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ORIGINAL PAPER

The Combined Influence of Monitoring and Early Puberty on Disruptive Behavior Problems in African American Girls

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Abstract

Adolescent girls' disruptive behavior problems (DBP) are associated with risk for other mental health challenges and legal system involvement. Existing literature suggests early pubertal timing and low maternal monitoring might confer risk for DBP; however, few studies examine the combined influence of these factors, particularly in samples at risk for both DBP and early pubertal timing. This longitudinal study examined whether perceived pubertal timing moderated the association between maternal monitoring and DBP in a treatment-seeking sample of 256 African American adolescent girls (ages 12–16) and their female caregivers. Hierarchical linear regression analyses demonstrated that pubertal timing moderated the association between maternal monitoring and DBP. For early-developing girls, maternal monitoring and DBP at 1-year were negatively associated. Maternal monitoring was not related to DBP at 1-year for on-time and later-developing girls. Findings suggest that maternal monitoring may be a more effective parenting practice for preventing DBP in early-developing girls as compared to their on-time and later-developing peers.

Keywords Pubertal development/pubertal timing · Maternal monitoring · Disruptive behavior problems/disruptive behavior disorders · Adolescents/youth · Gender/girls

Highlights

- Pubertal timing moderated the relation between monitoring and DBP in a treatment-seeking sample of African American girls.
- Maternal monitoring and DBP at 1-year were negatively related for early developers.
- Maternal monitoring was not related to DBP at 1-year for on-time/later developers.
- Maternal monitoring may be more effective for preventing DBP in early-developing girls as compared to their on-time and later-developing peers.

Disruptive behavior problems (DBP) encompass a broad pattern of externalizing problems including delinquency, antisocial behavior, and aggression (Kroneman et al., 2009), and are most closely related to diagnoses of oppositional defiant disorder and conduct disorder (American Psychiatric Association, 2013). DBP are of critical importance to public health, as adolescent girls with DBP are at risk for legal system involvement and persistent negative outcomes into adulthood such as substance use, depression, and poor physical health (Odgers et al., 2008). The published literature on DBP has primarily focused on boys; however, recent research suggests that DBP may develop and manifest differently for girls than boys (Javdani et al., 2011). For example, girls tend to develop DBP during adolescence versus childhood (Silverthorn & Frick, 1999). These gender differences underscore the importance of further investigating gender-specific pathways to DBP in adolescent girls. Existing literature suggests that both early pubertal timing and low maternal monitoring confer risk for DBP; however, few studies examine the combined influence of these

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factors, particularly in African American girls who are at risk for both DBP and early pubertal timing (Dimler & Natsuaki, 2015; Racz & McMahon, 2011). The present study aims to address this gap by examining whether perceived pubertal timing moderates the association between maternal monitoring and DBP at 1-year follow-up in a sample of mental health treatment-seeking African American adolescent girls.

Theory and research have long supported the influence of parenting and family factors on the development of DBP across genders, particularly parenting styles and parental monitoring (Javdani et al., 2011). The present study focuses on monitoring because it is one of the most studied parenting practices in relation to adolescent DBP and is a malleable parenting skill, making it a promising intervention target (Dishion & McMahon, 1998). Parental monitoring consists of parents' information-seeking and surveillance practices that result in knowledge of their children's behavior and whereabouts, as well as parental knowledge gleaned through adolescent disclosure of information (Stattin & Kerr, 2000). Monitoring is hypothesized to protect against adolescent DBP by preventing exposure to unsupervised contexts and peers that engage in risky behaviors (Dishion & McMahon, 1998). However, associations between monitoring and problem behavior are inconsistent across studies. Some studies report that high monitoring is associated with lower levels of problem behavior (e.g., De Kemp et al., 2006; Richards et al., 2004), while others report that greater monitoring is associated with greater problem behaviors (e.g., Kiesner et al., 2009). Still, others report no significant associations between monitoring and problem behaviors (e.g., Laird et al., 2018).

One possible explanation for these inconsistent findings is that parental monitoring is most effective at preventing problem behaviors for adolescents who need it the most. For example, some research has found that parental monitoring is more strongly related to the prevention of problem behaviors for adolescents who spend much of their time unsupervised or have low levels of empathy (e.g., Crocetti et al., 2016; Laird et al., 2010). Given the differences in the development and manifestation of DBP between girls and boys, we argue that our understanding of these inconsistent findings could be expanded by considering gender-specific developmental and contextual factors that may help to uncover for which adolescents parental monitoring is an effective practice for preventing DBP. Prior research has also revealed that parents tend to monitor girls more than boys and girls may also disclose information to their parents more readily, which may result in more "successful" monitoring and prevention of DBP (Crouter & Head, 2002). However, the effect of parental monitoring on the prevention of DBP decreases across adolescence for girls compared to boys (Jacobson & Crockett, 2000). As such, there is a need for identifying factors that may strengthen or dampen the effectiveness of parental monitoring on the prevention of DBP in adolescent girls to inform intervention and prevention efforts for DBP.

