and the interaction between partner age and pubertal onset. Youth age was included as a covariate given the robust finding that youth experience more mental health challenges as they age. Between 3 and 8 participants had missing data on key variables. Data were missing at random and modeled using pairwise deletion to retain the maximum amount of information. Data were examined for outliers and non-linear distributions. No clear univariate or bivariate outliers were present. Analyses were conducted using SPSS version 24 (SPSS, Chicago, IL).

2. Results

Forty-three percent of the sample qualified for at least one mental health diagnosis and 18.3% qualified for comorbid diagnoses for both Internalizing and Externalizing. Internalizing and Externalizing symptoms ($r = 0.36$, $p < .05$) correlated positively, while Partner Age and Pubertal onset were not associated with each other or with either indicator of mental health.

Table 2 reports on two hierarchical linear regressions predicting Externalizing and Internalizing symptoms, separately. Block 1 included age as a covariate, Block 2 included sexual Partner Age and age of Pubertal Onset, and Block 3 included the Partner Age x

Pubertal Onset interaction. Table 2 note also reports results from other analyses conducted to investigate patterns for key subgroups and including other covariates.

For Internalizing symptoms, Pubertal Onset was the only significant predictor ($\beta = -0.23$, $p < .05$), suggesting that early puberty is positively related to Internalizing symptoms. This relationship did not depend on Partner Age ($\beta = -0.18$, *ns*). For Externalizing symptoms, neither Partner Age nor Pubertal Onset were significant predictors by themselves. However, as expected, the interaction of these two variables was significantly related to Externalizing symptoms ($\beta = -0.27$, $p < .05$). Fig. 1 illustrates this relationship, suggesting that sexual partner age and externalizing symptoms are moderately strongly correlated for early-developing girls ($r = .45$, $p < .05$; $R^2 = 17.6\%$), but not for average or later developing girls (i.e., after age 10; $r = 0.05$, $p = .60$ $R^2 = 0\%$).

3. Discussion

This paper provides a novel examination of the influence of girls' pubertal development on mental health. Prior theoretical and qualitative empirical support (Caspi & Moffitt, 1991; Ge et al., 2011; Haynie, 2003; Javdani et al., 2011; Miller, 2008) suggests that older male romantic partners may introduce girls to contexts that do not match their social and emotional maturity. While we do not directly examine this assertion, this study advances prior work by examining the direct and interactive influence of romantic partner age and girls' pubertal development on both internalizing and externalizing symptoms in a sample of girls with high mental health needs. Below, we outline key contributions and suggest possible interpretations of findings.

The contributions of this study are two-fold. First, we directly test the hypothesis that older male partners amplify girls' risk for mental health problems. Girls with earlier pubertal development, operationalized as early menarche, were at increased risk for engaging in behaviors associated with externalizing symptoms only when those girls reported having a male romantic partner more than 2 years older than them. This parallels research with non-clinical samples, which find that having an older partner predicts risky sex and substance use for early developing girls (Halpern et al., 2007). Our results expand previous work by directly testing the interaction between puberty and partners and finding that this interaction heightens risk for a broad spectrum of externalizing symptoms that include disruptive behavior and conduct problems that can place girls at risk of arrest. This supports theory suggesting that the negative impact of girls' early puberty on externalizing symptoms is not direct, but instead amplified by exposure to risky social contexts (Harden & Mendle, 2012; Savolainen et al., 2015).

Current findings suggest that the presence of older male sexual partners may be a key component of this social risk for girls. Interpreted broadly, older male partnerships may be more stressful and create opportunities for girls to engage in disruptive behaviors; risk factors that uniquely predict delinquency for early developing girls (Gowen, Feldman, Diaz, & Yisrael, 2004; Sontag, Graber, & Clemans, 2011; Stattin, Kerr, & Skoog, 2011). Interpreted with a gendered lens, the developmental transition of adolescence is one during which girls are increasingly expected to cultivate and maintain relationships, consistent with

female gender roles that value caretaking and nurture (Taylor et al., 2000). Girls with older partners are more likely to experience a loss of perceived power within relationships (DiClemente et al., 2002), and delinquency-related pressure from their boyfriends (Cauffman, Farugia, & Goldweber, 2008). For early developing girls, these social risks are exacerbated by heightened sensitivity to interpersonal stress (Natsuaki et al., 2009) and exposure to dating abuse (Chen, Rothman, & Jaffee, 2017). Taken together, early developing girls with older partners may experience stronger social pressure to stay in relationships that expose them to partner violence and delinquency-related pressure, which combine with interpersonal stress to predict externalizing symptoms.

