



## Do the effects of early childhood education programs differ by gender? A meta-analysis<sup>☆</sup>



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### ABSTRACT

A meta-analysis was conducted to examine gender differences in the effects of early childhood education programs on children's cognitive, academic, behavioral, and adult outcomes. Significant and roughly equal impacts for boys and girls on cognitive and achievement measures were found, although there were no significant effects for either gender on child behavior and adult outcomes such as employment and educational attainment. Boys benefited significantly more from these programs than girls on other school outcomes such as grade retention and special education classification. We also examined important indicators of program quality that could be associated with differential effects by gender.

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### 1. Introduction

For decades, scholars, policymakers, and advocates have touted the potential of early childhood education (ECE) to remediate disadvantaged children's low levels of achievement at school entry, and have more recently argued that these programs benefit more affluent children as well (Barnett, 1995; Kirp, 2009). Over time, as public and private funding for these programs expanded, children's participation has risen, and now more than half of children experience ECE before entering kindergarten (Magnuson & Shager, 2010). With increased participation has come greater scrutiny of program effectiveness, and more attention to whether the benefits of ECE programs are broadly distributed or whether they are concentrated among some subgroups of children. Understanding whether pro-

gram impacts differ by child characteristics is especially important for policymakers and educators who generally share the goal of designing programs and policies that improve the school success of all children.

Numerous studies and meta-analyses now suggest that ECE has meaningful short-term effects on children's early academic skills that vary from small to large across program evaluations, but fewer consistent positive impacts on children's behavior or self-regulation (Burchinal, Magnuson, Powell, & Hong, 2015; Camilli, Vargas, Ryan, & Barnett, 2010). Although ECE evaluation studies have often considered heterogeneous effects by race, ethnicity and low-income status (Currie & Thomas, 1999; Duncan & Sojourner, 2013; Garces, Thomas, & Currie, 2002), little systematic attention has been given to whether program impacts differ by gender.

Gender differences in program effectiveness are sometimes reported in some articles, but such differences have rarely been the primary focus of analysis. A notable exception is a reanalysis of three prominent experimental ECE studies (Perry Preschool, Abecedarian, and the Early Training Project) by Anderson (2008), which had a provocative conclusion. Although female participants gained substantially from the programs, "the overall patterns of male coefficients is consistent with the hypothesis of minimal effects at best—significant (unadjusted) effects go in both directions

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and appear at a frequency that would be expected due simply to chance” (Anderson, 2008, p. 1494). Several more recent ECE studies of Head Start and the Chicago Parent-Child Centers, however, arrive at the opposite conclusion and find that boys benefit more than girls (Deming, 2009; Ou & Reynolds, 2010).

Gender differences in educational outcomes have received considerably more attention in the later school years than the preschool years. Girls consistently outperform boys on the National Assessment of Educational Progress (NAEP) reading tests and have higher levels of educational attainment, including college completion, in the general population and among low income samples (Aud et al., 2010). The gender gaps in academic outcomes have multiple determinants, but it is important to better understand the role that early education may have in shaping such gender differences. If girls do have better outcomes from early educational investments than boys, then it might provide some insight as to why girls outperform boys in the later years. Moreover, this would suggest that efforts to improve the school readiness of vulnerable children should be carefully examined to better meet boys’ needs.

This study uses meta-analytic methods to investigate whether there are differential program impacts of ECE for boys and girls across a broad set of ECE programs in four domains: cognitive skills and achievement, behavior and mental health, other school related outcomes, and adult outcomes. In addition, we explore whether program features may explain any differences in ECE impacts by gender.

## 2. Background

In order to understand why gender may affect the extent to which children benefit from ECE, it is important to consider what is known about how about typical development in early childhood differs by gender. Specifically, gender differences in early skills and behaviors are theoretically important for thinking about how ECE may affect boys and girls differently. We discuss these gender differences in development and their application to ECE contexts before reviewing the empirical studies of gender differences in ECE program impacts. Finally, we discuss the possibility that differences across ECE program designs (or evaluation study designs) may be important to understanding whether a program has different effects on boys or girls.