One developmental factor that may be particularly relevant for adolescent girls is pubertal timing. Puberty is a developmental transition period with biological, social, and psychological implications. This transition may become increasingly difficult for girls when pubertal development occurs at a different time than one's peers due to observable differences in physical attributes, like breast development, among same-age peers. The social deviance hypothesis suggests that pubertal development occurring earlier *or* later than one's peers is associated with poorer adjustment outcomes, such as social exclusion and low self-esteem (Alasker, 1992). Alternatively, the stage termination hypothesis posits that pubertal timing is most difficult for girls who develop *earlier* than their peers because they may not have completed important cognitive and social developmental tasks prior to exposure to the new environmental pressures and challenges associated with puberty (e.g., romantic relationships, entering mixed-sex peer groups; Peskin & Livson, 1972; Petersen & Taylor, 1980). This discrepancy may also influence parents' perceptions and expectations of adolescents' social and emotional competencies. For example, parents of an early-developing girl may expect her to behave more maturely in accordance with her physical development, despite her younger chronological age.

Prior research has demonstrated associations between both early and late pubertal timing and some negative outcomes, including academic challenges, engagement in risky health behaviors, and mental health problems, such as DBP (Mendle et al., 2007). The literature focusing on the association between pubertal timing and DBP in girls tends to support the stage termination, or early timing, hypothesis (Mendle, 2014). Several hypotheses about why early puberty may confer risk for DBP have been proposed in the literature (for a review, see Ge & Natsuaki, 2009). Early-developing adolescents may self-select into or be sought out by older peer groups, as well as potential romantic partners, that may introduce these adolescents into risky contexts that promote DBP (Javdani et al., 2011). Additionally, the stressful transition of experiencing puberty earlier than one's peers may exacerbate pre-existing difficulties, such as childhood behavior problems (Caspi & Moffitt, 1991). However, there are some mixed findings regarding the association among pubertal timing and DBP and recent meta-analytic work suggests this association is modest in size (e.g., Deardorff et al., 2013; Obeidallah et al., 2004). In their recent meta-analysis, Dimler and Natsuaki (2015) reported a small but significant effect size ($r = 0.18$, $p < 0.0001$) for the association between puberty and DBP,

such that girls with early pubertal development were at greater risk for developing DBP during adolescence compared to their on-time or later-developing peers. In light of this small effect size and the inconsistencies across studies, it is important to consider other contextual factors that may contribute to the development of DBP (e.g., deviant peers, parenting) and how these factors may interact with pubertal timing to confer risk for DBP (Ge et al., 2011).

Little research has been conducted on how pubertal timing may interact with parenting practices associated with DBP like maternal monitoring. Because early-developing girls may not have the cognitive and emotional skills to effectively navigate exposure to risky contexts that might promote DBP (e.g., deviant peer groups, romantic relationships), early developers may benefit more from the provision of additional guidance or involvement from parents such as via increased monitoring, or conversely, may be more vulnerable to the effects of negative parenting practices than their on-time or later-developing peers. For example, harsh parenting more strongly predicted aggressive behavior among early-developing youth than their on-time or later-developing peers, while positive parenting negatively predicted aggressive behavior only for early developers (Chen & Raine, 2018). Similarly, research suggests that nurturing and involved parenting predicts lower DBP in early-developing girls (Mrug et al., 2008), while harsh and inconsistent parenting is associated with greater DBP in early-developing girls both cross-sectionally and prospectively (Deardorff et al., 2013; Ge et al., 2002). While several studies have examined the relation between parenting styles and DBP across pubertal development, few studies have examined the effect of specific parenting practices, such as monitoring. Because early-developing girls are also at increased risk for exposure to risky social contexts that may promote DBP, we hypothesize that maternal monitoring may help early developers to effectively navigate these contexts and reduce DBP (Javdani et al., 2014; Stattin et al., 2011).

To our knowledge, only nine studies have examined the relationship between parenting styles or parenting practices and puberty in girls (Arim & Shapka, 2008; Belsky et al., 2010; Chen & Raine, 2018; Deardorff et al., 2013; Ge et al., 2002; Koo et al., 2012; Low & Shortt, 2016; Mrug et al., 2008; Winer et al., 2016), although none focus on girls seeking mental health services who are at higher risk for DBP. Of these studies, only one study examined child outcomes prospectively (Low & Shortt, 2016), and two studies examined relations among parental monitoring, pubertal development, and engagement in risky behaviors (Koo et al., 2012; Low & Shortt, 2016). Koo et al. (2012) reported that stage of pubertal development status was associated with greater likelihood of engaging in sexual or other risk behaviors cross-sectionally, but was not associated with greater parental monitoring in African American fifth-grade boys or girls. Similarly, Low and Shortt (2016) found that parental monitoring did not moderate the relationship between pubertal maturation and early dating behaviors three years later in early adolescents, but did not examine gender differences. Although the majority of the nine existing studies measure relative pubertal timing which compares girls' pubertal development to that of their peers, the two studies that have examined the influence of monitoring and puberty on risk-taking behaviors measured pubertal maturation (e.g., development of breasts, first menstruation) rather than pubertal timing. Relative pubertal timing is typically operationalized by measuring pubertal development status and standardizing within the sample by age and sex or standardizing using a nationally representative sample (Dorn & Biro, 2011). Assessments of relative pubertal timing may be particularly relevant for studies examining psychological outcomes like DBP because they capture biological changes related to puberty as well as social and cognitive changes (Mendle, 2014; Mendle et al., 2019).

