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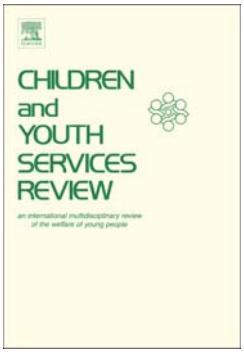

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The Added Impact of Parenting Education in Early Childhood Education Programs: A Meta-Analysis

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1.1. Introduction

Public funding for preschool programs has increased substantially in the United States in recent years. In part, this increase has been driven by recognition that development proceeds rapidly in early childhood, when children are particularly sensitive to experience and responsive to intervention (Knudsen, Heckman, Cameron, & Shonkoff, 2006; Shonkoff & Phillips, 2000). A large body of research indicates that preschool programs can have positive impacts on children's cognitive, academic, and socio-emotional development (Camilli, Vargas, Ryan, & Barnett, 2010; Gorey, 2001). However, not all programs are equally effective, and significant variation has been found in the magnitude and duration of effects, with large impacts from early demonstration programs like Perry Preschool (Radin & Wiekart, 1966), smaller impacts found more recently for Head Start (Puma et al., 2005) and other studies even suggesting potential null or even negative effects (Lipsey, Farran, & Hofer, 2015) .

One longstanding strategy to increase the effectiveness of preschool programs is to combine educational programming for children with additional programming for parents (Brooks-Gunn, Berlin, & Fuligni, 2000; Seitz, 1990; St. Pierre, Layzer, & Barnes, 1995; Yoshikawa, 1994). Preschool-based parenting education programs provide parents with information about their child's development, and guidance on how they can provide growth-promoting activities, typically focusing on parent-child engagement that is likely to support children's cognitive development. Although many preschool programs routinely include parenting education components, little is known about the supplemental benefits of these programs or whether different approaches result in differential impacts for children.

In this study we examine the potential added benefits of parenting education, the most common form of parent-focused service provided by preschool programs, on the development of children's cognitive and pre-academic skills. Using a large-scale meta-analytic database of preschool evaluations, we employ multilevel regression analyses to examine the associations between the addition of parenting education services to preschool programs and program impacts on children's cognitive and pre-academic skills in early childhood. We also test two additional hypotheses regarding the added impact of parenting education: first, that parenting education that provides modeling or opportunities to practice positive interactions with children will have stronger added impacts than parent education programs that do not; and second, that child impacts will increase with the intensity and frequency of parenting education provided.

1.2. Parent-child Interactions in Early Childhood Learning

Two aspects of parenting behaviors have been found to relate positively to children's cognitive development: 1) the warmth and responsiveness of parents' interactions with their children, and 2) the amount of cognitive stimulation these interactions provide. Consistently responsive interactions—those that provide contingent and appropriate responses to children's communicative actions—support cognitive development in early childhood (Landry, Smith, Swank, Assel, & Vellet, 2001). Additionally, responsive interactions during activities that are cognitively stimulating provide support for cognitive development, through more individualized responses and better scaffolding of skill development (Cristofaro & Tamis-LeMonda, 2012; Mol, Bus, deJong, & Smeets, 2008; Dieterich, Assel, Swank, Smith, & Landry, 2006; Weizman & Snow, 2001).

Programs that have trained parents in either increased responsiveness or more appropriate, cognitively supportive interactions, such as interactive book reading, have had positive impacts on children's language and literacy outcomes (Landry et al., 2012; Lonigan & Whitehurst, 1998). The parenting education components of preschool programs often include efforts to encourage such responsive and cognitively stimulating behaviors. Yet it is unclear whether these types of parenting education efforts have an added effect on child cognitive outcomes, above and beyond the experience of preschool alone.

1.3. Parenting Education as Provided by Preschool Programs

Many U.S. preschool programs provide some form of parenting education. The parenting education provided by preschool programs is delivered in a number of formats, with some provided through home visiting or classes for parents, and some offered as a part of comprehensive services that may also include case management and preschool programming (St. Pierre & Layzer, 1999). Regardless of the primary delivery mechanism, parenting education programs typically seek to shape parenting attitudes, beliefs, and practices (Smith, Perou, & Lesesne, 2002). Intervention strategies include sharing information about child development and parenting techniques, supporting skill-building through modeling and practice, promoting self-awareness, and/or supporting parents' ability to problem-solve (Fine & Henry, 1989). The specific parenting behavior(s) targeted by these programs may also differ depending on the age of the child, the theoretical grounding, and the goals of the specific program (Fine & Henry, 1989; Smith et al., 2002; Sandler, Scheonfelder, Wolchik, & MacKinnon, 2011). The diversity of these programs is reflected in the diversity of parent and child outcomes they target, and there is evidence that these programs can succeed in changing a variety of parent behaviors (Bakermans-Kranenbug, van Ijzendoorn, & Huffer, 2003; Brooks-Gunn, Berlin, & Fuligni, 2000). Evidence of impacts on child outcomes is less consistent. Programs that attempt to improve child behavior through changes in parenting have shown some consistent success (Webster-Stratton & Hammond, 1997), but efforts to improve cognitive skills have had mixed results (Brooks-Gunn & Markman, 2005).

It is unclear whether providing services in both the home and preschool program is more effective in supporting the development of young children than targeting one or the other context alone. Lonigan and Whitehurst (1998) found that training in dialogic reading (a strategy for interactive book reading) is most effective when provided to parents and teachers, rather than just training the teachers alone. Similarly, evaluations of the Getting Ready program indicate that Head Start children whose parents received training on how to support responsive and cognitively stimulating parent-child interactions scored substantially higher on measures of language and literacy when compared with children whose parents did not receive this training (Sheridan, Knoche, Kupzyk, Edwards, & Marvin, 2011).

In contrast to these findings, a meta-analytic review of center-based preschool programs conducted by Camilli et al. (2010) found that the addition of services to parents was associated with smaller effect sizes on children's cognitive development, compared with the effects of programs that provided ECE alone, raising questions about the effectiveness of these additions. This analysis considered all additional parent-focused services collectively, including those supporting human capital development or providing material resources, like food or clothing, and did not look specifically at the impact of parenting education programs. To date, no meta-analytic study has attempted to isolate the added impact of types or intensity of parenting education programs, provided in the context of preschool, on children's cognitive development.