### 2.1. Normative early development and gender

If boys and girls typically enter early childhood with different levels of cognitive and behavioral skills, then the learning supports provided by ECE experiences may have differing effects on their learning. Normative gender differences in skill levels and behavior may stem from both biological processes, such as the effects of prenatal exposure to testosterone, and social processes, such as differential patterns of peer and parental socialization by gender (Busey & Bandura, 1999; Maccoby, 1990; Rose & Rudolph, 2006; Zahn-Waxler, Shirliff, & Marceau, 2008). In early childhood, boys are described as being less developmentally advanced than girls in several domains (Crockenberg, 2003; Zaslow & Hayes, 1986). Getting a handle on the exact magnitude of these skill gaps is difficult, as often in the process of designing a performance test items are chosen that tend minimize group differences (Ackerman, 2006). This may be why greater differences are found in some school outcomes such as grades and high school completion compared with standardized achievement assessments.

In the cognitive and achievement domain, by the time of school entry, performance on standardized assessment show that girls have greater pre-reading skills, but not pre-math skills (Duncan & Magnuson, 2011). Recent summaries of the large literature on

gender differences in language conclude that girls tend to have faster vocabulary growth and demonstrate better language outcomes relative to boys across a range of types of measures in early childhood (Bornstein, Hahn, & Haynes, 2004; Eriksson et al., 2012; Huttenlocher, Haight, Bryk, Seltzer, & Lyons, 1991). Despite these potentially important differences, boys and girls are more similar than different with respect to their learning capacities and cognitive capabilities (Spelke, 2005). A review of 46 meta-analyses by Hyde (2005) concluded that 78% of gender differences across all ages on a wide range of domains have effect size differences smaller than .35, relatively small according to convention, with many of the larger gender differences found in the motor performance domain.

Young girls also have what is often described as an advantage relative to boys in terms of some aspects of temperament and socioemotional development. A meta-analysis by Else-Quest, Hyde, Goldsmith, and Van Hulle (2006) showed that girls outperform boys on measures of effortful control (attention regulation, inhibitory control, and perceptual sensitivity), and boys have slightly higher levels of surgency (sociability, activity, and positive affect) across the early childhood years (Else-Quest et al., 2006). Boys also demonstrate higher levels of physical and direct aggression than girls (Card, Stucky, Sawalani, & Little, 2008; Matthews, Ponitz, & Morrison, 2009). The differences in behavior and self-regulation have implications for peer group interactions, with a lengthy research literature suggesting that gender segregation begins in early childhood and that boys’ peer interactions are characterized by relatively more activity, competition, hierarchy, and aggression, whereas girls tend toward to be somewhat more concerned with social cohesion, although girls’ advantage in peer and prosocial behavior is more pronounced in middle childhood than early childhood (Rose & Rudolph, 2006).

### 2.2. Gender and the ECE classroom

Taken together, the developmental gender literature suggests that boys and girls enter the preschool years with largely similar levels of cognitive and pre-academic skills, but with some potentially larger differences in language, social, emotional and behavioral domains. In a preschool classroom setting, these differences are thought to lead to differences in child-teacher relationship quality as well as how children spend their time, especially during unstructured child play time. Specifically, girls are described as having closer and less conflicted relationships with their teachers than boys (Ewing & Taylor, 2009). In addition, girls are also described as being more involved in cognitively stimulating classroom activities and verbally mediated and prosocial imaginary play, than boys, especially during self-directed free play time (Early et al., 2010; Goble, Martin, Hanish, & Fabes, 2012). If teachers are the conduits of instructional content and serve an important scaffolding role in children’s learning (Burchinal, Magnuson, Powell, & Hong, 2015), then the closeness of girls with their teachers provides a basis for arguing that girls are likely to learn more early academic skills from ECE programs than boys. The same hypothesis might also hold for ECE’s impacts on girls’ behaviors. Again, girls’ better self-regulatory skills and closer relationships with their teachers may mean that they are particularly likely to attend to their teachers’ efforts to develop their social and behavioral skills, and they may be more able to meet their teachers’ behavior expectations, thus creating positive interactions the fuel further prosocial behavior and self-regulation. Notably, this developmental explanation is consistent with Heckman’s (2008) observation that “skills-beget-skills” during later childhood.

However, the comparison of program impacts requires a comparison of not only boys and girls in the same ECE settings, but also how they might experience the counterfactual settings of their home and other informal care environments. Conceptually,

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