It is also critical to consider the role of monitoring and pubertal timing in populations that are at risk for DBP. Few studies have focused on examining factors that protect against or promote DBP in treatment-seeking samples, although adolescents referred for mental health treatment are at higher risk for DBP and are more likely to be experiencing clinically significant symptoms of DBP, rather than subthreshold levels as are common in community samples (Starr et al., 2012). Youth residing in under-resourced urban areas are also at risk for DBP due to exposure to contexts that encourage or enable engagement in disruptive behaviors (Obeidallah et al., 2004). This contextual risk is of particular importance for African American girls, given that they are four times more likely to live in poverty than White children (Patten & Krogstad, 2015). African American girls are also more likely to experience pubertal development earlier than their peers of other races (Wu et al., 2002). Despite this increased likelihood of early pubertal development, there is a paucity of research examining pubertal timing and DBP in African American girls and in ethnically and racially diverse youth more broadly (Deardorff et al., 2019; Mendle et al., 2007). This gap in the literature is problematic given that youth from different ethnic and cultural backgrounds may vary in their psychological responses to physical maturation (e.g., shame or pride), yet the majority of the literature to date has focused on White adolescents (Deardorff et al., 2019). A need to focus on African American girls is strongly justified by more recent literature that suggests this population is experiencing inequality in school discipline for exhibiting perceived DBP and are more likely to be viewed as more socially mature than their White or male counterparts (Carter et al., 2018; Crenshaw et al., 2015; Epstein et al., 2017). This is particularly the case for older-presenting

African American girls, making pubertal timing a key moderator of experience to examine.

The present study also extends past research on pubertal timing and DBP in African American girls by considering maternal monitoring as a risk factor for DBP. Research suggests that it may be especially important to consider maternal monitoring in this population because African American girls tend to identify the mother-daughter relationship as an important form of support and source of information about the dangers of engaging in risky behaviors (Donenberg et al., 2011; Nichols et al., 2016). One study utilizing a sample of African American adolescents found that maternal monitoring was associated with lower delinquency when mothers were highly involved, but only for girls, highlighting the unique role of maternal involvement and monitoring for African American girls' DBP (Bowman et al., 2007). Taken together, these findings suggest that high levels of monitoring by a female caregiver might be particularly beneficial in reducing DBP in early-developing African American girls.

This study addresses these gaps in the literature by examining whether pubertal timing moderates the association between maternal monitoring and DBP prospectively at 1-year follow-up in a sample of African American adolescent girls. We conceptualize pubertal timing as the moderator, rather than maternal monitoring, because we are interested in examining how associations between maternal monitoring and DBP vary based on key gender-sensitive developmental milestones. In addition, previous research has found inconsistent associations between maternal monitoring and DBP for girls, and our goal is to examine the extent to which this relationship depends on pubertal timing. This approach is consistent with prior studies indicating that the consequences of conceptual factors such as parenting will differ for youth who experience early, average, or late pubertal onset relative to their peers (e.g., Chen & Raine, 2018; Shelton & Van Den Bree, 2010).

The present study utilizes a multi-informant sample of treatment-seeking adolescent girls and their female caregivers. Based on the previous literature and the goals of our study, we chose to use adolescent reports of maternal monitoring. Prior research suggests that there is typically low correspondence between adolescent and parent report of parental monitoring (e.g., De Los Reyes et al., 2008; Hadley et al., 2011) and associations with outcomes may vary by reporter. For example, one study found that only adolescent perceptions, not parent report, of parental monitoring predicted adolescents' engagement in risky behavior (Cottrell et al., 2003); whereas others have found that only parent report of monitoring predicted adolescents' risky sexual behavior (Hadley et al., 2011). Adolescent reports of monitoring likely reflect adolescents' perceptions of whether the caregiver engages in these practices and whether the adolescent shares information about their activities with the caregiver. We chose to use adolescent reports of maternal monitoring as we are specifically interested in whether and to what extent adolescents *perceive* that their female caregiver is monitoring them, given stronger associations between adolescent perceptions of monitoring and DBP compared to parent perceptions in prior work (e.g., Cottrell et al., 2003).

This study employs caregiver reports of DBP and pubertal timing. Because DBP represent disruptive or norm-violating behavior that is often observable, we chose to rely on parents' perspective as they play a key role in establishing the norms and expectations of adolescents' behavior (Stanger & Lewis, 1993). We used parent-rated perceptions of relative pubertal timing (i.e., "Does your adolescent's physical development seem to be earlier or later than most of the other girls her age?") given that adolescents' self-reports of relative pubertal timing are not very reliable (Mendle et al., 2019). Additionally, prior research has indicated that girls' physical development influences adults' perceptions of girls' behavior relative to their peers which may be important when examining DBP (Carter et al., 2018; Epstein et al., 2017). Only one of the nine existing studies on parenting and puberty examined *perceived* relative pubertal timing (Winer et al., 2016) using parent reports. This measurement approach is consistent with prior research demonstrating interactive effects of perceived relative pubertal timing and psychosocial variables (e.g., peer relationships, parenting) on internalizing and externalizing symptoms using the same parent-reported measure (e.g., Javdani et al., 2014; Winer et al., 2016).