1.4. Provision of Modeling and Practice in Parenting Education

A key challenge for parenting education programs is that they attempt to shape adult behavior and habitual patterns of interaction that have developed over time (Halpern, 2000). Prior research on adult behavior suggests that programs that engage parents in active learning though opportunities to practice and model healthy interactions with children may be more effective in changing behavior than simply providing parents with information. Early work by Bandura and colleagues on social learning theory highlights the important role that imitation plays in learning new social behaviors, as well as in encouraging the inhibition or disinhibition of already learned behaviors (Bandura & Walters, 1963; Bandura, 1971). According to social learning theory, observing a particular behavior creates a mental representation of the behavior to support retention, which can then be entered into one's behavioral repertoire through practice. Although much of the evidence supporting social learning theory focused on evidence of imitative learning in children, later studies with adults have shown that modeling and practice of behavior can be more effective in changing a wide range of behaviors than training methods without any modeling or practice (Bandura, Blanchard, & Ritter, 1969; Haguenauer et al., 2005; O'Toole, 1979; Brown et al., 2004).

This work suggests that modeling new interactions, and providing opportunities to practice them, may be more likely to increase both the responsiveness and cognitive stimulation of parents, and therefore more likely to improve children's development of cognitive and pre-

academic skills than the most common alternative, which is providing parents with information about parenting or child development. This type of modeling or practice can be provided across a variety of delivery mechanisms. Home visiting, for example, may provide opportunities for program staff to work directly with parents and children together. Group parenting classes, although they typically do not include children, can be enhanced with videotapes of particular types of interactions. Video-recorded training, in which parents reflect on images of their own interactions with their child, is another method that can be used in any of these contexts. In fact, a meta-analysis of a variety of parent training programs designed to improve parental sensitivity and child attachment found that programs were more effective if they provided video feedback (feedback on videotaped parent-child interactions) (Bakermans-Kranenburg et al., 2003). A 2005 meta-analysis of home- and center-based programs by Blok, Fukkink, Gebhardt, and Leseman (2005) found that having some form of parent "coaching," including modeling, was related to larger effects on cognitive measures. A more recent meta-analysis of programs that provided training in parenting skills also found larger impacts for programs that gave parents an opportunity to practice the skills taught (Kaminsky et al., 2008).

This prior work indicates that parenting education programs that include some form of modeling, feedback, or practice may represent an effective approach to changing parent behaviors. The modeling and feedback provided by parenting education components of preschool programs have not been evaluated in any prior meta-analysis. Programs that demonstrate cognitively stimulating parent-child interactions to parents, and those that offer parents opportunities to practice new behaviors, may, therefore, generate larger impacts on children's development than programs that provide preschool only, or preschool programs that offer parent information sessions.

1.5. Intensity of Parenting Education

In addition to the type of parenting education, its intensity or frequency of contact may also affect children's development. Many of the parenting education programs that are provided within the context of preschool rely largely on low-frequency or largely didactic models, such as parenting classes. For example, Head Start programs require only two home visits per year. It is unclear whether this represents a sufficient intensity of contact to lead to improved outcomes for children.

In two meta-analyses of home visiting programs, high-frequency home visiting (two or more visits a month) has been shown to produce significantly larger effect sizes on both parenting behaviors and children's cognitive skills than lower- frequency home visiting (Sweet & Appelbaum, 2004; Nievar, Van Egeren, & Pollard, 2010). These meta-analyses, however, did not distinguish between home visiting programs that were provided in combination with ECE and those that were not. The complexity of changing parent behavior—responsiveness or stimulation—may require contact more than once per month. First, frequent visits may be

necessary for a visitor or educator-parent relationship to develop the rapport and trust that is characteristic of an effective helping relationship. All helping relationships are characterized by some combination of encouragement, confiding, modeling, and feedback (Frank, 1985). For such a relationship to occur with positive behavior change, frequency of contact does seem to matter in the therapeutic literature, not just in the home visiting literature (Freedman, Hoffenberg, Vorus, & Frosch, 1999; Sweet & Appelbaum, 2004). Second, greater time in practice resulting from more-frequent visits may be more effective at changing parent behaviors than more-limited practice in programs with fewer parent contacts. To date, no meta-analysis has examined the relationship between the intensity or frequency of parent education programs in a preschool context and children's cognitive outcomes.

1.6. The Present Study

Prior research has raised important, unanswered questions regarding when and how parenting education may be an effective supplement to a preschool program for supporting children's cognitive development and pre-academic skills. Understanding the relative effectiveness of different types and frequencies of parenting education services provided in combination with preschool is critical as policymakers seek to maximize the effectiveness of this rapidly increasing type of early childhood program.

The present study uses a large meta-analytic database of early childhood education evaluations to examine the following research questions:

1. Do preschool programs that provide parenting education have larger short-term program impacts on children's cognitive and pre-academic skills than preschool programs that do not provide parenting education?

2. Among preschool programs that provide parenting education, do those that include modeling or opportunities for practice and feedback have larger short-term impacts than those that do not provide these features?

3. Among preschool programs that provide parenting education, are those that provide more-frequent services, as measured by larger numbers of contacts, associated with greater short-term impacts on cognitive and pre-academic outcomes?

2. Method

The analyses reported in this paper are drawn from a comprehensive database of U. S. early childhood education program evaluations published between 1960 and 2007. This was database was constructed by the authors along with a team of research assistants. We limit our sample to interventions that provided some form of center-based preschool services (with or without additional parenting education services) to children from 36 to 60 months old. In our meta-analytic approach, results from impact evaluation studies are transformed into

effect sizes that represent differences in outcomes between treatment and comparison groups at follow-up divided by the pooled standard deviation of the treatment and comparison groups at pretest. These effect sizes can then be used to estimate average effects across studies, and to explore the differential impact of various types of preschool program characteristics.

