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Executive function of Spanish-speaking language-minority preschoolers: Structure and relations with early literacy skills and behavioral outcomes

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ABSTRACT

Young children's executive function (EF) is increasingly recognized as an important construct associated with development in cognitive and socioemotional domains. To date, however, few studies have examined EF in populations of language-minority children. In this study, 241 Spanish-speaking language-minority preschoolers who ranged in age from 38 to 69 months ($M = 54.23$ months, $SD = 6.17$) completed three tasks designed to measure inhibitory control (IC) and four tasks designed to measure working memory (WM). Children completed assessments of their vocabulary skills, early literacy skills, and behavioral self-regulation in both English and Spanish, and their classroom teachers completed three behavior rating measures. Children were classified as more proficient in English or Spanish based on their scores on the vocabulary measures, and all IC and WM measures were administered in the children's more proficient language. Results of confirmatory factor analyses supported a two-factor model of EF for both groups of children as well as strong measurement and structural invariance across groups. Children's EF was substantially related to the language, early literacy, and behavioral self-regulation measures as well as teacher ratings of inattention and hyperactivity/impulsivity. For children with more proficient English, EF was associated with skills in both English and Spanish; however, for children with more proficient Spanish, EF was associated primarily with skills in

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Spanish. These results provide evidence of strong correspondence for EF measured in Spanish-speaking language-minority preschoolers and monolingual preschoolers, and they identify a potential key factor that can enhance understanding of development in this population of children.

Introduction

Over the past decade, there has been an increasing focus on young children's self-regulation as an important developmental construct that is associated with other important developmental outcomes, including academic achievement and socioemotional functioning. One area of self-regulation that has received a significant amount of attention is executive function (EF). EF represents a set of interrelated domain-general cognitive skills that are linked with development of the prefrontal cortex and its role in activating and inhibiting activity in other brain regions (Garon, Bryson, & Smith, 2008). Although there are several models of EF (e.g., Barkley, 2001; Duncan & Owen, 2000), one of the most commonly studied models was developed by Miyake, Friedman, Emerson, Witzki, and Howerter (2000) based on factor-analytic work with adults. This model includes three correlated but distinct dimensions: inhibitory control (IC), updating/working memory (WM), and shifting. IC represents the capacity to withhold a predisposed response, often in favor of a non-predisposed response. WM represents the capacity to hold information in memory and either manipulate that information or update it based on ongoing sensory input. Shifting represents the capacity to alternate between sets of stimulus–response rules.

Children's EF is related to academic and behavioral outcomes both during early childhood (e.g., Allan, Hume, Allan, Farrington, & Lonigan, 2014; Schoemaker, Mulder, Deković, & Matthys, 2013; Thorell, Bohlin, & Rydell, 2004) and during middle childhood (e.g., Arrington, Kulesz, Francis, Fletcher, & Barnes, 2014; Brocki, Eninger, Thorell, & Bohlin, 2010). Higher levels of EF are associated with higher scores on measures of language, literacy, and math, and with lower levels of problematic behaviors. Given these linkages, knowledge of the nature and development of EF may lead to better methods of understanding factors influencing early development, which in turn may result in better early identification of children at risk for academic or socioemotional difficulties. Although there is a growing literature concerning EF in monolingual children, little research to date has examined the nature and developmental correlates of EF with children whose home language is different from the societal language. Many children whose home language is not the societal language experience substantial difficulties related to academic achievement (Hemphill, Vanneman, & Rahman, 2011). Consequently, the goals of this study were to examine the nature of EF with a group of preschool children whose home language was Spanish and to determine the relations between EF and these children's academic skills and classroom behaviors.

Executive function in young children

Although studies that include children as young as 8 years (Lehto, Juujärvi, Kooistra, & Pulkkinen, 2003) have replicated the three-factor model of EF, other studies indicate that a two-factor model (i.e., WM and IC/shifting) adequately describes children's EF (Lee, Bull, & Ho, 2013; Van der Sluis, de Jong, & van der Leij, 2007). Lee et al. (2013) reported that a three-factor model in which shifting and IC were separate factors was supported only for their oldest group of children (13 years). Results of some studies support a simpler one-factor model of EF with preschool-age children (e.g., Wiebe, Espy, & Charak, 2008; Wiebe et al., 2011; Willoughby, Blair, Wirth, & Greenberg, 2010). In contrast, other studies of preschool children indicate that EF is best represented by distinct WM and IC factors (e.g., Lerner & Lonigan, 2014; Schoemaker et al., 2012). Overall, the developmental structure of EF seems to be