Second, we test the direct association between early pubertal development and mental health, and find that early menarche, regardless of partner age, was only a significant predictor of internalizing symptoms associated with anxiety and depression. This finding replicates previous research with community samples associating early pubertal timing with depression (e.g., Stroud & Davila, 2008); a pattern that may be explained by the link between early puberty and poorer emotional clarity (Hamilton, Hamlat, Stange, Abramson, & Alloy, 2014) and higher emotional arousal, which predict increased depressive affect (Graber, Brooks-Gunn, & Warren, 2006). It is also possible that other stressful contexts not considered in this study, including being targets of rumors at school, are particularly powerful for explaining early developing girls' internalizing experiences (Reynolds & Juvonen, 2011). Notably, we do not find a direct link between early puberty and externalizing, in keeping with some previous studies (Negriff & Trickett, 2010) but not others (Caspi et al., 1993). Reasons for this may include the way externalizing was measured, given that previous research suggests that early puberty predicted only non-violent forms of delinquency (Harden & Mendle, 2012); and that research with clinical samples such as ours (Negriff & Trickett, 2010) and racially diverse samples such as ours (Deardorff et al., 2013; Obeidallah, Brennan, Brooks-Gunn, & Earls, 2004) with similarly aged girls does not find a direct effect of early puberty on externalizing symptoms. Finally, we did not find evidence that the presence of older boyfriends alone predicts either internalizing or externalizing symptoms, corroborating previous studies (Javdani et al., 2014) suggesting that the influence of older boyfriends does not persist past early adolescence (Haydon & Halpern, 2010).

Understanding the impact of puberty and romantic partners with attention to other sociodemographic variables, including race, is an important area for future research given that girls of color are viewed as more adult-like as compared to their white counterparts (Epstein, Blake, & Gonzalez, 2017) and experience greater neighborhood-level risk (Obeidallah et al., 2004). Similarly, girls' own perceptions of the potential social costs and benefits of engaging with older male partners remains understudied (e.g., Miller, 2008). These are particularly important given that the mismatch between early-developing girls' socio-emotional and physical maturity (Magnusson, Stattin, & Allen, 1986) may limit their capacity to negotiate safe sex or reject unwanted sexual advances (Cavanagh, 2004).

Findings should be considered in light of limitations. The cross-sectional design prohibits inferences about the direction of relationships; the focus on girls' heterosexual relationships limits generalizability; age of partners was assessed categorically; our puberty measure

relied on retrospective reports (Haynie, 2003), it did not consider pubertal tempo (Beltz, Corley, Bricker, Wadsworth, & Berenbaum, 2014), and its direct association with internalizing symptoms was small. Important covariates, such as parental mental health, more robust assessments of family income, and child maltreatment were not available and should be considered in future research. Strengths of the study include a racially and ethnically diverse sample of girls at risk for mental health disparities, use of multiple validated measures, and a focus on contextualizing the pubertal development of girls, who represent an understudied population with respect to externalizing symptoms in particular.