2.1. Meta-Analysis

Meta-analysis is useful for understanding how different types of parenting education programs shape child cognitive outcomes as part of preschool programs. These programs have been studied extensively since the early 1960s, thereby creating a research base that spans five decades and includes many programs that provide both preschool and parenting education. Meta-analysis provides a systematic means to quantify program impacts identified across multiple studies. In contrast to individual studies, which provide important information about the details of program effectiveness, and answers to specific empirical questions, meta-analyses can quantitatively synthesize impacts of multiple studies, identifying overall average impacts as well as dimensions of programs that systematically relate to larger impacts across the studies. The challenge of a meta-analysis is identifying a coherent set of programs to support meaningful analysis of effect sizes without narrowing the definition so tightly as to eliminate so many studies that the broader domain of available research is not properly represented (Sharpe, 1997). Meta-analyses must consider moderating variables and in some way assess or control for the impact of different aspects of program characteristics, particularly when the characteristics of the programs are varied. Indeed, since predictors of interest in our analyses were not randomly assigned, our meta-analytic framework cannot support causal inference. However, we take care to control for a number of the research design- and sample-related differences in program impacts. Ultimately, the strength of a meta-analysis is in synthesizing the breadth of research findings available on a particular topic.

Our meta-analytic database includes published and unpublished studies of child and family policies, interventions, and programs provided to U.S. children from birth to age 5. This database builds on previous meta-analytic databases (Camilli et al., 2010; Jacob, Creps, & Boulay, 2004; Layzer, Goodson, Bernstein, & Price, 2001). We identified additional studies through word searches for the terms “early childhood education,” “preschool,” “Head Start,” or “pre-k*”in ERIC, PsychINFO, EconLit, and Dissertation Abstracts databases, as well as through manual searches of leading policy research institutes (e.g. , Abt Associates, Rand, Mathematica Policy Research, National Institute for Early Education Research) and state and federal departments (e.g., U. S. Department of Health and Human Services); and through perusal of reference lists in screened-in studies and key early childhood education reviews.

Study screening criteria were designed to identify high-quality experimental and quasi-experimental studies with comparable experimental treatment and comparison groups.

Studies were first screened at the abstract level, and then the full text was screened if there was a possibility that the study would meet our inclusion criteria. Coders were trained by a principal investigator or experienced research assistant on how to conduct screening. To be included in our meta-analytic database, studies needed to 1) evaluate their programs using some sort of comparison group, 2) have at least 10 participants in each condition at follow-up, and 3) experience less than 50% attrition in either the treatment or comparison group between the initiation of treatment and measurement.

We included experimental studies, and studies that employed a high-quality, quasi-experimental design; in both instances, the treatment and comparison participants had to be equivalent on relevant characteristics before the initiation of treatment in order to be included in our meta-analysis. We excluded evaluations of interventions designed for children with diagnosed disabilities, and evaluations to test the effectiveness of medical procedures or health-related products. These methodological criteria are more rigorous than those applied by McKey et al. (1985) and Abt/NIEER; for example, our criteria exclude all pre-post only (no comparison group) studies, as well as regression-based studies in which the baseline equivalence of treatment and comparison groups was not investigated. Using these criteria, we reviewed more than 10,000 articles captured by our search terms and identified 272 studies for inclusion in our database of early childhood education programs

2.2. Coding

Each of the 272 studies identified in the search process was then coded by a team of doctoral-level research assistants to document information about study design, program and sample characteristics, and information needed to compute effect sizes. Before coding started, we implemented a training process that included practice coding, assessing reliability, and holding regular meetings (Cooper & Hedges, 2009). Specifically, research assistants were trained during a three- to six-month period, during which we provided the trainees an overview of the project, a discussion of each item in the codebook, training on manualized effect size, and practice in coding a sample of studies alongside an experienced coder. Trained coders were then required to achieve an interrater reliability rate with a master coder of 1.00 for effect sizes and .80 for all other study information, based on the procedure used in the meta-analytic database we built upon (Camilli et al., 2010). The range of interrater reliabilities for all study information was .87–.96 (M =. 87). Any discrepancies or questions were resolved through weekly meetings between coders and principal investigators, and decisions about any ambiguities discussed during these meetings were kept in an annotated codebook to ensure they were followed throughout the coding process (Cooper & Hedges, 2009).

Throughout the coding period, coders periodically double-coded studies to avoid drift in reliability. Additionally, any questions coders had were discussed in weekly research team conference calls and resolved by the principal investigators. After the database was finished,

data entry was checked through systematic data exploration and cleaning. This process included checking outliers, confirming skip patterns, and examining missing values. These methods for maintaining high-quality, reliable coding are consistent with those of previous meta-analyses and the recommendations of Lipsey and Wilson (2001).

2.3. Database

The database consists of three levels of data: study, contrast, and effect size. *Studies* are defined as independent investigations of preschool programs. *Contrasts* are comparisons of groups that experienced different conditions within a study. For example, a study might provide one group of participants with preschool programs, a second group of participants with preschool plus parenting education, and a third group with no services. For our purposes these would produce three contrasts: preschool services versus comparison, preschool plus parenting education versus comparison, and preschool versus preschool plus parenting education. *Effect sizes* are standardized comparisons of treatment and comparison groups on a set of outcome measures.

2.4. Procedures for Calculating Effect Sizes

We coded each study's outcome measures into standardized mean difference effect sizes, using the pooled standard deviation; the effect sizes were computed using the Comprehensive Meta-Analysis computer software program (Borenstein, Hedges, Higgins, & Rothstein, 2005). We converted effect sizes to Hedges' g, an effect-size statistic that adjusts the standardized mean difference (Cohen's d) to account for bias in the d estimator when sample sizes are small. Because single contrasts frequently provide multiple effect sizes with varying levels of precision, we weighted effect sizes by the inverse of the variance of each effect size multiplied by the inverse of the number of effect sizes per contrast (Cooper & Hedges, 2009; Lipsey & Wilson, 2001).

2.5. Measures

We examined measures of program impacts in two distinct domains. The first and largest category consists of measures of children's cognitive skills. Our analytic sample includes 321 effect sizes for measures of cognitive skills, drawn from 60 contrasts. Cognitive skills measures include vocabulary, IQ, task persistence, and syllabic segmentation (Snow, Burns and Griffin 1998). We distinguish these broader cognitive skills from measures of children's more narrow pre-academic skills, such as reading, counting, letter recognition, and generalized achievement tests. We make this distinction based on work by Christian, Morrison, Frazier, and Massetti (2000), which demonstrates that these specific domains of children's cognitive development are more sensitive to the types of instruction young

children receive in educational programs such as the ones evaluated in this study. Our analytic sample includes 124 effect sizes in the pre-academic skills domain drawn from 37 contrasts.

Values for the 445 effect sizes in our analytic sample ranged from -0.65 to 2.51, with a mean of 0.22 (SD = 0. 43). Of the reported effect sizes, three had values greater than 1.5. To ensure these outliers do not exert undue influence on our analyses, we capped these large effect sizes at 1.5, following the guidance of Lipsey and Wilson (2001). We conducted all subsequent analyses using both the capped and uncapped effect sizes. Analyses using the uncapped effect sizes typically produced larger standard errors but did not differ substantively from analyses using the capped effect sizes. We chose to feature the more precise results from the capped effect sizes in this paper. We also used information on the direction and significance of effect sizes, when available, to impute missing effect sizes. Estimated effect sizes were calculated assuming a p value of .05 for 40 observations that were missing effect sizes but for which the authors indicated that the difference between the treatment and comparison group was significant. Observations where both effect size and significance information were missing were deleted from the analyses.

For our first research question, we created a dichotomous variable coded as 1 if the preschool program provided any type of parenting education—defined as systematic efforts to improve parenting skills, behavior, interactions, and attitudes—and 0 if the program did not provide parenting education.

For our second research question, we created a categorical variable indicating whether the preschool program provided 1) parenting education that offered parents modeling or opportunities to practice parenting behaviors with their child(ren); 2) parenting education that did not offer parents modeling or opportunities to practice; or 3) no parenting education. A program provided modeling if a teacher, parent educator, home visitor, or other staff member demonstrated particular types of interactions with a child to the parent. We defined practice as occurring if parents were instructed in particular types of interactions and given an opportunity to practice these in the presence of a program staff member. See Appendix A for a list of the programs that provide parenting education with modeling or opportunities for practice.

For the third research question, we used information on the frequency of home visiting to measure the relationship between the frequency of parenting education and children's outcomes. Although some programs provided parenting education through other formats, such as in the context of groups or classes, home visiting was the only delivery mode for which study authors typically provided information on the number of contacts. In addition, home visiting was a primary delivery mode for programs that provided parenting education. Home visits were a component of all but two of the programs that provided modeling or practice, and home visits were also part of approximately half of the programs that did not

provide modeling and practice. For our frequency analyses, we therefore created a dummy variable equal to 1 if the program provided one or more home visits per month over the course of the program. Programs that provided home visits but did so at a rate of less than one per month were coded as 0, and those that did not provide home visits were not included in the frequency analyses. Although one visit a month would not be considered high-frequency for a home visiting program, one visit a month was at the high end of the frequency of visits provided by the preschool programs in our sample (see Table 1).

We included in our regressions a set of covariates to control for effect-size variation resulting from differences in characteristics of the program and study design. Specifically, program characteristic variables included: 1) Program length, a continuous variable indicating the total length of the program, centered at 10 months to reflect the typical academic year of many early childhood programs; and 2) for research questions 1 and 2, Home visiting, a dummy variable coded as 1 if the program offered home visits.

To control for differences in the quality of study design, we created an index with values ranging from 0 to 3 representing the number of quality indicators for a given study. Studies were given 1 point for each of the following indicators of quality: 1) the study used random assignment; 2) the study had less than 25% attrition in treatment and comparison groups at the time of follow-up; and 3) coders did not observe any evidence of systematic bias in the evaluation or study methods (e.g., forming a treatment group from program volunteers, or excluding attrited participants from the analysis). We also include: 1) a dummy variable coded as 1 if the study was published in a peer-reviewed journal, and 0 if it was published in some other format; and 2) a dummy variable coded as 1 if the comparison group was active (i.e., members may have received some form of services on their own), and 0 if the comparison group was passive (received no services at all).

In many cases, the articles and reports from which we gathered data about these programs did not provide the necessary information to code one or more of our covariates. As a result, several contrasts in our analyses were missing data on one or more variables. Reports generally provided sufficient information to code key research design characteristics, and typically had low rates of missing data for variables related to types of program services (between 0 and 34%). We used a dummy variable approach to indicate missingness (Puma, Olsen, Bell, & Price, 2009). For example, for our measure of whether a program provided any form of parenting education, we created a dichotomous variable equal to 1 if the study provided information indicating the program offered parenting education. Programs that did not provide this information were coded as 0 on this variable, but also coded as 1 for a variable indicating missing on the provision of parenting education. We created similar missing data dummy variables indicating whether data were missing on the dependent variables. We attempted to address the issue of missing data using multiple imputations

(PROC MI in SAS), but found that these methods yielded unstable estimates with this multilevel, meta-analytic dataset.

2.6. Analytic Sample

Our analytic sample included programs with the following characteristics: 1) provided some form of center-based preschool services to children who were between 36 and 60 months of age, on average, at the initiation of the program; and 2) measured children's cognitive or pre-academic skills, with measures taken between the time the child had received two thirds of the intended treatment and up to one year after treatment had ended. We examined contrasts that compared treated participants to comparison group participants, excluding contrasts in which a treatment was compared with an alternative treatment, or contrasts that compared subgroups such as male versus female or African American versus white children. The resulting sample represents 46 studies, 70 contrasts, and 445 effect sizes.

As shown in Table 1, the majority of the programs in this sample served primarily low-income children, with a substantial percentage of African American children. There was a range in the quality of studies included (all of which met the database's high criteria for quality), as the sample included both experimental and quasi-experimental studies, some of which showed some potential form of bias. The sample also included published and unpublished reports, as it is important in meta-analysis to avoid bias towards significant findings. Parenting education was provided in approximately half the contrasts, and those with active learning components represented about a fifth of the contrasts included in the analysis. Home visiting was provided in more than half of contrasts, while high-intensity home visits (one or more per month) were provided in 10% of cognitive skills contrasts and 14% of preacademic skills contrasts. The average inverse-variance-weighted effect size for cognitive skills was 0.30 (SE = 0. 03) and 0.26 (SE = 0. 05) for pre-academic skills. Average effect sizes varied substantially from contrast to contrast. Tests of the heterogeneity of effects yielded I2 statistics of 58.96 in the cognitive skills domain, and 77.81 in the pre-academic skills domain.