We hypothesized that perceived pubertal timing would moderate the association between maternal monitoring and DBP, such that early pubertal timing may change the relationship between maternal monitoring and DBP, compared to other levels of pubertal timing. Specifically, we hypothesized that maternal monitoring would be negatively related to DBP at 1-year follow-up for early-developing girls but not average- or later-developing girls. We do not offer hypotheses about main effects of pubertal timing and maternal monitoring on girls' DBP given our focus on the combined effects of these variables and that main effects are not likely to be meaningful in the presence of an interaction.

Method

Participants

The baseline sample for this study comprised 256 African American girls aged 12 to 16 ($M = 14.45$, $SD = 1.15$) and their female caregivers ages 23–83 ($M = 43.18$, $SD = 11.25$). The majority of female caregivers were the biological mother of the participating girl (72.7%) and families

Table 1 Descriptive information for sample at baseline ($N = 256$) and key study variables

Age	$M = 14.45$ ($SD = 1.15$)
Family SES	(%)
1 to 2 (lowest)	59.0
3 (medium)	24.8
4 to 5 (highest)	16.3
Female Caregiver	*N* (%)
Biological mother	186 (72.7)
Grandmother	40 (15.6)
Adoptive mother	11 (4.3)
Aunt / Foster mother / Other	19 (7.4)
Perceived Pubertal Timing	*N* (%)
Much earlier	48 (18.8)
Somewhat earlier	47 (18.4)
About the same	126 (49.2)
Somewhat later	24 (9.4)
Much later	11 (4.3)
Perceived Monitoring	$M = 16.27$ ($SD = 4.09$)
Disruptive Behavior Problems (DBP)	*M* (*SD*)
Baseline ($N = 256$)	18.60 (13.89)
1-Year ($N = 199$)	14.68 (12.00)

Note. A series of independent samples *t*-tests and chi-square tests were conducted to explore whether there were any differences between girls living with a biological mother versus with another female caregiver. No significant differences were detected.

were of low socioeconomic status (59%) according to the Hollingshead index (see Table 1; Hollingshead, 1975). Most girls were attending a regular school program (85.1%), with 10.6% receiving special education services at school. The remaining 4.4% of girls were either not attending school, were homeschooled, or were attending a vocational program.

Procedures

The Institutional Review Boards of the University of Illinois at Chicago and New York University approved all study procedures and the secondary data analysis. Data are from a longitudinal study of sexual risk-taking among African American girls referred for outpatient mental health care at eight mental health clinics in a large Midwestern city (Donenberg et al., 2011, 2018). Data on girls' presenting problems at referral were not available. Although it is unknown whether girls were seeking treatment for DBP, it is likely that this sample may over select for girls with functional impairment as compared to a community sample. Clinic staff obtained permission from families to send their contact information to study personnel. Girls were excluded from the study by clinic staff if they did not identify as African American, did not speak English, were wards of the state, were diagnosed with severe cognitive impairment or intellectual disability, or did not live with a female caregiver. Eighty-two percent of the invited participants elected to enroll in the study ($N = 266$). Due to the focus of the larger study on HIV-risk and heterosexual romantic relationships, 10 participants were excluded because they did not indicate at least one heterosexual romantic relationship. Thus, the complete sample at baseline comprised 256 girls and their female caregivers.

Informed consent and assent were obtained from all individual participants included in the study. Caregivers and adolescents completed self-report questionnaires, a computer-assisted structured diagnostic interview, and activities unrelated to the present study. Families completed assessments at baseline, 6-month follow-up, and 1-year follow-up; however, only baseline and 1-year assessments were included in the present analyses. Caregivers and adolescents each received $45 at baseline, $50 at 6-months, and $55 at 1-year follow-up, along with travel expenses. A total of 199 adolescent-caregiver pairs participated in the 1-year follow-up (78% retention rate).

Measures

Demographics

Demographic information about youth was collected from female caregivers at baseline, including adolescents' age, ethnicity, and family SES. Family SES was calculated from caregiver education and occupation using the Hollingshead index (Hollingshead, 1975). Family SES factor levels range from 1 to 5, with 1 indicating the lowest level of SES.

Parental Monitoring

Adolescents' reports of parental monitoring were assessed using the monitoring subscale of the Parenting Style Questionnaire (PSQ; Oregon Social Learning Center, 1990). Four items (e.g., "How often, before you go out, do you tell your mom/female caretaker when you will be back?") were rated on a 5-point Likert scale ranging from 1 (*Never/almost never*) to 5 (*Always/almost always*). Item content included frequency of adolescent communication with the female caregiver about whereabouts, activities, and asking permission before leaving the house. A total monitoring score was generated, with higher scores indicating higher monitoring. The reliability and validity of the PSQ monitoring subscale is well-established (Oregon Social Learning Center, 1990) and has been used extensively with community and mental health referred samples of at-risk youth (e.g., Barker et al., 2019; Udell et al., 2017). This measure had good reliability in this sample ($\alpha = 0.83$).

Perceived Pubertal Timing

Caretaker report of their daughter's pubertal maturation relative to her peers was assessed at baseline using the Pubertal Development Scale (PDS; Petersen et al., 1988), which is supported by previous research as a reliable measure of relative puberty (Dimler & Natsuaki, 2015). Because the current study examines perceived pubertal timing rather than actual pubertal stage, only the single-item assessment of relative pubertal development ("Does your adolescent's physical development seem to be earlier or later than most of the other girls her age?") was used. Responses were rated on a 5-point Likert scale ranging from 1 (*Much earlier)* to 5 *(Much later)*. This classification of relative pubertal timing has been used in previous research and is associated with mental health outcomes longitudinally (e.g., Javdani et al., 2014; Mendle et al., 2019). Research suggests that parent reports of pubertal timing are appropriate for research examining psychological outcomes, as girls' self-reports of pubertal timing are often biased (Dorn & Biro, 2011).

