Journal of Experimental Child Psychology 142 (2016) 158–170

Contents lists available at ScienceDirect

Journal of Experimental Child Psychology

journal homepage: www.elsevier.com/locate/jecp

Does executive function mediate the path from mothers' depressive symptoms to young children's problem behaviors?

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ARTICLE INFO

Article history:
Received 4 December 2014
Revised 23 September 2015
Available online 6 November 2015

Keywords:
Executive function (EF)
Maternal depression
Externalizing problems
Internalizing problems
Mediation
Longitudinal analysis

ABSTRACT

This study investigated the mediation role played by children's executive function in the relationship between exposure to mild maternal depressive symptoms and problem behaviors. At ages 2, 3, and 6 years, 143 children completed executive function tasks and a verbal ability test. Mothers completed the Beck Depression Inventory at each time-point, and teachers completed the Strengths and Difficulties Questionnaire at child age 6. Longitudinal autoregressive mediation models showed a mediation effect that was significant and quite specific; executive function (and not verbal ability) at age 3 mediated the path between mothers' depressive symptoms (but not general social disadvantage) at the first time-point and children's externalizing and internalizing problems at age 6. Improving children's executive functioning might protect them against the adverse effects of exposure to maternal depressive symptoms.

Introduction

Among parents of young children, symptoms of depression are common and often chronic (Field, 2011), such that McLennan, Kotelchuck, and Cho (2001) found that nearly a quarter (24%) of

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http://dx.doi.org/10.1016/j.jecp.2015.09.022
0022-0965/

17-month-olds were exposed to maternal depression, with a third of these children still exposed to depression a year later. This early exposure to maternal depressive symptoms predicts a plethora of negative child outcomes. Compared with children of nondepressed mothers, children of depressed mothers show elevated rates of both externalizing problems, such as hyperactivity (Ashman, Dawson, & Panagiotides, 2008), conduct disorder (Leschied, Chiodo, Whitehead, & Hurley, 2005), and violence (Hay, Pawlby, Waters, Perra, & Sharp, 2010), and internalizing problems, such as depression (Hammen & Brennan, 2003; Murray et al., 2011), anxiety (Gartstein et al., 2010), and social phobia (Biederman et al., 2001). Studies of the mechanisms underpinning these associations have, to date, focused on aspects of maternal functioning such as maternal regulatory processes (Dix & Meunier, 2009). Child functioning has received much less attention, which is surprising given that exposure to maternal depressive symptoms is related to cognitive abilities that are relevant for behavioral adjustment such as executive functions (Hughes, Roman, Hart, & Ensor, 2013) and language development (e.g., Quevedo et al., 2012).

Research into the cognitive and neural mechanisms that may underlie childhood antisocial behaviors has highlighted the higher order processes associated with the prefrontal cortex that underpin flexible goal-directed action, collectively known as executive function (EF) (Hughes, 2011). The protracted development of the prefrontal cortex has led theorists to posit that EF might be particularly susceptible to environmental factors (e.g., Mezzacappa, 2004; Noble, Norman, & Farah, 2005). Studies of risk factors indicate that exposure to extreme adversity (i.e., maltreatment or neglect) has profound consequences for the functioning of the prefrontal cortex (for a review, see Belsky & De Haan, 2011). Until recently, however, few studies considered less extreme adversity such as exposure to mild maternal depressive symptoms (Odgers & Jaffee, 2013). The current study addressed this gap by focusing on children's exposure to maternal depressive symptoms in a normative sample and by examining the relationship between exposure to maternal depressive symptoms and child EF over the course of early childhood (ages 2–6 years).

The development of the prefrontal cortex is marked by growth spurts, with the first 3 years of life representing a time when the majority of myelination occurs and is paralleled by peaks in synaptic formation and dendritic growth (e.g., Spencer-Smith & Anderson, 2009). This heightened brain development translates into important EF developments through both refinements of acquired skills (e.g., Alloway, Gathercole, Willis, & Adams, 2004) and initial attempts to integrate and coordinate multiple functions (Garon, Bryson, & Smith, 2008). The emergence of toddlerhood as a critical period is further supported by research highlighting that individual differences in EF appear remarkably stable over time (Carlson, Mandell, & Williams, 2004; Fuhs & Day, 2011; Hughes & Ensor, 2007; Hughes, Ensor, Wilson, & Graham, 2010), with the implication that effects observed in preschoolers and school-aged children might simply reflect carry-on effects of early delays. Indeed, the complexity of EF development, whereby at each point emergent skills are reliant on the mastery of simpler abilities, lends support to the idea that EF development follows a cascading pathway model (e.g., Cummings, Davies, & Campbell, 2000). As such, this study focused on whether exposure to maternal depressive symptoms might translate into behavior problems specifically through delays in EF skills acquisition at a very early stage (i.e., age 3 years).

The current article represents a secondary data analysis. To examine whether poor early EF is a mechanism through which exposure to maternal depressive symptoms translates into problem behaviors, the current study builds on several studies involving overlapping samples. Regarding the first path in this proposed mediation model, these earlier studies showed that children of mothers who had fewer depressive symptoms at child age 2 years or who displayed steeper recoveries from depressive symptoms over 4 years typically showed better EF at age 6 years (Hughes et al., 2013). This was true even when individual differences in children's working memory at age 2 and maternal education and positive control at child ages 2 and 6 were accounted for (Hughes et al., 2013). In contrast, no relationship between maternal depression and child EF was found by two separate studies of older children in which maternal depression scores were dichotomized (Klimes-Dougan, Ronsaville, Wiggs, & Martinez, 2006; Micco et al., 2009). As discussed by Hughes and colleagues (2013), the most likely explanations for these discrepant findings relate to differences during the developmental period under focus (adolescence vs. early or middle childhood) and the sensitivity of the measures used. Regarding the latter, the previous studies that reported a relationship between maternal depression and child EF