Table 1
Descriptive Statistics for Dependent and Independent Variables (Unweighted)

	Cognitive skills n=43 studies Mean (SD) or percentage		Pre-academic skills n= 21 studies Mean (SD) or percentage	
	Effect-size level n=321	Contrast level n=60	Effect-size level n=124	Contrast level n=37
Effect size (unweighted)	0.20 (0.47)	0.34 (0.33)	0.26 (0.33)	0.29 (0.34)
Any parenting education	57%	47%	61%	51%
Parenting education with modeling	22%	18%	28%	22%
15 hours or more of preschool per week	6%	12%	22%	19%
Any home visiting	71%	52%	70%	59%
Intensive home visiting (1 or more per month)	16%	10%	21%	14%
Active comparison group	7%	8%	23%	19%
Program length	11.83 (8.30)	11.68 (8.10)	14.98 (9.83)	12.31 (6.84)
Random assignment	15%	23%	24%	19%
Published in peer-refereed journal	10%	17%	9%	14%
Bias was observed in study	43%	47%	54%	43%
Treatment on the treated	96%	95%	87%	92%
Child age at measurement (in months)	62.40 (8.39)	63.75 (9.81)	69.96 (13.43)	67.35 (10.65)
Months elapsed since end of treatment	2.10 (3.69)	3.08 (4.46)	5.27 (4.92)	5.81 (5.08)
Greater than 50% of participants white	6%	10%	11%	11%
Greater than 50% of participants African American	31%	38%	39%	41%
Greater than 50% of participants Hispanic	7%	8%	13%	11%
Greater than 90% of participants low-income	82%	83%	89%	81%
Missing on one or more covariates	81%	73%	58%	70%

2.7. Analytic Approach

Because of the nested nature of the effect-size data (i.e., effect sizes are clustered within contrasts, which in turn are clustered within studies), we employed multilevel modeling procedures to estimate how the independent variables predict variation in effect sizes. For the purposes of this analysis, we estimated a two-level model, with level-1 reflecting effect sizes and level-2 reflecting contrasts. We did this for both theoretical and practical reasons. First, the typical circumstances that give rise to multiple contrasts (multiple treatment arms with different groups of children) suggest that effect sizes are more likely to be similar within contrasts than within studies, as differing contrasts within a study are likely to produce

discrepant effect sizes. Put another way, we expected that differences in effect sizes between contrasts (even within the same study) were likely to be more consequential and important to capture in our modeling than differences between studies. Second, more than half of the studies we have coded consist of one contrast, and thus it is likely that the data would not support consistent estimation of a three-level model. We expressed our models with nested equations (Raudenbush & Bryk, 2002). The level-1 model (effect-size level) is

$$(1)\ ES_{ij} = \pi_{0j} + \pi_{1j}x_{1ij} + \ldots + \pi_{kj}x_{kij} + e_{ij}$$

where effect size i in contrast j is modeled as a function of the intercept (π0j), which represents the average (covariate-adjusted) effect size for contrast j, independent variables measured at the effect-size level (π1jx1ij + … + πkjxkij) and a within-contrast error term (eij). The level-2 equation (contrast-level) models the intercept as a function of the grand mean effect size (β00), independent variables measured at the contrast level (β01x1j + … + β0pxpj), and a between-contrast random error term (u0j):

$$(2)\ \pi_{0j} = \beta_{00} + \beta_{01}x_{1j} + \ldots + \beta_{0p}x_{pj+}\ u_{0j.}$$

This "mixed-effects" model, which can also be expressed in one equation by substituting (2) into (1), assumes there are two sources of variation in the effect-size distribution, beyond subject-level sampling error: 1) the "fixed" effects of effect-size and contrast-level variables that measure key features of the program design, contrast-level study methods, effect-size characteristics, and other covariates; and 2) remaining "random" unmeasured sources of variation between (u0j) and within contrasts (eij), which are assumed to be homogeneous both within and between model levels. We conducted our analyses in SAS, using the PROC MIXED procedure.

For each research question, and for each of the two domains of children's development within a research question, we first evaluated the relation between effect size and our question predictors, and then added two sets of covariates: program characteristics and study design characteristics. The addition of covariates allows us to control for some of the variation in program design, study quality, and dependent measure characteristics that may relate to different effects, thereby more precisely estimating the relationship between each predictor and effect sizes. We display the results of these regressions in Tables 2–4 and discuss them below. In addition, for reference we include the unweighted mean effect sizes for our predictor variable categories in Table 1 above.

Table 2

Children's Cognitive and Pre-academic Skills in Early Childhood Education Programs That Did and Did Not Provide Parenting Education of Any Type

	Cognitive skills Effect size n=321, Contrast n=60		Pre-academic skills Effect size n=124, Contrast n=37	
	No covariates	With covariates	No covariates	With covariates
Any parenting education	0.017 (0.087)	-0.052 (0.097)	-0.015 (0.100)	0.014 (0.128)
Program offered home visits		0.047 (0.094)		0.103 (0.122)
High-quality study index		-0.035 (0.049)		-0.093 (0.079)
Active comparison group		-0.096 (0.129)		-0.313~ (0.184)
Program length		0.009 (0.005)		0.005 (0.008)
Peer-refereed publication		0.161~ (0.091)		.0.000 (0.114)
Intercept	0.236 *** (0.077)	0.321* (0.132)	0.244* (0.086)	0.306 (0.185)
Random effects:	0.05 0.31	0.04 0.31	0.06 0.42	0.06 0.42
ICC	0.14	0.11	0.13	0.13

Two-sided test: ~p<0.1, *p<0.05, **p<0.01. ***p<0.001. *Note: coefficients for missing data dummy variables are not displayed.*

Table 3

Children's Cognitive and Pre-academic Skills in Early Childhood Education Programs That Did and Did Not Provide Parenting Education with Modeling or Opportunities for Practice