Disruptive Behavior Problems

The externalizing subscale of the parent-reported Child Behavior Checklist (CBCL; Achenbach & Rescorla, 2001) was completed by maternal caregivers to measure DBP at baseline and 1-year follow-up. The CBCL is a widely used measure of child behavior problems for youth aged 11–18 that assesses parents' report of their child's symptoms now or within the past six months. Items were rated using a 3-point Likert scale as 0 (*Not true*), 1 (*Somewhat or sometimes true*), or 2 (*Very true or often true*). The CBCL externalizing scale comprises 35 items across two subscales: aggressive behavior and rule-breaking behavior. Aggressive behavior includes overt, physical, or relationally aggressive behaviors such as teasing or bullying, physical fights with others, and threatening others. Rule-breaking includes behaviors that are typically considered delinquent acts such as substance use, truancy, stealing, and vandalism. Total raw scores range from 0 to 70 possible points. The CBCL had excellent internal consistency at baseline and follow-up ($\alpha = 0.97$ and 0.87, respectively).

Data Analyses

Hierarchical Linear Regression analyses were used to assess the primary research question examining the combined contributions of maternal monitoring and pubertal timing on DBP. Baseline data were used to measure monitoring and pubertal timing. DBP at 1-year served as the outcome variable and the model controlled for baseline DBP. This approach is consistent with other studies that examine the influence of family context on problem behaviors over time by controlling for baseline behaviors (e.g., Jouriles et al., 2014). Age and family SES were entered as covariates, given that older girls with lower family SES are more likely to report higher levels of DBP (Obeidallah et al., 2004). However, age and SES were not significant predictors of DBP in this sample and were removed from the final models. DBP assessed at baseline was entered in Step 1 to control for baseline levels of DBP and to allow for examination of the influence of parenting and pubertal timing on changes in DBP. Parental monitoring and pubertal timing were centered to remove non-essential multicollinearity (as recommended by Cohen et al., 2003) and entered in Step 2. Finally, the interaction of monitoring and pubertal timing was entered in Step 3.

Results

Preliminary Findings

Descriptive and distributional characteristics of variables were evaluated. Bivariate correlations between the predictor and outcome variables were examined before proceeding with substantive analyses (see Table 2). Eleven univariate and bivariate outliers were identified and a sensitivity analysis revealed no differences between models with and without outliers. Perceived monitoring was relatively high ($M = 16.27$, $SD = 4.09$) but comparable to similar treatment-seeking samples of African American girls (Hadley et al., 2009). Overall, 37.1% of girls' caregivers reported early pubertal development, 49.2% reported on-time development, and 13.7% reported later development. To examine potential differences in DBP at baseline and 1-year by pubertal timing, a one-way MANOVA was conducted. Three groups were created from the pubertal timing measure to interpret the study results. Adolescents whose caregivers indicated their development was "much earlier" or "somewhat earlier" than their peers were considered early developers, those who were "the same" as

Table 2 Bivariate correlations for key study variables

Variables	1	2	3	4	5	6
1. Age	–					
2. SES	0.07	–				
3. Pubertal Timing	0.08	0.09	–			
4. Baseline DBP	−0.04	−0.04	−0.05	–		
5. 1-Year DBP	−0.09	−0.10	0.04	0.70*	–	
6. Monitoring	−0.04	0.03	−0.06	−0.34*	−0.28*	–

Note. DBP = Disruptive Behavior Problems.

*$p < 0.001$

peers were grouped as average or on-time, and adolescents who were "somewhat later" or "much later" than their peers were considered late developers (Javdani et al., 2014). The results indicated there were no significant differences among the pubertal timing groups on DBP (F (4, 390) = 0.493, Wilk's $\Lambda = 0.99$, $p = 0.741$, partial $\eta^2 = 0.01$). Using age-standardized T scores, 48% of girls at baseline and 52% of girls at 1-year follow-up scored in the clinical range for externalizing problems, underscoring this sample's considerable behavioral health needs. Differences in key study variables among adolescents who lived with their biological mother versus another female caregiver were tested using independent samples t-tests for perceived monitoring and DBP at baseline and 1-year and a chi-square test for pubertal timing. There were no significant differences in any of the key study variables between adolescents who lived with their biological mother and those that lived with another female caregiver. Perceived monitoring was significantly negatively correlated with DBP at baseline, $r = -0.34$, $N = 256$, $p < 0.001$, and 1-year, $r = -0.28$, $N = 199$, $p < 0.001$ (see Table 2 for full correlation table).

