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The role of pubertal development in emerging depression risk in middle childhood ☆

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ABSTRACT

Although parental depression, stressful life events, cognitive vulnerability, and temperament have been strongly implicated in the etiology of adult and adolescent depression, their association with depressive symptoms in childhood is mixed. We hypothesized that pubertal development would moderate associations of known risks for depression such that more advanced pubertal development would strengthen associations between risks and child depressive symptoms. Partial support was found for this hypothesis: greater pubertal features strengthened associations between maternal depression and stressful life events with child depressive symptoms. Results highlight the idea that puberty may confer risk for depression by heightening negative effects of other psychological or social risks.

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Depression is one of the most burdensome diseases in terms of physical, emotional, and financial costs (Hees, Koeter, & Schene, 2013). Although clinically significant depression is rare in childhood (Costello, Mustillo, Erkanli, Keeler, & Angold, 2003), children show increased variation in depressive symptoms during middle-to-late childhood (Cole et al., 2002). Given the predictive validity of depressive symptoms for later disorder (Birmaher et al., 1996), research that identifies predictors of symptoms may inform preventative efforts. A robust finding with respect to depression is that rates of the disorder increase in late childhood, coinciding with the onset of puberty (Ellis, 2004). Conley, Rudolph, and Bryant (2012) outlined several ways in which pubertal development may confer risk for depression, such as through heightening negative psychological and social risks. Puberty also involves hormonal changes associated with depression (Mezulis, Salk, Hyde, Priess-Groben, & Simonson, 2014). Individual differences in pubertal development and how these modify risk for depression are thus the focus of the current study.

While reliable predictors of depression in adults and adolescents are established (Lewinsohn, Rohde, Seeley, Klein, & Gotlib, 2000), the literature linking these factors to children's depressive symptoms is inconsistent (Klein, Dougherty, & Olino, 2005). The most robust predictors of depression in adolescents and adults are parental history of depression, negative emotionality/neuroticism, cognitive vulnerability, and stress (Hammen, Brennan, & Shih, 2004), although few studies have used models that include all of these conceptually and statistically overlapping risks. Studies integrating an array of risks are needed to clarify unique associations between likely overlapping predictors and risk for depression. Further, whether the pubertal transition serves to strengthen links between these vulnerabilities has not been examined, although such a pattern would explain why the robust findings linking these factors to adolescent and adult depression is not found in studies of children.

One of the most robust predictors of depressive disorders in adolescents and adults is parental depression (Klein, Lewinsohn, Rohde, Seeley, & Durbin, 2002). Maternal depression in particular consistently predicts adolescent depressive symptoms (Bureau, Easterbrooks, & Lyons-Ruth, 2009); however, fewer studies have examined associations between maternal depression and depressive symptoms in middle childhood. More recently, interest in associations between paternal depression and child depression has increased, with findings indicating that paternal depression also predicts child psychopathology (Klein, Lewinsohn, Rohde, Seeley, & Olino, 2005); however, few studies have examined relations between paternal depression and children's own depression risk.

Cognitive vulnerability is another robust predictor of adult and adolescent depression. Cognitive theories of depression propose that negative cognitive styles are a vulnerability factor for depression (Jacobs, Reinecke, Gollan, & Kane, 2008). One key model of cognitive vulnerability is Beck's cognitive theory, which proposes that negative self-schemas

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that influence memory lead to depressive symptoms; a large literature supports the model in adults (Abela & Hankin, 2008). In a review of cognitive vulnerability in youth, Abela and Hankin (2008) noted the supportive evidence, with the caveat that more consistent associations are found between cognitive vulnerability and depressive symptoms with increasing age (i.e., in adolescence), a pattern of effects that could be mediated by pubertal development.

Temperamental vulnerability also plays an important role in depression's etiology (Clark, Watson, & Mineka, 1994). In particular, although the precise nature of the relationship between negative emotionality (NE) and depression is complex, with the two constructs showing conceptual overlap (Klein, Durbin & Shankman, 2009), NE may play a causal role in depression; a meta-analysis (Kotov, Gamez, Schmidt, & Watson, 2010) reported that depressive disorders were associated with high NE in adults. While some data implicate NE in youth depression (Lonigan, Phillips, & Hooe, 2003), given that direct associations between temperament and depression risk have not been consistently found in children (Klein et al., 2005), further study is needed to clarify the role of NE in depression risk in childhood. Also, many studies use self-report methods to assess both NE and depressive symptoms (Klein et al., 2009). As many NE questionnaire items show significant overlap with depressive symptoms, this can artificially inflate associations between NE and depression (Klein et al., 2009). Additional research using objective, observational methods is needed to clarify the nature of associations between NE and depression; whether NE-depression links are strengthened during pubertal development also needs further clarification.

