



Contents lists available at ScienceDirect

Early Childhood Research Quarterly



Bidirectional relations among executive function, teacher–child relationships, and early reading and math achievement: A cross-lagged panel analysis[☆]

Rachel D. McKinnon^{*}, Clancy Blair

Department of Applied Psychology, New York University, 196 Mercer Street, 8th Floor, New York, NY 10012, United States

ARTICLE INFO

Article history:

Received 31 May 2017
Received in revised form 9 March 2018
Accepted 17 March 2018
Available online xxx

Keywords:

Executive function
Math achievement
Reading achievement
Teacher–child conflict
Longitudinal
Early primary grades

ABSTRACT

Though prior research has examined the links between executive function (EF) – the higher order cognitive processes involved in self-regulation – and academic achievement, and between teacher–child relationships and academic achievement, few studies have examined the extent to which EF, teacher–child conflict, and academic achievement are related. The present study explores the longitudinal, bidirectional relations among direct assessments of children's EF and early reading and math achievement and teacher–reports of relationship closeness and conflict with target children. Data were collected with $N = 759$ children in fall and spring of kindergarten and in fall of first grade. The results confirm bidirectional associations between EF and math achievement. Moreover, the study finds that conflict with teachers predicts EF and reading achievement, but not math achievement, though the relations are not bidirectional.

© 2018 Elsevier Inc. All rights reserved.

1. Introduction

Children's academic success in the early years of school strongly relates to academic achievement in later school years (Duncan et al., 2007). Children from low-socioeconomic status (SES) families are at-risk of starting school with fewer school readiness skills, putting them at further risk for continued setbacks in academic achievement (Reardon, Robinson-Cimpian, & Weathers, 2015). For example, when surveyed about children's problems in adapting to the classroom environment, kindergarten teachers reported that children in high-poverty schools were more likely than children in low-poverty schools to have problems with

following directions, lagging academic skills, getting along with peers, and working independently or as a group (Rimm-Kaufman, Pianta, & Cox, 2000). Integrating two largely independent lines of research, teacher–child relationships, and executive function (EF) – higher-order, cognitive self-regulation processes necessary for deliberately controlling attention, organizing and integrating information, and planning goal-directed behaviors (Blair & Ursache, 2010) – can provide the foundation for understanding classroom dynamics that may bolster children's educational engagement.

Despite large bodies of literature that have found direct links between children's academic achievement and both EF and teacher–child relationships (e.g., Blair & Razza, 2007; Maldonado-Carreño & Votruba-Drzal, 2011; McClelland et al., 2007; McCormick, O'Connor, Cappella, & McClowry, 2013; Schmitt, Geldhof, Purpura, Duncan, & McClelland, 2017; Welsh, Nix, Blair, Bierman, & Nelson, 2010), relatively little research has examined the ways in which EF and teacher–child relationships may mutually influence the development of academic achievement. Children's development is thought to occur through bidirectional interactions between children's behavior (driven by individual characteristics and abilities) and the environments within which they operate (Bronfenbrenner & Morris, 2006; Sameroff, 2010). Children's development likely emerges through such bidirectional interactions between individual levels of EF and their relationships with teachers. Understanding the transactional associations among children's

[☆] We wish to thank the participating children, families, schools, and teachers and acknowledge the assistance of a large group of data collectors and research assistants, particularly Mohamed Soliman, Aida Alikalfic, and Caitlin Mauger. Support for this research was provided by the U.S. Department of Education Institute of Education Sciences Grant R305A1000058. This work was also supported by the Institute of Education Sciences, U.S. Department of Education to New York University Grant R305B140035. The opinions expressed are those of the authors and do not represent views of the Institute or the U.S. Department of Education.

^{*} Corresponding author at: SRCD Congressional Policy Fellow & Department of Applied Psychology, New York University, 196 Mercer Street, 8th Floor, New York, NY 10012, United States.

E-mail addresses: rachel.mckinnon@nyu.edu (R.D. McKinnon), clancy.blair@nyu.edu (C. Blair).

EF, relationships with teachers, and academic achievement is critical for identifying mechanisms that shape long-term academic development and, ultimately, detecting levers to improve outcomes for at-risk children from low-SES families. The present study begins to address this empirical gap in a less disadvantaged – and, thus, more exploratory – sample by longitudinally examining bidirectional relations among children's EF, relationships with teachers, and academic achievement as children progress through fall and spring of kindergarten and fall of first grade.

1.1. Executive function and academic achievement

Extant literature supports EF as a critical skill for young children's academic achievement. EF is broadly considered to be comprising working memory (the ability to manage and update multiple pieces of information), inhibitory control (the ability to suppress automatic behaviors), and attention shifting or cognitive flexibility (the ability to flexibly shift attention between distinct aspects of a given stimulus). Though research with adults suggests that working memory, inhibitory control, and attention shifting are unique but related aspects of EF (Miyake et al., 2000), multidimensional, unitary constructs of EF are more developmentally appropriate at younger ages. Individual aspects of EF likely develop at different rates (Garon, Bryson, & Smith, 2008; Willoughby, Holochwost, Blanton, & Blair, 2014) and suffer from the task impurity problem found in EF tasks (Hughes, Ensor, Wilson, & Graham, 2009; Müller & Kerns, 2015). As such, EF performance in young children is most parsimoniously measured as a function of average scores among the tasks rather than as distinct aspects (Lee, Bull, & Ho, 2013), a practice endorsed in measurement models with samples of young children (Fuhs & Day, 2011; Hughes et al., 2009; Shing, Lindenberger, Diamond, Li, & Davidson, 2010; Wiebe, Espy, & Charak, 2008; Willoughby et al., 2014).