There was no missing data on maternal monitoring or pubertal timing at baseline or 1-year follow-up. Fifty-seven participants (22%) were missing data on DBP at 1-year resulting in a sample of 199 girls with complete data. Independent samples t-tests were conducted to assess for differential attrition. There were no significant differences in age, family SES, pubertal timing, baseline maternal monitoring, or baseline DBP between participants with missing and non-missing follow-up data at 1-year. Given that missing data has the potential to bias parameter estimates, a multiple imputation method was employed using STATA MICE in STATA Version 14 (StataCorp, 2015). Multiple imputation replaces missing data with predicted values based on all other observed variables in the study. Ten separate datasets were imputed using chained equations. The models were run ten separate times and aggregated across the datasets by averaging the parameter estimates from each dataset. The findings did not differ between the imputed model and results using listwise deletion, thus results using only the raw data are presented.

Key Findings

A hierarchical linear regression examined the individual and combined influences of perceived monitoring and pubertal timing on DBP at 1-year follow-up ($N = 199$; see Table 3). Baseline levels of DBP significantly and positively predicted DBP at 1-year ($\beta = 0.62$, $p < 0.001$, $R^2 = 0.49$, $F(1, 197) = 193.51$, $p < 0.001$). The main effects of perceived monitoring and pubertal timing did not significantly predict DBP at 1-year, after controlling for DBP at baseline. The interaction between monitoring and pubertal timing significantly predicted DBP at 1-year ($\beta = 0.42$, $p < 0.01$, $R^2 = 0.52$, $F(4, 194) = 53.51$, $p < 0.001$). Probing of the significant moderation was conducted by computing and testing the simple slopes using procedures outlined in Holmbeck (2002). The three pubertal timing groups used in the MANOVA (early, average/on-time, and later developers) were used to interpret the results of these analyses. The simple slopes were used to plot the regression lines in Fig. 1. The simple slope for the regression line of the association between monitoring and DBP at 1-year was significant for early-developing girls ($\beta = -0.30$, t (198) = -3.05, $p < 0.01$), but was not significant for average or later developers. For early-developing girls, low maternal monitoring (1 *SD* below the mean) predicted higher DBP and high maternal monitoring (1 *SD* above the mean) predicted lower DBP as compared to average- or later-developing girls (see Fig. 1).

Table 3 Hierarchical regression analyses predicting DBP at 1-year

	b	*SE*	*Beta*	R^2/ ΔR^2
Step 1				0.49*
Baseline DBP	0.62***	0.05	0.70	
Step 2				0.00*
Baseline DBP	0.62***	0.05	0.70	
Monitoring	−0.09	0.15	−0.03	
Pubertal timing	0.75	0.57	0.07	
Step 3				0.03*
Baseline DBP	0.61***	0.05	0.69	
Monitoring	−0.18	0.15	−0.06	
Pubertal timing	0.90	0.56	0.08	
Monitoring x Puberty	0.42**	0.14	0.16	

Note. $N = 199$. *DBP* = Disruptive Behavior Problems.
*$p < 0.05$. **$p < 0.01$, ***$p < 0.001$

Sensitivity Analyses

A series of sensitivity analyses were conducted to determine whether the study findings were robust to changes in analytical decisions, such as use of the maternal or youth report of monitoring. Although we did not plan to examine our full set of hypotheses separately using maternal and adolescent reports of monitoring and DBP a priori, we conducted these follow-up analyses in light of research indicating that informants' reports of child psychopathology are often discrepant and because the data were available for interested readers (De Los Reyes & Kazdin, 2005). First, we examined whether the findings varied using maternal reports of monitoring, instead of adolescent reports. Maternal reports of monitoring were measured using the 10-item parent version of the Parenting Style Questionnaire, which is

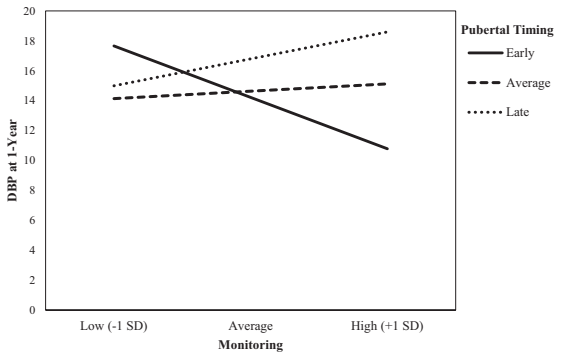

Fig. 1 Interaction between monitoring and pubertal timing on DBP at 1-year. The relation between monitoring and DBP is significant for early-developing girls, such that low monitoring predicts higher DBP and high monitoring predicts lower DBP as compared to average- or later-developing girls.

analogous to the adolescent measure used (PSQ; Oregon Social Learning Center, 1990). Notably, the correlation between adolescent and maternal reports of monitoring was moderate at baseline ($r = 0.39$, $p < 0.001$), suggesting a small amount of shared variance ($R^2 = 0.15$). Using maternal reports of monitoring, there was no significant interaction of monitoring and pubertal timing in the model.

Second, we tested the hypothesized model using the two subscales of the DBP measure (aggressive and rule-breaking behavior) as separate outcomes to determine whether there might be differences depending on the type of behavior engaged in as aggressive behavior tends to be more overt than rule-breaking behavior. The significant interaction of monitoring and pubertal timing held for both aggressive and rule-breaking behavior suggesting that this effect does not depend on the type of DBP adolescents engage in. Finally, we also examined whether the significant interaction remained when using adolescent self-reports of DBP, instead of parent reports. There was no significant interaction of adolescent-reported maternal monitoring and pubertal timing on adolescent self-reports of DBP. Parent and adolescent reports of DBP had a moderate significant correlation at baseline ($r = 0.47$, $p < 0.001$) and a smaller, but still significant correlation at 1-year ($r = 0.38$, $p < 0.001$).

