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Do children's learning-related behaviors moderate the impacts of an empirically-validated early literacy intervention?

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ABSTRACT

The present study included 314 children who had been involved in Project STAR, and explored how two learning-related behaviors, interest in literacy and effortful control, moderated the impact of the literacy intervention on reading outcomes. Results indicated significant associations of both learning-related behaviors with reading, with the children with the highest literacy interest and effortful control in the intervention group showing the highest reading outcomes. These results indicate that accounting for a greater breadth of possible moderators of intervention impacts is an important area to explore.

1. Introduction

In the broader field of human development, there is evidence that individuals vary in whether and/or the degree to which they are affected by environmental exposures, a phenomenon called the diathesis-stress/dual-risk model (see Belsky & Pluess, 2009). Evidence supporting this model indicate that some individuals are more vulnerable to environmental stressors, measured by an individual's characteristic (e.g., temperament, behavior) moderating an environmental influence. Within the field of education, there is consistent evidence suggesting that the individual characteristics that a child brings into the classroom, including both cognitive and learning-related behaviors, can have an interactive effect with the instruction received in the classroom. This phenomenon is commonly referred to as child-by-instruction interaction or aptitude-by-treatment interaction (Cole & Dale, 1986; Connor, Morrison, & Katch, 2004; Kanfer & Ackerman, 1989; Speece, 1990). This hypothesis, which has been explored for its potential in the educational fields as well as health sciences (see Caspi & Bell, 2004), asserts that treatment outcomes reflect the match (or lack thereof) between characteristics of the individual and the intervention provided. Said another way, for some individuals, a certain characteristic shows a different relation to an outcome variable in one treatment than it does in another (Snow, 1991). In the educational field, the potential value of linking treatment to child-level characteristics has gained momentum in recent years as a result of a series of investigations that involve carefully mapping reading instruction to children's specific needs, finding that this leads to accelerated early reading growth (Connor et al., 2009).

Early work on aptitude-by-treatment interactions argued that treatments are most effective when they are tailored not only to an individual's cognitive factors but also their motivational factors (Kanfer & Ackerman, 1989). Motivational theorists, in particular, argued that one's performance on a task (or responsiveness to an intervention) should reflect cognitive abilities, motivational factors, and the interplay among the two. To this end, our interest in the present work is to consider how other child-level factors, namely those representing their learning-related behaviors, might moderate children's reading outcomes within an empirically validated early-literacy intervention added as a supplement to typical classroom instruction. Learning-related behaviors is a general term that describes how children approach opportunities to learn within the classroom, as represented by their motivation towards participating in and completing an activity and their ability to maintain their focus during that activity and limit distractions (see Stipek, Newton, & Chudgar, 2010).

On the basis of the hypothesized child-by-instruction interactions, we would presume that individual characteristics of children should interact with more intensive educationally-based interventions as they do with typical instruction (e.g., Peterson & Janicki, 1979). Similar to the recent work regarding individual differences in response to instruction, in which children receive additional tiers of support in conjunction with typical classroom instruction, researchers have identified specific closely related cognitive factors which moderate response to intervention, particularly phonological awareness (see Fletcher et al., 2011; Al Otaiba & Fuchs, 2002; Vellutino et al., 1996). Different than this work examining closely related cognitive factors, little work could be found

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which examined more broadly defined "learning-related behaviors" influencing treatment outcomes.

There have been some efforts to understand children's responsiveness to interventions beyond characteristics of the child herself. For instance, distal from the child, aspects such as teacher knowledge (Connor, Son, Hindman, & Morrison, 2005; Piasta, Connor, Fishman, & Morrison, 2009) and general school environment (Rutter & Maughan, 2002) have been suggested to significantly interact with child outcomes due to treatment. Also, as mentioned previously, there is a literature pointing to the importance of closely-related cognitive skills, such as phonological awareness and letter knowledge, with child outcomes due to treatment (e.g., Vellutino et al., 1996; Vellutino, Scanlon, Zhang & Schatschneider, 2008). However, the literature is sparse in research examining child-specific factors encompassing learning-related behaviors, such as motivation and effortful control, which may affect treatment outcomes. What few reports exist (e.g., Deault, Savage, & Abrami, 2009; for review, Snow, 1992) were conducted typically outside of a formal randomized controlled trial framework, thus resulting in many potential confounds. A notable exception indicated that children's attentional skills moderated the extent to which explicit print instruction contributed to children's literacy learning (McGinty, Justice, Piasta, Kaderavek, & Fan, 2012).

Our interest in exploring learning-related behaviors and their contribution to intervention outcomes is supported by research showing they are an important part of learning to read (Guthrie & Wigfield, 1999; Guthrie, Wigfield, & VonSecker, 2000). For example, children's interest towards reading (i.e., literacy interest or literacy motivation) and their effortful control make strong contributions to children's reading development (Valiente, Lemery-Chalfant, & Swanson, 2010; Wigfield, 2010). The amount of personal interest for reading activities is typically a stable predisposition that develops over time and is related to grade outcomes, even when controlling for ability (Schiefele & Csikszentmihalyi, 1994). Moreover, it has been suggested that literacy interest leads to unconscious selective attention towards a reading activity (Hidi, 1990). From this, it has been proposed that information which is considered interesting is processed differently than information which is not considered of interest (Hidi, 1990). Therefore, higher literacy interest may result in a totally different learning situation for a child compared to one with low interest in reading (Hidi, 1990).