Finally, negative life events are another robust predictor of depression in adults (Hammen, 2005), with mixed findings in youth (Ge, Lorenz, Conger, Elder, & Simons, 1994). Rende and Plomin (1991) asserted the importance of using multiple informants on stressful life events in childhood; collecting information from parents and children on life events may be critical in middle childhood. Parents may provide better information on stressors involving family finances, parental health, and marital satisfaction (Conger, Ge, Elder, Lorenz, & Simons, 1994). However, middle childhood is also a time when peer stressors, on which children may be more accurate informants, play an increasingly important role in children's lives (Rudolph & Hammen, 1999).

The purpose of the current study is to identify associations between these risk factors and children's depressive symptoms during middle to late childhood, and to test whether links between risks and depressive symptoms are moderated by pubertal development. Few studies have tested broader models of depression risk during this developmental period. Given that variables predicting risk such as parent history of depression, stressful life events, negative emotionality, and cognitive vulnerability are likely interrelated, including multiple predictors shows the unique contributions of each for future depressive symptoms. As middle childhood is associated with a variety of physical and psychosocial changes for children, it may represent a time in which children are particularly sensitive to risk due to shifts in pubertal development (Del Guidice, 2014). In particular, it is possible that inconsistent associations between parental depression, cognitive vulnerability, negative emotionality, and stress with children's depression risk will be stronger in the context of greater pubertal development, following a vulnerability-stress pattern such that specific vulnerabilities become more potent predictors of depressive symptoms in the context of the stress associated with the pubertal transition. We examined interactions between these risks and pubertal status to identify whether the negative effects of these variables are strengthened depending on child pubertal development.

1. Method

1.1. Baseline sample characteristics

At baseline, a community sample of 205 seven-year-old children (boys = 96; 47%) and their parents were recruited from Ontario, Canada. Children with a diagnosis of any psychological or developmental disorder were ineligible. The mean age of children at baseline was 88.44 months ($SD = 3.58$; range = 84–96 months). The Peabody Picture Vocabulary Test, Fourth Edition (PPVT-IV; Dunn & Dunn, 1997) was administered; children performed within the normal range ($M = 111.92$; $SD = 12.15$). Sample characteristics were comparable to data pertaining to race and income reported in the 2008 census (Statistics Canada, 2008). Study data were collected in three waves, as measures of child self-reported stress and pubertal development were not collected at baseline due to the young age of participants; these Time 2 data, along with the baseline data, are predictors of Time 3 depressive symptoms.

1.2. Baseline assessment

1.2.1. Child temperament

Child NE was assessed using an hour-long battery of laboratory tasks based on the Laboratory Temperament Assessment Battery (Lab-TAB; Goldsmith, Reilly, Lemery, Longley, & Prescott, 1995) adapted for older children. Tasks simulated naturalistic events likely to be experienced by children in their everyday lives (e.g., being allowed to play with a novel toy, interacting briefly with a stranger). Tasks were video-recorded for coding and ongoing reliability checks were completed by graduate students and trained undergraduate students to maintain minimum inter-rater reliability (minimum ICC = .80) for all tasks; a full description of laboratory tasks, coding procedures, and support for their validity as an index of temperament can be found in previously published studies (Kotelnikova, Mackrell, Jordan, & Hayden, 2012). Child facial, bodily and vocal fear, anger, and sadness were coded during each task, standardized, and aggregated across all tasks to yield a total NE score. Internal consistency for the NE scale was .68.

1.2.2. Depression self-rating scale (DSRS)

The DSRS (Birleson, 1981) is a 24-item self-report measure of depression in children (Asarnow & Carlson, 1985) with good psychometric properties (Cronbach's $\alpha = 0.73$ in our sample).

1.2.3. Self-referent encoding task (SRET)

A mood induction procedure via a sad video clip was administered prior to the SRET to activate latent cognitive vulnerability (Taylor & Ingram, 1999). This method has previously been shown to be successful in producing sad affect in children (e.g., Brenner, 2000), and in our samples (Hayden, Klein, Durbin, & Olino, 2006). The SRET (Kuiper & Derry, 1982) is a widely used information processing task used to assess memory biases for positive and negative self-referent information. In this task, participants are presented with a series of 14 positive and 14 negative adjectives and are asked to indicate whether each adjective is "like them". This is followed by an unexpected free recall period in which participants are asked to recall as many of the presented adjectives as possible. A negative schematic processing score was calculated (the proportion of negative words rated as self-descriptive and recalled relative to all words rated as self-descriptive). We elected to focus on negative processing here to reduce the size of our models, and as it appears to have more consistent relationships to children's depressive symptoms (Hayden et al., 2006).

1.2.4. Parent psychopathology

Parents were assessed for lifetime history of depression using the Structured Clinical Interview for DSM-IV (SCID; First, Spitzer, Gibbon, & Williams, 1996). Interviews were administered and scored by graduate students in clinical psychology who were blind to other aspects study data. In situations in which one of the biological parents was unavailable to complete a SCID the Family History-Research Diagnostic Criteria (FH-RDC; Andreasen, Endicott, Spitzer, & Winokur, 1977) was used as an assessment of history of psychopathology. Most mothers (n = 202; 98.54%) and fathers (n = 183; 89.27%) completed the SCID.

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