Discussion

This study contributes to the emerging literature on girls' DBP by longitudinally examining the combined influences of maternal monitoring and perceived pubertal timing on DBP in a mental health-referred sample of African American girls at risk for both DBP and early pubertal timing. We examined the degree to which baseline levels of parental monitoring and perceived pubertal timing predicted DBP at 1-year follow-up, while controlling for baseline DBP. As expected, baseline levels of DBP were positively linked to DBP over time. Neither maternal monitoring nor pubertal timing alone predicted DBP at 1-year. Although the absence of main effects of maternal monitoring and pubertal timing is inconsistent with some prior literature (e.g., De Kemp et al., 2006; Dimler & Natsuaki, 2015), it is consistent with our hypothesis that the *combined* effects of maternal monitoring and pubertal timing confer risk for DBP and with results of other studies examining the combined influence of pubertal timing and contextual risk factors in similar samples (Obeidallah et al., 2004). We then tested whether perceived pubertal timing moderated the association between baseline maternal monitoring and DBP at 1-year. As predicted, the degree to which maternal monitoring was linked to DBP depended upon pubertal timing. There was a significant, negative association between maternal monitoring and DBP only for early, but not average or later developers. For early-developing girls, low maternal monitoring predicted higher DBP and high maternal monitoring predicted lower DBP at 1-year.

The present study offers support for the stage termination hypothesis of pubertal timing, such that early-developing girls may be at greater risk for behavioral difficulties as compared to their average- or later-developing peers. While this study found that early-developing girls may be more vulnerable to the deleterious effects of negative parenting practices (e.g., low monitoring) by exhibiting higher DBP, we also found that early-developing girls may benefit more from positive parenting practices (e.g., high monitoring) resulting in lower DBP. These results are consistent with prior work (Chen et al., 2018) which found that positive parenting was negatively associated with DBP, specifically aggressive behaviors, but only for early-developing girls. Taken together, these findings suggest that early-developing girls at risk for DBP may benefit from family-based positive parenting interventions. However, more research is needed to examine *why* monitoring may matter more for early-developing girls' DBP. Because early-developing girls are likely to be less cognitively and emotionally developed as compared to their physical development, they may benefit more from maternal monitoring to help them regulate their behavior as compared to peers (Peskin & Livson, 1972; Petersen & Taylor, 1980). Early-developing girls are also at increased risk for exposure to risky social contexts that may promote DBP (e.g., older peers, romantic relationships) and maternal monitoring may help early developers to effectively navigate these contexts and reduce DBP (Javdani et al., 2014; Stattin et al., 2011). For example, prior research has found that early-developing girls who had a sexual partner more than 2 years older were at increased risk for externalizing symptoms, but not average- or later-developing girls (Javdani et al., 2019).

These findings also highlight the value and risk reduction benefits of mothers' caregiving practices, particularly for early-developing daughters. That is, mothers may play a crucial role in reducing the risk that could be imposed onto young yet physically mature girls by limiting their exposure to - or supporting their navigation of – social contexts shaped by gendered power dynamics (e.g., sexual objectification, Crawford & Unger, 2004). An important agenda of future translational research can be to investigate programming that supports mothers in their capacity to provide impactful monitoring. Innovative programs that promote empowering processes for mothers and daughters and steers away from individual blame narratives may be particularly promising given that the risk for girls may lie in the social contexts to which they are exposed, rather than entirely in their own behavior (e.g., Christens & Peterson, 2012). Further, prevention or intervention approaches that foster sociopolitical awareness can arm girls with the capacity to understand and navigate risky social contexts and, in turn, promote exposure to goal-enhancing and protective contexts (e.g., Diemer, 2009). These types of programs can consider the role of gender more directly in their design and evaluation, alongside physical maturity (not just age) as influences on the heterogeneity of their impact.

To further clarify this study's findings, a series of sensitivity analyses were conducted to determine whether findings held when using different informants in light of a large body of literature that suggests informants' ratings of child psychopathology are often discrepant (De Los Reyes & Kazdin, 2005). Although we were primarily interested in adolescent reports of monitoring given literature that suggests adolescents' perceptions of monitoring are associated with DBP both cross-sectionally (Li et al., 2000) and longitudinally (Rai et al., 2003), we tested the hypothesized model using maternal reports of monitoring and found that the significant interaction of monitoring and pubertal timing did not hold. We also found only a moderate correlation between adolescent and maternal reports of monitoring in this sample. When interpreting the study findings, it is important to consider that adolescents' and caregivers' responses may not agree concerning monitoring behaviors, especially for more covert behaviors (i.e., tracking, checking in). However, the results of these analyses are consistent with our hypothesis that adolescent perceptions of monitoring are particularly important in predicting DBP in the context of pubertal timing.