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References

- Agnew R, & Brezina T (1997). Relational problems with peers, gender, and delinquency. *Youth & Society*, 29(1), 84–111.
- Anderson KL (2005). Theorizing gender in intimate partner violence research. *Sex Roles*, 52(11–12), 853–865.
- Beltz AM, Corley RP, Bricker JB, Wadsworth SJ, & Berenbaum SA (2014). Modeling pubertal timing and tempo and examining links to behavior problems. *Developmental Psychology*, 50(12), 2715–2726. [PubMed: 25437757]
- Brown LK, Hadley W, Stewart A, Lescano C, Whiteley L, Donenberg G, et al. (2010). Psychiatric disorders and sexual risk among adolescents in mental health treatment. *Journal of Consulting and Clinical Psychology*, 78(4), 590. [PubMed: 20658815]
- Caspi A, Lynam D, Moffitt TE, & Silva PA (1993). Unraveling girls' delinquency: Biological, dispositional, and contextual contributions to adolescent misbehavior. *Developmental Psychology*, 29(1), 19.
- Caspi A, & Moffitt TE (1991). Individual differences are accentuated during periods of social change: The sample case of girls at puberty. *Journal of Personality and Social Psychology*, 61, 157. [PubMed: 1890586]
- Cauffman E, Farruggia SP, & Goldweber A (2008). Bad boys or poor parents: Relations to female juvenile delinquency. *Journal of Research on Adolescence*, 18(4), 699–712. [PubMed: 19920878]
- Cavanagh SE (2004). The sexual debut of girls in early adolescence: The intersection of race, pubertal timing, and friendship group characteristics. *Journal of Research on Adolescence*, 14(3), 285–312.
- Chen FR, Rothman EF, & Jaffee SR (2017). Early puberty, friendship group characteristics, and dating abuse in US girls. *Pediatrics*, 120(6), e20162847.
- Chumlea WC, Schubert CM, Roche AF, Kulin HE, Lee PA, Himes JH, et al. (2003). Age at menarche and racial comparisons in US girls. *Pediatrics*, 111, 110–113. [PubMed: 12509562]
- Copeland W, Shanahan L, Miller S, Costello EJ, Angold A, & Maughan B (2010). Outcomes of early pubertal timing in young women: A prospective population-based study. *American Journal of Psychiatry*, 167(10), 1218–1225. [PubMed: 20478880]
- Deardorff J, Cham H, Gonzales NA, White RMB, Tein J, Wong JJ, et al. (2013). Pubertal timing and Mexican-origin girls' internalizing and externalizing symptoms: The influence of harsh parenting. *Developmental Psychology*, 49(9), 1790–1804. [PubMed: 23231686]

- DiClemente RJ, Wingood GM, Crosby RA, Sionean C, Cobb BK, Harrington K, ... Oh MK (2002). Sexual risk behaviors associated with having older sex partners: a study of black adolescent females. *Sexually Transmitted Diseases*, 29(1), 20–24. [PubMed: 11773874]
- Dimler LM, & Natsuaki MN (2015). The effects of pubertal timing on externalizing behaviors in adolescence and early adulthood: A meta-analytic review. *Journal of Adolescence*, 45, 160–170. [PubMed: 26439868]
- Donenberg GR, Emerson E, Brown LK, Houck C, & Mackesy-Amiti ME (2012). Sexual experience among emotionally and behaviorally disordered students in therapeutic day schools. *Journal of Pediatric Psychology*, 37(8), 904–913. [PubMed: 22467883]
- Donenberg G, Emerson E, Bryant F, Wilson H, & Weber-Shiffrin E (2001). Understanding AIDS-risk behavior among adolescents in psychiatric care: Links to psycho-pathology and peer relationships. *Journal of the American Academy of Child & Adolescent Psychiatry*, 40, 642–653. [PubMed: 11392341]
- Eichorn DE (1975). Asynchronizations in adolescent development (pp. 81–96). In Dragastin SE, & Elder GH, Jr. (Eds.). *Adolescence in the life-cycle: Psychological change and the social context*. New York: Wiley.
- Epstein R, Blake JJ, & González T (2017). *Girlhood interrupted: The erasure of Black girls' childhood*. Washington, DC: The Georgetown Law Center on Poverty and Inequality.
- Garnefski N, Kraaij V, & van Etten M (2005). Specificity of relations between adolescents' cognitive emotion regulation strategies and internalizing and externalizing psychopathology. *Journal of Adolescence*, 28(5), 619–631. [PubMed: 16203199]
- Ge X, Brody GH, Conger RD, Simons RL, & Murry VM (2002). Contextual amplification of pubertal transition effects on deviant peer affiliation and externalizing behavior among African American children. *Developmental Psychology*, 38(1), 42. [PubMed: 11806701]
- Ge X, Natsuaki MN, Jin R, & Biehl MC (2011). A contextual amplification hypothesis: Pubertal timing and girls' emotional and behavioral problems Understanding girls' problem behavior: How girls' delinquency develops in the context of maturity and health (pp. 9–29). *Co-Occurring Problems, and Relationships*.
- Goodman R (2001). Psychometric properties of the strengths and difficulties questionnaire. *Journal of the American Academy of Child & Adolescent Psychiatry*, 40, 1337–1345. [PubMed: 11699809]
- Goodman R, Meltzer H, & Bailey V (1998). The strengths and difficulties questionnaire: A pilot study on the validity of the self-report version. *European Child & Adolescent Psychiatry*, 7(3), 125–130. [PubMed: 9826298]
- Gowen LK, Feldman SS, Diaz R, & Yisrael DS (2004). A comparison of the sexual behaviors and attitudes of adolescent girls with older vs. similar-aged boyfriends. *Journal of Youth and Adolescence*, 33(2), 167–175.
- Graber JA, Brooks-Gunn J, & Warren MP (2006). Pubertal effects on adjustment in girls: Moving from demonstrating effects to identifying pathways. *Journal of Youth and Adolescence*, 35(3), 391–401.
- Graber JA, Lewinsohn PM, Seeley JR, & Brooks-Gunn J (1997). Is psychopathology associated with the timing of pubertal development? *Journal of the American Academy of Child & Adolescent Psychiatry*, 36(12), 1768–1776. [PubMed: 9401339]
- Graber JA, Seeley JR, Brooks-Gunn J, & Lewinsohn PM (2004). Is pubertal timing associated with psychopathology in young adulthood? *Journal of the American Academy of Child & Adolescent Psychiatry*, 43(6), 718–726. [PubMed: 15167088]
- Halpern CT, Kaestle CE, & Hallfors DD (2007). Perceived physical maturity, age of romantic partner, and adolescent risk behavior. *Prevention Science*, 8(1), 1–10. [PubMed: 16972191]
- Hamilton JL, Hamlat EJ, Stange JP, Abramson LY, & Alloy LB (2014). Pubertal timing and vulnerabilities to depression in early adolescence: Differential pathways to depressive symptoms by sex. *Journal of Adolescence*, 37(2), 165–174. [PubMed: 24439622]
- Harden KP, & Mendle J (2012). Gene-environment interplay in the association between pubertal timing and delinquency in adolescent girls. *Journal of Abnormal Psychology*, 121(1), 73–87. [PubMed: 21668078]
- Haydon AA, & Halpern CT (2010). Older romantic partners and depressive symptoms during adolescence. *Journal of Youth and Adolescence*, 39(10), 1240–1251. [PubMed: 20424899]