	Cognitive skills Effect size n=321, Contrast n=60		Pre-academic skills Effect size n=124, Contrast n=37	
	No covariates	With covariates	No covariates	With covariates
Parenting education with modeling (parent education without modeling as the reference category)	0.083 (0.095)	0.023 (0.116)	0.223~ (0.132)	0.145 (0.145)
No parenting education (parent education without modeling as the reference category)	-0.042 (0.093)	0.017 (0.116)	0.086 (0.112)	0.042 (0.167)
Program offered home visits		0.044 (0.095)		0.089 (0.155)
Study quality index		-0.027 (0.049)		-0.033 (0.083)
Active comparison group		-0.100 (0.133)		-0.245 (0.197)
Program length		0.009 (0.006)		0.006 (0.008)
Peer-refereed publication		0.161~ (0.091)		-0.006 (0.117)
Intercept	0.293*** (0.041)	0.253* (0.114)	0.164* (0.076)	0.273 (0.176)
Random effects:	0.05 0.31	0.05 0.31	0.06 0.41	0.06 0.42
ICC	0.14	0.114	0.13	0.13

Two-sided test: ~p<0.1, *p<0.05, **p<0.01. ***p<0.001. *Note: coefficients for missing data dummy variables are not displayed.*

Table 4
Children's Cognitive and Pre-Academic Skills in Early Childhood Education Programs That Did and Did Not Provide One or More Home Visits per Month

	Cognitive skills Effect size n=115, Contrast n=16		Pre-academic skills Effect size n=68, Contrast n=14	
	No covariates	With covariates	No covariates	With covariates
Intensive home visiting (1 or more per month)	0.300** (0.083)	0.300* (0.124)	0.420~ (0.200)	0.294 (0.282)
High-quality study index		-0.073 (0.050)		0.058 (0.128)
Active comparison group		0.013 (0.110)		-0.344 (0.249)
Program length		-0.002 (0.006)		0.002 (0.018)
Peer-refereed publication		0.167~ (0.010)		-0.119 (0.140)
Intercept	0.206 *** (0.045)	0.284** (0.060)	0.130 (0.110)	0.284 (0.194)
Random effects:	0.01 0.23	0.01 0.23	0.10 0.27	0.10 0.28
ICC	0.04	0.04	0.27	0.26

Two-sided test: ~p<0.1, *p<0.05, **p<0.01, ***p<0.001. *Note: coefficients for missing data dummy variables are not displayed.*

3. Results

Results presented in Table 2 show that the addition of general parenting education was not associated with program impacts on children's cognitive or pre-academic skills. This finding is consistent across estimation models with and without the covariates.

Bivariate analyses indicated a positive association between parenting education with modeling or opportunities for practice and effect sizes for measures of pre-academic skills that approached statistical significance (see Table 2, ES =+ 0. 22 (0. 13), p < .10). Associations between parenting education with modeling or opportunities for practice and effect sizes were smaller, and not statistically significant for measures of cognitive skills ES =+0.08 (0. 10). When we added the full set of program and study design covariates to the models, the point estimates were smaller in magnitude for both cognitive skills ES =+0.02 (0.12) and pre-academic skills ES =+0.15 (0.15), and not statistically significant.

Preschool programs that provided frequent parenting education through home visits (defined as one or more home visits per month) yielded larger effects sizes when compared with preschool programs that provided low-frequency home visiting (less than one per month). As

shown in Table 4, we observed statistically significant associations between the provision of frequent parenting education and effect sizes for measures of cognitive skills in bivariate (ES =+0.30 (0.08)) and controlled models (ES =+0.30 (0.12)). Associations between high-frequency parenting education and effect sizes for pre-academic skills approached statistical significance in bivariate models but were non-significant in models with covariates.

3.1. Robustness Checks

To ensure that other program and study characteristics did not mask significant relationships between aspects of the parenting education programs reviewed and children's cognitive and pre-academic outcomes, we ran a number of sensitivity checks.

3.1.1 Length of Follow-Up

We were concerned that by including outcome measures taken up to a year after program completion we might be including effect sizes that were smaller than those taken directly at the end of program completion. However, when we limited the sample to those measures taken within three months, we found similar results

3.1.2 Reliability of Outcome Measurement

We were concerned that effect sizes might be more varied for programs with less reliable outcome measures, thereby creating a larger standard error and smaller effect sizes, or that impacts might vary across different subcategories of measures (such as literacy outcomes). Follow-up analyses analyzing effect sizes from only standardized measures or measures of IQ did not show substantially different findings.

3.1.3 Other Services for Parents

Preschool programs that provided parenting education with modeling frequently provided other types of family support services as well. For example, in our sample, 42% of the programs that offered parenting education with modeling also offered some form of parent human capital development; 36% helped parents access additional services through referrals; and 32% offered parents some direct material support. Because of the substantial overlap of additional types of family support offered by preschool programs in our sample, we could not fully control for the presence of these other family support services in our analyses of parenting education with modeling. In our primary analyses, we therefore did not consider information on the addition of these other parent-support services. Instead, we conducted separate parallel analyses examining whether the addition of each of these other types of parent-focused services (human capital development, referrals, and material resources) to preschool was related to larger or smaller effect sizes on children's pre-academic and cognitive skills when comparing such programs with preschool programs that did not offer that particular service. None of these additional services showed a significant added effect.

3.1.4 Time of study

Prior meta-analytic work indicates that the overall impacts of early care and education programs from studies that began before 1980 were, on average, stronger than those from studies that began after 1980 (Authors, 2013). The program components we investigate in this study were substantially more common in preschool programs from this earlier time period. For example, in the pre-academic skills domain, 83 percent of the effect sizes from programs that provided parenting education with modeling or opportunities for practice were from studies that were conducted prior to 1980. By contrast, just 23 percent of effect sizes from programs that did not provide parenting education with modeling or opportunities for practice were from studies that were conducted prior to 1980. Similarly, in the cognitive skills domain, 94 percent of the effect sizes from programs that provided one or more home visits per month were conducted prior to 1980 compared to 55 percent of the effect sizes from programs that did not offer one or more home visit per month. It is therefore possible that the observed positive relationships between program impacts and both parenting education with modeling and one or more home visits per month may be attributable to differences in program impacts over time.

