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Using the Early Development Instrument to examine cognitive and non-cognitive school readiness and elementary student achievement

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ABSTRACT

There is currently no accepted consensus over which aspects of school readiness abilities have noteworthy associations with later student achievement, independent of cognitive readiness, largely due to a limited range of non-cognitive abilities that are typically analyzed in school-based surveys. The Early Development Instrument (EDI) measures children's school readiness prior to Grade 1 entry in five areas of development: physical, social, emotional, language and cognitive, as well as communication. EDI data in kindergarten were linked to Grade 3 reading, writing and math standardized achievement scores for 45,000 kindergarten students in Ontario, Canada to investigate the impact of kindergarten abilities on later academic achievement. Multi-level regression models showed that the cognitive domains had the strongest correlations with reading, writing, and math with the largest coefficients, controlling for individual and school-level demographic factors, but the physical, social, and emotional domains also were significantly associated with achievement scores, independent of cognitive readiness. The effect sizes of the non-cognitive domains' impact were comparable to or larger than variables such as gender or first language. These findings demonstrate the importance of holistic measures of school readiness, encompassing cognitive and non-cognitive areas, for understanding early achievement and potential prevention of continuing underachievement.

1. Introduction

In recent years, a great deal of child development policy has focused on student achievement, partly leveraged by accountability regimes in contemporary school systems. Today's educators are being held accountable for children's scores on standardized tests of literacy and numeracy, beginning in the primary grades. To raise those scores and limit early school failure, policy makers are increasingly interested in promoting "school readiness," referring to children's abilities needed to meet the cognitive, physical, and social demands of school entry (Janus & Gaskin, 2013; Mashburn & Pianta, 2006; Pianta, Cox, & Snow, 2007). School readiness research assumes young children's transition from their preschool years into the primary grades represents a major early life milestone (McClelland, Acock, & Morrison, 2006) and is usually conceived as a multi-dimensional set of physical, emotional, cognitive, and social capacities that permit children to interact successfully in school (Hair, Halle, Terry-Humen, Lavelle, & Calkins, 2006). Indeed, a growing body of research has demonstrated that children's early capacities are strong predictors of their eventual academic success or failure (Caprara, Barbaranelli, Pastorelli, Bandura, & Zimbardo, 2000; Cerda, Im, & Hughes, 2014; Claessens, Duncan, & Engel, 2009; Duncan et al., 2007; Duncan & Magnuson, 2011; Farkas & Hibel, 2007; Hair et al., 2006; Janus & Duku, 2007; Li-Grining, Votruba-Drzal, Maldonado-Carreno, & Haas, 2010; Matthews, Ponitz, & Morrison, 2009; McClelland et al., 2006; Oberle, Schonert-Reichl, Hertzman, & Zumbo, 2014; Sabol & Pianta, 2012).

Some researchers prioritize cognitive aspects of readiness, that is, basic language, math, and reasoning abilities, over non-cognitive ones (Blair, 2002). According to their rationale, cognitive skills are most decisive for later learning. This reasoning has been most recently bolstered by an influential analysis of six longitudinal data sets in which Duncan et al. (2007) found that, after controlling for

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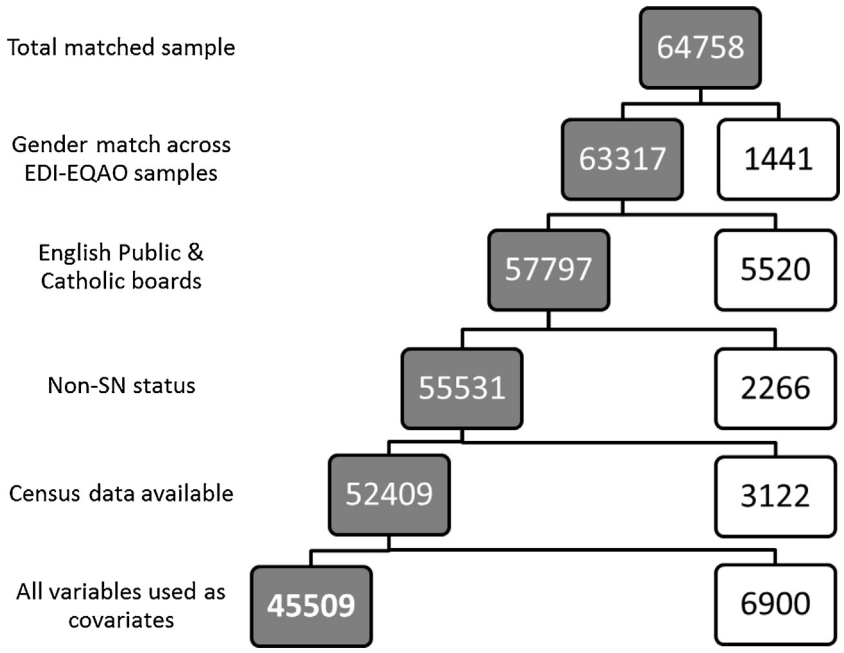