- Haynie DL (2003). Contexts of risk: Explaining the link between girls' pubertal development and their delinquency involvement. *Social Forces*, 82, 355–397.
- Haynie DL, Giordano PC, Manning WD, & Longmore MA (2005). Adolescent romantic relationships and delinquency involvement. *Criminology*, 43, 177–210.
- Javdani S, Rodriguez EM, Nichols SR, Emerson E, & Donenberg GR (2014). Risking it for love: Romantic relationships and early pubertal development confer risk for later disruptive behavior disorders in African-American girls receiving psychiatric care. *Journal of Abnormal Child Psychology*, 42(8), 1325–1340. [PubMed: 24748499]
- Javdani S, Sadeh N, & Verona E (2011). Expanding our lens: Female pathways to antisocial behavior in adolescence and adulthood. *Clinical Psychology Review*, 31, 1324–1348. [PubMed: 22001339]
- Kim K, Smith PK, & Palermi AL (1997). Conflict in childhood and reproductive development. *Evolution and Human Behavior*, 18(2), 109–142.
- Llewellyn N, Rudolph KD, & Roisman GI (2012). Other-sex relationship stress and sex differences in the contribution of puberty to depression. *The Journal of Early Adolescence*, 32, 824–850. [PubMed: 26778876]
- Magnusson D, Stattin H, & Allen V (1986). 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.
- Marceau K, Neiderhiser JM, Lichtenstein P, & Reiss D (2012). Genetic and environmental influences on the association between pubertal maturation and internalizing symptoms. *Journal of Youth and Adolescence*, 41(9), 1111–1126. [PubMed: 22476728]
- Mendle J, Turkheimer E, & Emery RE (2007). Detrimental psychological outcomes associated with early pubertal timing in adolescent girls. *Developmental Review*, 27, 151–171. [PubMed: 20740062]
- Miller J (2008). *Getting played: African American girls, urban inequality, and gendered violence*. NYU Press.
- Moffitt TE, Caspi A, Rutter M, & Silva PA (2001). *Sex differences in antisocial behavior: Conduct disorder, delinquency, and violence in the Dunedin Longitudinal Study*. Cambridge, England: Cambridge University Press.
- Moore SR, Harden KP, & Mendle J (2014). Pubertal timing and adolescent sexual behavior in girls. *Developmental Psychology*, 50(6), 1734. [PubMed: 24588522]
- Natsuaki MN, Klimes-Dougan B, Ge X, Shirtcliff EA, Hastings PD, & Zahn-Waxler C (2009). Early pubertal maturation and internalizing problems in adolescence: Sex differences in the role of cortisol reactivity to interpersonal stress. *Journal of Clinical Child and Adolescent Psychology*, 38(4), 513–524. [PubMed: 20183638]
- Negriff S, Hillman JB, & Dorn LD (2011). Does competence mediate the associations between puberty and internalizing or externalizing problems in adolescent girls?. *Journal of Adolescent Health*, 49(4), 350–356. [PubMed: 21939864]
- Negriff S, & Susman EJ (2011). Pubertal timing, depression, and externalizing problems: A framework, review, and examination of gender differences. *Journal of Research on Adolescence*, 21(3), 717–746.
- Negriff S, & Trickett PK (2010). The relationship in between pubertal timing and delinquent behavior in maltreated male and female adolescents. *The Journal of Early Adolescence*, 30, 518–542. [PubMed: 23970810]
- Obeidallah D, Brennan RT, Brooks-Gunn J, & Earls F (2004). Links between puberty timing, neighborhood contexts, and girls' violent behavior. *Journal of the American Academy of Child & Adolescent Psychiatry*, 429, 1460–1468.
- Reynolds BM, & Juvonen J (2011). The role of early maturation, perceived popularity, and rumors in the emergence of internalizing symptoms among adolescent girls. *Journal of Youth and Adolescence*, 40(11), 1407–1422. [PubMed: 21132522]
- Savolainen J, Mason WA, Hughes LA, Ebeling H, Hurtig TM, & Taanila AM (2015). Pubertal development and sexual intercourse among adolescent girls: An examination of direct, mediated, and spurious pathways. *Youth & Society*, 47(4), 520–538.