EF directly supports children's academic achievement by providing the foundational skills necessary for academic tasks (Blair, Knipe, & Gamson, 2008; Geary, 2010). For example, to successfully add two numbers, children must simultaneously consider various summing strategies, manage mental representations of multiple values, and inhibit the impulse to recite an automatized count list (e.g., "One, two, three, wheel"). Likewise, EF skills are related to early reading skills as children need to match alternate sounds for specific letters or combine letters into novel sounds. Not surprisingly, preschoolers and kindergarteners with higher EF tend to perform better on math, language, and reading assessments than children with lower EF (e.g., Blair & Razza, 2007; Brock, Rimm-Kaufman, Nathanson, & Grimm, 2009; Espy et al., 2004; Fuhs, Nesbitt, Farran, & Dong, 2014; Gathercole, Brown, & Pickering, 2003; Harvey & Miller, 2017; Lonigan, Allan, & Phillips, 2017; McClelland et al., 2007; Welsh et al., 2010). In a study with children from predominantly low-SES families in nonurban communities, preschoolers with higher scores on a multi-dimensional measure of EF had greater gains in math by kindergarten compared to children with lower EF scores, controlling for IQ and early math ability (Blair, McKinnon, & Family Life Project Investigators, 2016).

In addition, mounting evidence indicates that EF skills differentially support math achievement compared to reading achievement. In some studies, EF appeared to be a stronger predictor of math rather than reading achievement when controlling for IQ and prior EF (Blair, Ursache, Greenberg, Vernon-Feagans, & The Family Life Project Investigators, 2015; Schmitt, Pratt, & McClelland, 2014; Schmitt et al., 2017). This may be because children often enter school having been exposed to more reading in the home than math (Berkowitz et al., 2015; Cannon & Ginsburg, 2008). As a result, early reading skills – such as those assessed in the current study – are practiced and automatized whereas math

skills are more novel and require the volitional processes of EF to execute (Blair et al., 2015; Fuhs et al., 2014; Welsh et al., 2010).

There is also evidence for bidirectional associations between EF and both math and reading achievement (Fuhs et al., 2014; Schmitt et al., 2017; Welsh et al., 2010). In using EF to carry out math and reading exercises, children further develop and strengthen EF skills (Blair et al., 2008). Fuhs et al. (2014) argued that this might be particularly true when learning math, as teachers spend more instructional time on literacy compared to math (Hamre & Pianta, 2007; Milesi & Gamoran, 2006). Children must use more of their own cognitive resources to advance in math content, further strengthening their EF (Fuhs et al., 2014). As such, the current study examines the bidirectional associations between EF and early academic achievement and adds to the current literature by being one of the first to examine unique associations of EF with each academic domain over-and-above contributions made by the other academic domain (see Schmitt et al., 2017 for a notable exception).

1.2. Teacher–child conflict and academic achievement

Children's relationships with adults have long been understood to be important for development. In classrooms, teachers construct children's educational environment (Downer, Sabol, & Hamre, 2010) and, as an extension of attachment theory, children's interactions with teachers reinforce their confidence to independently explore and engage with the classroom (Pianta, Hamre, & Stuhlman, 2003). Close relationships are characterized by warm exchanges and open communication whereas conflictual relationships are marked by negative regard, antagonism, and disharmony. These dimensions of teacher–child relationships have been linked to children's academic achievement. In prekindergarten and kindergarten studies with concurrent measures of teacher–child relationships and academic achievement, closeness was positively related to academic achievement whereas conflict was negatively related (Birch & Ladd, 1997; Blair et al., 2016; Buyse, Verschueren, Doumen, Van Damme, & Maes, 2008; Mashburn, Hamre, Downer, & Pianta, 2006; Portilla, Ballard, Adler, Boyce, & Obradović, 2014). However, findings are relatively small in magnitude (for a review, see Roorda, Koomen, Spilt, & Oort, 2011) and are not consistent across studies or reporters (Maldonado-Carreño & Votruba-Drzal, 2011). In some cases, children's characteristics such as teacher-reported behavior problems and classroom engagement appeared to explain associations between teacher–child relationships and academic achievement (Hamre & Pianta, 2001). These discrepant findings suggest complex processes operating between children's individual characteristics and their learning environment. The current study aims to tease apart these processes by examining the bidirectional associations between children's EF and teacher–child relationships as they relate to academic achievement.

1.3. Bidirectional relations between executive function and teacher–child conflict

Perceived through a bioecological model of development (Bronfenbrenner & Morris, 2006), it is likely that the dynamics between children and teachers shape the educational environment within which children develop. Though individual characteristics of each child and teacher contribute to the environment, in this study, we focus on the interactions between children's EF and their relationships with teachers as shaping children's academic achievement. First, the nature of children's relationships with teachers may affect opportunities for children to cultivate and sharpen EF skills. Close relationships with teachers are expected to promote feelings of security in children, freeing them to independently explore the learning environment and become engaged in learning activities (Pianta, 1999; Pianta, Nimetz, & Bennett, 1997)

متن کامل مقاله

دریافت فوری ←

ISIArticles

مرجع مقالات تخصصی ایران

- ✓ امکان دانلود نسخه تمام متن مقالات انگلیسی
- ✓ امکان دانلود نسخه ترجمه شده مقالات
- ✓ پذیرش سفارش ترجمه تخصصی
- ✓ امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
- ✓ امکان دانلود رایگان ۲ صفحه اول هر مقاله
- ✓ امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
- ✓ دانلود فوری مقاله پس از پرداخت آنلاین
- ✓ پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات