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Does attending a state-funded preschool program improve letter name knowledge?

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ABSTRACT

This study investigated the causal impact of attending a state-funded pre-K program, the Virginia Preschool Initiative (VPI), on letter name knowledge using a regression discontinuity (RD) design. Children who attended VPI (n = 9,689) had higher letter name knowledge (9 letters higher) compared to students who had just begun VPI (n = 10,897). Findings were robust across various model specifications and imputation methods used. Effect sizes were large (ES = 0.89–1.01) and comparable to other statewide pre-K evaluations using an RD design with a similar outcome.

1. Introduction

The preschool years are viewed by many as an important time for children to gain prerequisite skills that foster and support future literacy development (Sayeski, Burgess, Pianta, & Lloyd, 2001). One skill in particular, letter name knowledge, has often been used to assess a child for future reading difficulty and to predict future reading achievement (Adams, 1994; Snow, Burns, & Griffin, 1998). Although the benefits of the attendance of preschool programs on cognitive skills seem self-evident given that much of early preschool instruction is focused on building early language and literacy skills (Connor, Morrison, & Slominski, 2006), the causal evidence to support such claims is limited but growing. For example, a rigorously designed study that investigated the effects of preschool attendance in Oklahoma (n = 838) showed a small positive effect size (ES) for receptive vocabulary skills (ES = 0.29) but did not find statistically significant effects for both math and print awareness skills (Wong, Cook, Barnett, & Jung, 2008). In an earlier review of the effectiveness of Head Start, researchers reported that Head Start students knew about 4 letters in the fall and left with knowing about 9 letters in spring though the gain in the Letter-Word Identification task (Woodcock & Mather, 2000) was small (ES = 0.05) and not statistically significant (Zill et al., 2006; p. 2–7). In a review of four studies that estimated the effects of preschool and kindergarten programs on alphabet knowledge (which includes letter name knowledge), the National Early Literacy Panel (NELP; 2008) found only a small effect size (ES = 0.28, 95% CI = −0.18–0.64) which was also not statistically significant (p = 0.27). Despite various early learning initiatives, little is known about the effect of early instruction on alphabet knowledge (Piasta & Wagner, 2010).

The objective of the current study was to evaluate the causal relationship of attending a state-funded preschool program on children's letter name knowledge scores using a regression discontinuity (RD) design. Much of the recent evidence on the causal, short-term effects of public preschool programs have used an RD design as a result of the design's strong internal validity when RD assumptions are met (Lipsey, Weiland, Yoshikawa, Wilson, & Hofer, 2014). In the past decade, a growing number of state-funded pre-K programs been evaluated using RD designs (e.g., Gormley & Gayer, 2005; Lipsey, Farran, Bilbrey, Hofer, & Dong, 2011; Wong et al., 2008).

1.1. Why focus on letter name knowledge?

Being able to identify the letters of the alphabet by name is an essential foundational skill in early literacy development (Adams, 1994; Treiman, Kessler, & Pollo, 2006). Understanding that the alphabet is a symbolic system that represents speech sounds is an important stage in a child's literacy growth (Foulin, 2005; Whitehurst & Lonigan, 1998). The ability to name letters in the alphabet in preschool and kindergarten has historically been iden-

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tified to be one of the best predictors of future reading ability (Bond & Dykstra, 1967; Catts, Fey, Tomblin, & Zhang, 2002; Foulin, 2005; Hammill, 2004; Schatschneider, Fletcher, Francis, Carlson, & Foorman, 2004; Share, Jorm, Maclean, & Matthews, 1984).

Poorly developed letter name knowledge has consistently shown to be reliable predictor of later reading difficulty (McCardle, Scarborough, & Catts, 2001; Snow et al., 1998). On its own, letter name knowledge can be as effective at predicting later reading skills compared to administering an entire reading readiness test (Scanlon & Vellutino, 1996; Scarborough, 1998; Snow et al., 1998). The predictive ability of alphabet knowledge has been found to be independent of a child's socioeconomic status, IQ, age, and other early literacy skills such as phonological awareness (NELP; 2008; Snowling, Gallagher, & Frith, 2003; Storch & Whitehurst, 2002).

Furthermore, the relationship between letter name knowledge and later literacy skill is likely causal in nature (Kim, Petscher, Foorman, & Zhou, 2010; Share, 2004; Treiman & Kessler, 2003). Familiarity with letter names provides children a useful mnemonic peg to use while learning about the different visual and auditory characteristics of the letters (Adams, 1994). Learning letter names may help children in learning letter sounds which benefits overall reading (Treiman, Tincoff, & Richmond-Welty, 1997). Studies have shown that children are able to use sound cues embedded at the start (e.g.,/p/in P) or end (e.g.,/es/in S) of the English letter names to learn letter sounds (Evans, Bell, Shaw, Moretti, & Page, 2006; Huang & Invernizzi, 2014; McBride-Chang, 1999). In addition, letter name knowledge is used by young children in connecting both printed and spoken words (Treiman & Rodriguez, 1999). Knowledge of letter names helps facilitate the development of the alphabetic principle or the understanding that patterns of letters represent sounds of spoken language (Huang, Tortorelli, & Invernizzi, 2014). Overall, findings of studies over the decades indicate that children with higher letter name knowledge have a greater likelihood of experiencing success in literacy learning compared to students with lower letter name knowledge who may be at risk of future reading difficulties (Piasta, Petscher, & Justice, 2012).