We also tested the hypothesized model separately for the two subscales of the DBP measure (aggressive behavior and rule-breaking behavior) to determine whether findings varied based upon the type of behavior exhibited. The significant interaction between pubertal timing and maternal monitoring held across both outcomes, suggesting that the combined influence of pubertal timing and maternal monitoring does not depend upon the type of behavior girls engage in. To examine potential differences by reporter of DBP, we also examined the model using girls' self-reports of DBP rather than maternal reports. The interaction between pubertal timing and maternal monitoring did not hold using adolescent reports of DBP. However, the parent report of DBP had a higher mean and greater variability ($M = 14.68$, $SD = 12.00$) than the adolescent report ($M = 12.79$, $SD = 8.67$), which may explain why the significant interaction is only found for parent-reported DBP. These differences are consistent with prior research demonstrating that parent endorsement of youth conduct disorder symptoms is typically higher than adolescent self-reports for clinical samples as compared to community samples (MacLeod et al., 1999).

Taken together, the results of these sensitivity analyses indicate that the robustness of the interaction between pubertal timing and maternal monitoring on girls' DBP does depend upon the selection of informants. However, these findings are consistent with the literature on informant discrepancies which suggests that adolescents and their parents tend not to agree (e.g., De Los Reyes et al., 2008; De Los Reyes & Kazdin, 2005). In light of the informant discrepancies revealed in this study, we recommend that future studies examining parenting and DBP collect reports from both adolescents and their parents and conduct sensitivity analyses to evaluate the robustness of findings. In addition, it is important to consider *why* adolescents and their parents may disagree, and the implications of these discrepancies for prevention and treatment for DBP. Prior research has indicated that informant discrepancies may be influenced by contextual factors (such as clinical vs. community setting), as well as child and parent characteristics (De Los Reyes & Kazdin, 2005).

Limitations

Results of this study should be considered in light of its limitations. The findings of this study may not generalize beyond African American girls referred for mental health care in an urban setting. However, this sample allowed for examination of maternal monitoring in a group of youth at increased risk for both early puberty and DBP. Girls were recruited for the present study from mental health clinics, but data were not available on girls' presenting problems upon referral to the clinic or whether girls participated in treatment for DBP or other mental health problems between baseline and 1-year follow-up. Thus, we were unable to control for any impacts of treatment receipt, duration, intensity, or presenting problems in the model and acknowledge that these variables will be critical to account for in future research utilizing a clinic-referred sample. This study used only caretakers' and adolescents' reports, which

might be subject to social desirability bias, as compared to clinical assessment of symptoms. Caregiver report in this study only included female caregivers and it is unknown whether male caregivers or other individuals were involved in co-parenting. Female caregivers in this study were primarily the biological mother of the child; however, the results should be interpreted with consideration that caregivers in this study were not exclusively biological parents.

While the validity of the Parenting Style Questionnaire to measure monitoring has been questioned (Kerr et al., 2010), previous work examining monitoring and risky behavior in at-risk samples suggests that the robust literature on the associations between parental monitoring (assessed more broadly) and DBP attests to the value of the PSQ in garnering a broader view of the parent-child context in relation to monitoring and knowledge of behavior (Barker et al., 2019; Nichols et al., 2016; Udell et al., 2017). However, use of this measure did not permit us to discern which aspects of parental monitoring account for this study's findings, such as adolescent disclosure or maternal solicitation. Although pubertal timing was assessed using only one item rated by caregivers, this measure is supported by previous DBP research as an appropriate indicator for relative, perceived pubertal timing (Dorn & Biro, 2011), has been employed with African American girls (Javdani et al., 2014), and is justified given the specific focus on the impact of *relative* pubertal timing in combination with environmental factors (i.e., maternal monitoring). Moreover, use of caregiver reports of pubertal development is supported by research suggesting that girls' self-reports of pubertal timing are often biased (Dorn & Biro, 2011). Future research should incorporate multiple indices of puberty, including adolescent-reported relative pubertal timing, as their perceptions might be influential (Dorn & Biro, 2011), and reports of physical indicators of puberty, as physical changes affect adults' perceptions of early-developing girls and may influence the use of specific parenting practices, like maternal monitoring (Carter et al., 2018; Epstein et al., 2017). In this sample, exploratory analyses did not suggest that age was a significant covariate or correlate of outcomes. However, future work with larger samples can compare early versus mid adolescence as distinct developmental windows during which parenting and mental health may be differentially affected by pubertal timing.

This study's findings warrant replication as they may have implications for assessment, prevention, and intervention efforts. We recommend that mental health screenings should gather data regarding girls' pubertal timing and relational contexts (e.g., parenting practices), as our findings indicate that these contexts may augment risk for DBP and are not included in many screening recommendations. In addition, we note the need for early assessment and intervention for girls, particularly those that are early-developing. This is important given that parenting practices are often routinized by the time a girl reaches mid-adolescence (Forehand & Jones, 2002) and, in this study, mid-adolescent girls already demonstrated elevated levels of DBP. Because parenting practices are more malleable than parenting styles (Dishion & McMahon, 1998) and our findings suggest that early-developing girls may benefit more from parental monitoring than their on-time or later-developing peers, parental monitoring may be a suitable target in family-based prevention and intervention programs for DBP in early-developing girls.

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Compliance with Ethical Standards

Conflict of Interest The authors declare no competing interests.

Ethical Approval The Institutional Review Boards of the University of Illinois at Chicago and New York University approved all study procedures and the secondary data analysis. This study was performed in accordance with the ethical standards of the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed Consent Informed consent was obtained from the parents or guardians for all individual participants included in this study.

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