Interest towards literacy has consistently been shown to be associated with literacy, and subsequent reading outcomes, even beyond important other predictors of literacy. For example, child engagement during a parent-child book reading activity at 2 years, a proxy for child interest towards reading, was associated with higher literacy outcomes at 4.5 years, beyond language skills and exposure to direct instruction in reading (Crain-Thoreson & Dale, 1992). In another study, a direct measure of child interest accounted for 3% of unique variance in literacy outcomes in 5-year-old children, beyond phonological awareness, vocabulary, and levels of home literacy (Frijters, Barron, & Brunello, 2000). Sénéchal, LeFevre, Hudson, and Lawson (1996) reported that children's interest towards storybook reading, measured by children's requests for reading, accounted for unique variance in vocabulary outcomes, after controlling for home literacy and socioeconomic status. Recently, Sparks and Reese (2013) found that preschool children's interest towards literacy was related to literacy and early-reading outcomes such as print concepts and decoding, above socioeconomic status and vocabulary. In general, high literacy interest can influence literacy outcomes and subsequent reading performance, and is specifically associated with better learning strategies, sustained attention to the task and greater reading comprehension (see Wigfield, 2010, for review).

Similar to literacy interest, the temperament trait effortful control has been linked with literacy, and subsequent reading outcomes (Keogh, 2003) and is considered an important early learning-related behavior (Stipek et al., 2010). Effortful control, commonly considered a proxy for self-regulation, is linked with the ability to control behavior and attention as needed to complete difficult tasks (Posner & Rothbart, 2006), which is associated with reading achievement outcomes (Deater-Deckard, Mullineaux, Petrill, & Thompson, 2009). In general, it is hypothesized that the ability to focus on relevant information and inhibit distractions, both attributed to high effortful control, aids in the learning process (NICHD Early Child Care Research Network, 2003). In a study of elementary school-aged children, effortful control was linked to children's general school achievement, beyond previous school achievement and socioeconomic status (Valiente, Lemery-Chalfant, Swanson, & Reiser, 2008). Blair and Razza (2007) found that effortful control, measured in preschool, accounted for unique variance in kindergarten literacy outcomes, beyond executive function and false belief. Also, Liew, McTigue, Barrois, and Hughes (2008) reported that effortful control measured in first grade uniquely predicted third grade reading outcomes beyond covariates including IQ, socioeconomic status, and ethnicity. In general, effortful control is considered to be very important in early school readiness and maintains its influence on achievement outside of cognitive ability and family factors (Ladd, Birch, & Buhs, 1999; Lewit & Baker, 1995).

Despite the literature suggesting that these two learning-related behaviors, namely literacy interest and effortful control, are important independent predictors of reading outcomes, the relationship between the two has been underexplored. One report suggested that children with higher effortful control tend to rate liking school more, possibly because they are more capable of managing emotion in school and have a stronger support system as they tend to be liked more by peers and teachers, resulting in greater academic success (Valiente, Lemery-Chalfant, & Castro, 2007). To our knowledge, the relation between literacy interest and effortful control has yet to be explored within an intervention framework. If it is the case that they both predict children's reading outcomes independently and interactively, then it stands to reason that these learning-related skills might be important moderators of treatment outcomes. For instance, we might anticipate that children with high literacy interest and/or high effortful control would benefit more from being in an intensive literacy treatment compared to similar children receiving typical instruction. This work makes an important contribution to the literacy intervention literature, as the movement towards a greater awareness of learning-related behaviors that affect academic outcomes increases (e.g., Valiente et al., 2010).

The present research uses data available from a larger multi-site randomized controlled trial (RCT) designed to improve preschool children's literacy skills in advance of kindergarten entry (Justice, McGinty, Piasta, Kaderavek, & Fan, 2010). The intervention, Project STAR (Sit Together and Read), involved a 30-week preschool book reading treatment which consisted of whole-class shared-reading sessions in which teachers implemented print-focused instruction within the context of shared reading with their students (Justice, Kaderavek, Fan, Sofka, & Hunt, 2009). The treatment involves teachers' adherence to a systematic scope and sequence of instruction that teachers follow using various tools to promote implementation fidelity (in-service training, on-going monitoring based on fidelity checks, teachers' manual with book inserts to guide sessions). On the basis of consistent efficacy data showing the positive impacts of this treatment (see Justice & Ezell, 2000; Justice & Ezell, 2002), the RCT involved a more generalized test of intervention effects with implementation by teachers working in a variety of preschool settings. Treatment teachers adhered to the print referencing instructional scope and sequence, with comparison classrooms reading project storybooks using their normal reading approach, thus allowing for direct tests of causal effects. Initial work suggested that children in the experimental classrooms reported greater positive gains in print knowledge ($d = 0.21$) during their preschool year over the comparison classrooms (Justice et al., 2010). Moreover, the positive gains continued through kindergarten ($d = 0.21$ to 0.26) and first grade ($d = 0.26$ to 0.31), indicating that children who were exposed to this treatment at preschool were better readers (based on measures of decoding and comprehension) than those in the comparison group (Piasta, Justice, McGinty, & Kaderavek, 2012). Given the multiple tests of this, and similar treatments, including evaluation by independent research teams (Lovelace & Stewart, 2007), STAR can be