- Shaffer D, Fisher P, Lucas C, Dulcan M, & Schwab-Stone M (2000). NIMH diagnostic interview schedule for children version IV (NIMH DISC-IV). *Journal of the American Academy of Child & Adolescent Psychiatry*, 39, 28–38. [PubMed: 10638065]
- Sontag LM, Graber JA, & Clemans KH (2011). The role of peer stress and pubertal timing on symptoms of psychopathology during early adolescence. *Journal of Youth and Adolescence*, 40(10), 1371–1382. [PubMed: 21170672]
- Stattin H, Kerr M, & Skoog T (2011). Early pubertal timing and girls' problem behavior: Integrating two hypotheses. *Journal of Youth and Adolescence*, 40(10), 1271–1287. [PubMed: 21769611]
- Stattin H, & Magnusson D (1990). Pubertal maturation in female development. Erlbaum Inc.
- Stroud C, & Davila J (2008). Pubertal timing and depressive symptoms in early adolescence: The roles of romantic competence and romantic experiences. *Journal of Youth and Adolescence*, 37(8), 953–966.
- Susman EJ, Dockray S, Granger D. a., Blades KT, Randazzo W, Heaton J. a., et al. (2010). Cortisol and alpha amylase reactivity and timing of puberty: Vulnerabilities for antisocial behaviour in young adolescents. *Psychoneuroendocrinology*, 35, 557–569. [PubMed: 19819639]
- Taylor SE, Klein LC, Lewis BP, Gruenewald TL, Gurung RA, & Updegraff JA (2000). Biobehavioral responses to stress in females: Tend-and-befriend, not fight-or-flight. *Psychological Review*, 107(3), 411. [PubMed: 10941275]
- Toffol E, Koponen P, Luoto R, & Partonen T (2014). Pubertal timing, menstrual irregularity, and mental health. *Archives of Women's Mental Health*, 17(2), 127–135.
- Ullsperger JM, & Nikolas MA (2017). A meta-analytic review of the association between pubertal timing and psychopathology in adolescence. *Psychological Bulletin*, 143(9), 903. [PubMed: 28530427]
- Wallenius M, Hirvonen A, Lindholm H, Rimpela A, Nygard CH, Saarni L, et al. (2010). Salivary cortisol in relation to the use of Information and Communication Technology (ICT) in school-aged children. *Psychology*, 1(02), 88.
- Young AM, & d'Arcy H (2005). Older boyfriends of adolescent girls: The cause or a sign of the problem? *Journal of Adolescent Health*, 36(5), 410–419. [PubMed: 15837345]

Fig. 1.

Early pubertal development moderates the relationship between partner age and externalizing symptoms. Sexual partner age and externalizing symptoms are moderately strongly correlated for early-developing girls ($r = .45, p < .05$), but not for average or later developing girls (i.e., after age 10; $r = 0.05, p = .60$). Early puberty did not confer risk for externalizing symptoms when partners were younger or the same age ($r = 0.18, ns$), or less than 2 years older than girls ($r = 0.20, ns$). However, if girls reported having sexual partners more than 2 years older than them, a significant negative relationship emerged between early puberty and externalizing symptoms ($r = -.60, p < .05$).

Table 1

Descriptive statistics for key study variables (N = 121).

Externalizing		
CDISC Symptoms	Symptom Percentage	Range
Oppositional Defiance Disorder	43.53% (29.75%)	0–73.08
Conduct Disorder	25.42% (18.37%)	0–100
	Mean (Standard Deviation)	Range
SDQ Conduct Problems	3.85 (2.21)	0–10
Externalizing Composite (Standardized)	.28 (2.3)	–4.29–7.26
Internalizing		
CDISC Symptoms	Symptom Percentage	Range
Major Depressive Disorder	33.36% (24.85%)	0–81.82
Generalized Anxiety Disorder\	36.86% (25.70%)	0–100
	Mean (Standard Deviation)	Range
SDQ Emotional Problems	4.97 (2.67)	0–10
Internalizing Composite (Standardized)	.12 (2.6)	–4.63–6.29
Partner Age	Mean (Standard Deviation)	Range
	3.22 (0.97)	1–5
	Frequency	
1 - “younger than you”	4.3%	
2 - “you were the same age”	13%	
3 - “1–2 years older than you”	50.7%	
4 - “3–4 years older than you”,	20.3%	
5 - “5 or more years older than you”	11.6%	
Age of Pubertal Onset	Mean (Standard Deviation)	Range
Age	11.71 (1.68)	9–15

Note. CDISC = Computerized Diagnostic Interview Schedule for Children. SDQ = Strengths and Difficulties Questionnaire. Symptom percentages were calculated as the total number of symptoms endorsed divided by the total number of possible symptoms.

Table 2

Regression analyses examining the effects of sexual partner age, age of pubertal onset, and their interaction on Externalizing and Internalizing symptoms (N = 121).

	(A) Externalizing Symptoms		(B) Internalizing Symptoms	
	β (SD)	p-value	β (SD)	p-value
	(Final model: $R^2=11.4\%$, $p=.046$)		(Final model: $R^2=10.4\%$, $p=.11$)	
Age	-.13 (.17)	.27	.13 (.22)	.28
Partner age difference	-.15 (.17)	.21	.07 (.38)	.56
Age of pubertal onset	-.01 (.30)	.76	-.23 (.21)*	.049*
Partner age difference x Age of pubertal onset	-.27 (.16)*	.02*	-.18 (.21)	.12

Note.

* = $p < .05$.

Partner age x age of pubertal onset was residualized by regressing the interaction variable onto its simple effects. Supplementary follow up analyses were conducted by (1) conducting regression analyses separately for subgroups of participants and comparing analytic patterns for (a) white (43%) versus nonwhite (46%) participants and (b) youth younger than median age (15 years) versus older youth. Subgroup analyses produced the same pattern of results, including the direction, magnitude, and significance of all simple effects. Given lower statistical power for each subgroup, the p-value for the interaction between partner age and pubertal onset was only significant for nonwhite youth ($p = .035$) and ranged from $p = .11$ to $.14$ for other subgroups. Further, (2) covariates other than age, including race, sexual debut, receipt of free or reduced lunch, and number of adults living at home were included individually and in combination with one another. All covariate analyses also support the same pattern of results, including the direction, magnitude, and significance of all simple and interaction effects.