Fig. 1. Flow chart of the selection of the analytic sample for the study. Shaded fields represent groups that matched each criterion.

an extensive set of child, family, and contextual influences, cognitive skills from kindergarten were consistent and strong predictors of later academic achievement. In contrast, socio-emotional capacities had few consistently strong impacts. Similarly, Claessens et al. (2009) found that cognitive skills and an ability to pay attention in kindergarten were significant predictors of Grade 5 achievement, while a collection of socio-emotional capacities—making friends, sitting still, mental health, and aggression—were not. More recently, Claessens and Engel (2013) found that early math abilities in kindergarten predicted achievement through to Grade 8, while social skills were negligible predictors.

Duncan and Magnuson (2011) acknowledge that binary distinctions between cognitive and non-cognitive readiness can be misleading, since what many consider to be 'cognitive' abilities are actually quite varied, ranging from early verbal and counting skills to paying attention, and that these abilities are related to non-cognitive ones. But they defend this distinction, contending that cognitive skills are far more consequential for early academic achievement than are social skills, behavior problems, or mental health. The studies lead by Duncan are widely cited as evidence that cognitive skills are the essential ingredients of school readiness and that non-cognitive development has little independent influence on later school outcomes. The policy recommendation that flows from this research is that early education should focus foremost on the nurturing of cognitive readiness (Camilli, Vargas, Ryan, & Barnett, 2010; Claessens & Engel, 2013; Duncan & Magnuson, 2011).

Other researchers, however, have argued that a broader constellation of early child capacities, including non-cognitive abilities, is predictive of later school achievement (Mashburn & Pianta, 2006; Pagani & Messier, 2012). Their reasoning is based on a variety of longitudinal studies, such as one by Cerda et al. (2014) that found that measures of cognitive abilities left considerable amounts of variance unexplained for academic achievement, and that other traits such as motivation, sociality, self-regulation, and some physical capacities could enhance school learning (Cerda et al., 2014). In line with this, the data sets used by Duncan et al. (2007) have been re-analyzed in a series of studies (Grissmer, Grimm, Aiyer, Murrah, & Steele, 2010; Pagani, Fitzpatrick, Archambault, & Janosz, 2010; Romano, Babchishin, Pagani, & Kohen, 2010), several of which highlighted the omission of physical readiness items and a limited range of social-emotional measures in the original analyses. After including these additional measures, some researchers found that socio-emotional capacities, gross and fine motor skills, and general world knowledge had significant independent impacts on academic success (Grissmer et al., 2010; Pagani et al., 2010). Findings from these studies suggest that physical readiness, particularly motor skills, can affect later school achievement via the co-location of physical skills and cognitive functioning in brain development (Grissmer et al., 2010; Pagani & Messier, 2012).

A number of investigations following children from primary grades to middle school indicate that a variety of socio-emotional and self-regulations skills, such as helping and sharing, persistence, attention, and social competence exhibited in early grades, contribute to academic achievement measured between 1 and 5 years later (Caprara et al., 2000; Li-Grining et al., 2010; McClelland et al., 2006; Oberle et al., 2014). Measures of self-control and social and emotional adjustment, in addition to cognitive skills, have been shown to be significant predictors of later academic competencies (Burt & Roisman, 2010; Janus & Duku, 2007), as well as a variety of later-life outcomes, such as health and criminality (Moffitt et al., 2011). The findings from these studies typically lead to the recommendation that early school policies should invest resources that promote pro-social behavior, emotional health, and physical well-being, in addition to cognitive skills, in order to enhance their learning environments.

Holistic models of readiness suggest that a variety of child's capacities shape their academic preparation and affect their future school achievement and occupational success (Greenberg et al., 2003; NICHD Early Child Care Research Network, 2005). Indeed, the very organization of early education can be seen to reward both cognitive and non-cognitive capacities. Kindergarten was originally founded as a transitional year to ease children's social and emotional evolution from their "home" to their "schooled" selves (Gracey, 1975). Educational philosophies have long extolled the virtues of holism—the promotion of healthy minds and bodies. Notions of the 'whole child' are part of the very creed of many traditions of pedagogy, including progressive pedagogy (Davies,