The importance of early letter name knowledge is further highlighted given that both state and federal preschool-related programs focus on letter name knowledge as a formal target. The federally funded Early Reading First program set performance goals that preschoolers should register growth in letter name knowledge and grantees were required to submit annual reports to document their progress (U.S. Department of Education, 2009). The more recently developed Common Core State Standards also set letter name targets that by the end of kindergarten, children are expected to recognize all the upper and lowercase letters of the alphabet (Council of Chief State School Officers & the National Governors Association, 2010). State preschool programs have varied benchmarks for letter name knowledge ranging from formally knowing 10–20 letters by the end of preschool or more loosely being able to recognize some or several letters of the alphabet (see Piasta et al., 2012 for a detailed account of various benchmarks). A large body of evidence suggests that a child's early language and literacy experiences in preschool can have beneficial long-term effects and preschool experience can facilitate alphabet knowledge growth (Connor et al., 2006).

1.2. Effects of preschool

Approximately 1.1 million four-year-old children attended one of the 40 state-funded preschool programs in 2014 (Barnett, Carolan, Fitzgerald, & Squires, 2012). However, only 3 out of 10 four-year-olds are enrolled in a high quality preschool program and President Obama has set a goal of enrolling six million children in high quality preschools by the end of the decade (Slack, 2013). Given the recent increases in budgets for preschool programs and renewed attention on preschool initiatives, evidence on the causal effects of preschool are essential in order to justify the continued support for the expansion and improvement of preschool initiatives.

The benefits of preschool attendance have been well documented for decades with experimental studies such as the HighScope Perry Preschool Project (Schweinhart & Weikart, 1981; Schweinhart, 1994) and the Carolina Abecedarian Project (Campbell & Ramey, 1994; Ramey et al., 2000). These well-known early childhood programs provided services targeted towards families from disadvantaged backgrounds and have found that high quality early childhood care can have an impact on cognitive development, academic achievement, health-related outcomes, and behavior (Conti, Heckman, & Pinto, 2015). Although the benefits of preschool attendance have been well studied, early experimental studies had small sample sizes (e.g., $n = 123$ for the Perry Preschool Program; $n = 111$ for the Abecedarian Project), limited geographical reach, and were intensive, multi-year programs which may raise questions about their generalizability when implemented on a large scale such as in the case of one-year, state-funded pre-K programs serving children of various backgrounds (Barnett, 2011).

In addition to the early experimental studies, a sizeable body of nonexperimental studies though has demonstrated that preschool programs can benefit a large number of students (Burchinal, Peisner-Feinberg, Bryant, & Clifford, 2000; Camilli, Vargas, Ryan, & Barnett, 2010; Howes et al., 2008; Pianta, Barnett, Burchinal, & Thornburg, 2009). A review of 20 state-funded pre-K programs noted positive impacts across several domains though several methodological weaknesses in the evaluations were noted and limited the ability to draw solid conclusions about pre-K program effects (Gilliam & Zigler, 2004). One major issue in pre-K effectiveness studies is the lack of a comparison group and the issue of selection bias, wherein the participants of pre-K programs systematically differ from those who did not attend pre-K on both observed and unobserved variables which are then possibly related to the outcomes of interest (Gormley, 2007). However, a growing number of studies have evaluated state-funded pre-K programs using an RD design which today constitutes the primary body of research supporting the short term effects of pre-K programs (Lipsey et al., 2014).

1.3. Preschool studies using regression discontinuity designs

Traditional evaluation designs may compare outcomes of participants who received the treatment against the ones who did not and in the preschool context, studies may involve comparing the outcomes of students in the fall of kindergarten who had gone through preschool vs. the students who had not gone through any preschool program. However, a challenge in such a design is that students who had not gone through any preschool program may differ on a variety of characteristics compared to the students who had been through preschool, resulting in a problem of selection bias. Controlling for observed variables is often done with the inclusion of covariates in the statistical models though unobserved variables that have an association with various outcomes may still be present and/or there may be a lack of overlap with regard to the covariates used. In other words, non-experimental studies that only used statistical controls may still have biased results.

As large scale randomized control trials (RCTs) assigning children to attend preschool or not is not practical or always feasible, researchers have turned to regression discontinuity (RD) designs (Trochim, 1984) to assess the causal impacts of preschool attendance. Next to an RCT, studies using RD designs are considered the next best design for obtaining unbiased causal estimates (Institute of Education Sciences, 2014; Lipsey et al., 2014). Though the RD design has been around since the 1960s (Thistlethwaite & Campbell,