4. **We repeated our primary regression analyses limiting the sample to those studies conducted prior to 1980 (cognitive skills n=158, pre-academic skills n=48). We did not observe significant associations between program impact and any of the examined additional services (parenting education of any type, parenting education with modeling or opportunities for practice, or one or more home visits per month) in either domain within this pre-1980 sample. There were not a sufficient number of observations to conduct analyses within a post-1980 sample. Discussion**

Over the past 50 years, many preschool programs have provided some form of parenting education in addition to direct services for children. The rationale for this emphasis is that parenting behaviors, particularly cognitive stimulation and responsiveness or sensitivity, are consistently and strongly associated with children's early cognitive development and later school success (Cristofaro & Tamis-LeMonda, 2012; Landry, Smith, & Swank, 2006). By targeting both parenting behaviors and early learning directly through center-based preschool, the addition of parenting education is hypothesized to be more powerful in improving learning trajectories, particularly for low-income children at greater risk of school failure, than either single-generation approach on its own (Chase-Lansdale & Brooks-Gunn, 2014; Lombardi, et al., 2014).

That said, the added impacts of different types and frequencies of parenting education supports in preschool programs have not been documented through meta-analysis. In this study, using a comprehensive meta-analytic database of 445 effect sizes and 70 contrasts (specific group comparisons) within 46 preschool evaluations, we demonstrate that not all parenting education programs are effective at improving children's cognitive and pre-academic outcomes.

The results of the present study call into question some longstanding, generalized claims about the additional benefits of including some form of parenting education in preschool programs, while adding more information about how the frequency of parenting services may produce differential program impacts. To begin with, these analyses found no differences in program impacts on short-term measures of children's cognitive or pre-academic skills between preschool programs that did and did not provide some form of parenting education. Changing parent behaviors is challenging, and these findings suggest that, on average, the approaches that early childhood programs use to reach parents and attempt to change aspects of their parenting approaches may not provide added value for the development of children's cognitive and pre-academic skills. In part, this may be the result of the low level of attention typically directed toward the parenting education component. In this sample, most parenting education was provided through one or two home visits a year and/or in a small number of group classes, often focused on general topics that parents

identified as being of interest. These programs may need to be more frequent to produce meaningful changes in parents' behavior that are sustained in daily home interactions.

The one significant relationship that we found substantiates this hypothesis. When parenting education was provided through one or more home visits a month, the effect sizes for cognitive outcomes were significantly larger than for programs that provided lower dosages of home visits (an added impact of 0.28 SD in the model with full covariates, or roughly a doubling of the effect of preschool alone on these outcomes). This finding of the potential added benefits of home visiting in the context of pre-kindergarten programs is consistent with recent work by Walters (2014) using the Head Start Impact study, which found that Head Start centers that offered more than three home visits per year produced stronger impacts on children's behaviors and attention. In addition, Sweet and Appelbaum (2004) found that both the number of home visits and length of those visits were associated with stronger program impacts on children's cognitive skills. That meta-analysis, however, did not distinguish home visiting programs in the context of preschool versus stand-alone home visiting.

Home visiting frequency of at least once a month may be effective in augmenting child outcomes for several reasons. First, such frequency may facilitate the development of more-positive rapport and trust in the relationship between the home visitor and parent. Research on home visiting quality suggests that this rapport is associated with more positive effects (Roggman, Boyce, Cook, & Jump, 2001). Second, it simply may take more than a few contacts to change parents' behavior sufficiently to influence children's cognitive and achievement outcomes. A recent set of successful coaching interventions designed to improve preschool teachers' instructional behaviors have generally offered coaching at least once a month (see Yoshikawa et al., 2013 for a review). Although we were only able to analyze frequency of parenting education among programs that provided home visiting, our results suggest that fairly high-frequency parenting education may be necessary to produce the changes in parenting behaviors that might be expected to lead to improvements in children's cognitive outcomes.

Additionally, we hypothesized that programs that engaged parents in active learning, through opportunities to observe and practice particular parenting skills, might have greater child impacts than those that did not attempt to change parental behavior in such a systematic way. Although most of the findings from this analysis did not reach conventional levels of statistical significance, the results suggest that further investigation of this hypothesis is warranted. For example, programs that provided modeling or practice showed larger impacts on young children's pre-academic skills in reading and math (an added effect, on average, of + = 0. 22 ($p<.10$) in bivariate models, and + = 0. 15 (ns) in models with covariates), when compared with preschool programs that did not provide this type of active parenting education. Moreover, active learning for parents was an important component of nearly all of

the high-intensity home visiting efforts, making it impossible to fully disentangle the effects of visit frequency versus the inclusion of active learning or play in shaping children's outcomes. The lack of precision in these estimates cautions against drawing strong conclusions. However, future research should explore whether parenting education with modeling and opportunities for practice is more effective in preschool contexts than parenting education that focuses largely on providing information.

4.1. Limitations

Although this paper is based on a rich meta-analytic database that encompasses almost 50 years of program evaluations, there are limitations to the conclusions we can draw from the findings. First, our analytic framework does not permit us to make causal inferences regarding the impact on children's cognitive and pre-academic skills as a result of the addition of parenting education to an early childhood program. The preschool programs included in our study were not randomly assigned to either include or not include parenting education with modeling or opportunities for practice. Although our analyses permit us to control for many salient characteristics of the programs, some unobserved variable(s) may be responsible for the observed differences. The results of this study should therefore be viewed as correlational rather than causal.

Second, our meta-analysis focuses only on preschool programs in the United States with relatively rigorous evaluations, and thus our sample may not be representative of the overall field or of all preschool programs with added parenting education.

Third, these analyses focused only on the development of children's pre-academic and cognitive skills. It is possible that the addition parenting education to preschool programs might have positive impacts on other important early skills such as such as specific parenting behaviors, for which there was not sufficient statistical power to examine in the current study

Fourth, the current database did not include enough long-term follow-up studies to examine our research questions separately for longer-term impacts. More longitudinal studies are needed in the preschool field to determine, for example, the sustainability of the added effects of high-frequency home visiting.

Fifth, the landscape of U. S early childhood programs has changed dramatically since the 1960s, and children served in the early decades may have differed in important ways from children enrolled in early childhood programs in the 1990s and 2000s. For example, comparison groups in more recent studies had access to a wider range of alternative services (Author, 2016). When possible, we controlled for several demographic variables and research design characteristics in our analyses, but due to a paucity of data we were unable to control for several population characteristics (e.g., parent education and family structure) that might have accounted for changes in study samples over time. Preschool programs that

provided parenting education and modeling and those that provided one or more home visits per month were more common among those studies that were conducted prior to 1980. It is therefore possible that some of the observed positive associations between these program features and impacts on children may be attribute to differences in the counterfactual for older and more recent studies.

Finally, this study examines the impact of parenting education in addition to child-focused preschool only. Although we did not find a significant effect for simply providing information or advice on parenting, positive impacts of these services on young children's cognitive and pre-academic skills may have been masked by the effects of attending a preschool program. In the future we plan to apply our meta-analytic codes to a similar sample of studies that provided families with support in the absence of preschool. Many models of parenting education, including those that focus on young children with conduct problems, are provided in this way.

4.2. Conclusion

The implications of these findings for policymakers and practitioners are reflected in two complementary perspectives on the role of parent involvement in early education programs for three- and four-year-old children from low-income families. First, there is little evidence that a short course of parenting classes that provide information about child development, or one to two home visits per year, produce measurable gains in child cognitive or pre-academic skills above and beyond the effects of direct preschool experiences. Alternatively, more-intensive interventions through one or more home visits per month (in contrast to less frequent interactions between program staff and parents), and that include active learning for parents, were associated with substantially larger positive impacts of preschool programs on children's cognitive performance. This latter finding is particularly worthy of serious consideration for children who exhibit limited gains from early education alone.

The core question about the added value of an active learning experience for parents within an early childhood education program for three- and four-year-old children is particularly striking in view of the dramatic child impacts (both short- and long-term) achieved by the Perry Preschool Project (Schweinhart et. al., 2005). Although the differential influences of its multiple program components on child outcomes were not analyzed separately, the Perry program included weekly (or biweekly) home visits by highly trained teachers, who provided parent coaching linked to the child-focused classroom curriculum over the full length of the intervention period. The extent to which this highly interactive, high-frequency, "parenting education" dimension augmented the effects of the center-based program experience for children on their cognitive and pre-academic skills is an important question that has not yet been investigated in a sufficiently rigorous way. In order for future research in this area to be relevant for policymakers and practitioners, researchers must ensure greater precision in

defining the actual intervention and measuring the fidelity of its implementation, as well as conduct rigorous measurement of key mediators, moderators, and outcomes embedded in well-articulated theories of change that specify the links between explicit parent and child variables.

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[*] Indicates the sources of the effect size data.

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Appendix: Preschool Programs That Include Parenting Education with Modeling/Opportunities to Practice

Program Name	Program Description	Dosage of Parent Education	Modeling/Practice Opportunities	Year Begun
Early Training Project	Ten-week summer preschool program followed up by weekly home visits during school year. Teachers and visitors were mature black women, and the program targeted poor, African-American children.	Treatment groups received two and three summers of preschool (10 weeks each) respectively. Families also received two visits every one to two months during the school year.	Home visits focused on teaching the mother to engage in cognitively stimulating ways with the child, and visitors often role-played activities with the mother (with the visitor playing the part of the child).	1962
Even Start	Targeted families with very low literacy levels, and provided early childhood education (generally through Head Start), parenting education, adult education (includes literacy training), and parent-child joint literacy activities. Screenings and referrals were a large part of the program.	Eight months of program participation were evaluated. Families received a home visit every three weeks, and took part in parent classes once a week, on average.	The parent-child joint literacy activities were designed to support parents in learning to work with their child. These activities took place during home visits or in the classroom, depending on the program. Typically, parents read to children or worked with letters or numbers with their child.	1991, 1999
Home Oriented Preschool Education (HOPE)	Targeted rural families with a combination of TV show, weekly home visits, and group socialization time provided by a paraprofessional. Some referrals made as well.	Program ran for three years. Families in the full treatment condition received one visit and two hours of preschool a week, in addition to a half hour daily of television programming.	Provided activities to reinforce learning from the TV show. Visitor modeled these when necessary.	1968
Home Start Iowa	Home visits, parent groups, and referrals to community services were provided, with monthly children's socialization groups and parent education groups. Pre-kindergarten provided to four-year-olds.	Families participated in the program for three years. Weekly home visits and monthly group socialization opportunities and parent education groups were provided. A year of preschool was provided to four-year-olds.	Visitors spent one third of the visit working with the parent and child (the other two-thirds were with the child first and then the parent). The visitor introduced activities for the parent and child to do together.	1968

Program Name	Program Description	Dosage of Parent Education	Modeling/Practice Opportunities	Year Begun
Howard University Preschool Program	Preschool provided to children for two years. An adult worker provided group activities and individual contacts with parents to support their engagement with the school and understanding of effective ways to interact with their child, as well as engage them community-building activities.	Two years of preschool provided to children. Weekly parent meetings were scheduled, although it is not clear how much time during these meetings was devoted to observation of the classroom. Parents also varied in their attendance.	Individual contacts were often held at the school, during which parents would observe their child in the classroom (through a one-way mirror), and the adult worker would discuss what was happening.	1964
Planned Variation in Head Start	Planned Variation assessed a variety of approaches in Head Start, ranging from constructivist to behaviorist curricula, and including different types of parent involvement efforts.	A year of Head Start programming was evaluated. Programs varied widely in the services provided.	One of the programs trained parents to work in the classroom, while another used paraprofessional home visitors to provide instruction to the mother in using activities from school.	1969
The Perry Preschool	High-quality preschool provided, with an effort to engage parents. Teachers provided home visits to families.	The program was offered to children for two years. Families received weekly home visits.	Later visits focused on engaging the mother as a teacher of her child, and visitors modeled activities from the school curriculum.	1962

Highlights

- Comprehensive meta-analysis of U.S center-based preschool programs
- Examine the added benefits of parenting education programs provided through preschool programs
- Suggestive evidence that programs that provide parents with opportunities to practice parenting skills and/or those that offered a greater intensity of parenting education are associated with greater short-term impacts on children.