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Enriching Preschool Classrooms and Home Visits with Evidence-Based Programming: Sustained Benefits for Low-Income Children

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Abstract

Background—Growing up in poverty undermines healthy development, producing disparities in the cognitive and social-emotional skills that support early learning and mental health. Preschool and home-visiting interventions for low-income children have the potential to build early cognitive and social-emotional skills, reducing the disparities in school readiness that perpetuate the cycle of poverty. However, longitudinal research suggests that the gains low-income children make during preschool interventions often fade at school entry and disappear by early elementary school.

Methods—In an effort to improve the benefits for low-income children, the REDI program enriched Head Start preschool classrooms (study one) and home visits (study two) with evidence-based programming, documenting positive intervention effects in two randomized trials. In the present study, REDI participants were followed longitudinally, to evaluate the sustained impact of the classroom and home-visiting enrichments three years later, when children were in second grade. The combined sample included 556 children (55% European American, 25% African American, 19% Latino; 49% male); 288 children received the classroom intervention, 105 children received the classroom intervention plus the home-visiting intervention, and 173 children received usual practice Head Start.

Results—The classroom intervention led to sustained benefits in social-emotional skills, improving second grade classroom participation, student-teacher relationships, social competence, and peer relations. The coordinated home-visiting intervention produced additional benefits in child mental health (perceived social competence and peer relations) and cognitive skills (reading skills, academic performance). Significant effects ranged from 25% to 48% of a standard deviation, representing important effects of small to moderate magnitude relative to usual practice Head Start.

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Conclusions—Preschool classroom and home-visiting programs for low-income children can be improved with the use of evidence-based programming, reducing disparities and promoting complementary benefits that sustain in elementary school.

Keywords

Early intervention; Evidence-based programming; longitudinal follow-up

Introduction

Children who grow up in poverty often exhibit delays in academic and social-emotional school readiness that undermine their school progress at kindergarten entry and initiate a life-long trajectory of underachievement and underemployment (Coughlan et al., 2009; Ryan, Fauth, & Brooks-Gunn, 2006). Delays in school readiness are part of a larger set of health disparities associated with low socioeconomic status (SES), which confers elevated risks in diverse areas of physical health (e.g., cardiovascular disease, arthritis, diabetes, cancer) and mental health (e.g., oppositional-aggressive behaviors, depressive and anxiety disorders) (Adler & Newman, 2002; Winkleby, Cubbin & Ahn, 2006).

Remediating delays in school readiness may be highly strategic for public health if early interventions can leverage upward socio-economic mobility, thereby reducing exposure to adversity and improving quality of adult life, health, and well-being (Sammons et al., 2004; Ritsher et al. 2001). Indeed, past research on model preschool programs in the United States (US) and United Kingdom (UK) suggests that promoting school readiness can produce long-term benefits for children, including improved achievement, higher rates of high school graduation, fewer crimes, and better employment outcomes (Campbell et al. 2008; Coughlan et al., 2009; Schweinhart et al., 2005).

A key limitation of the existing data base on the long term benefits of high-quality preschool, however, is a reliance on longitudinal studies that were initiated a half-century ago, when the context of early childhood was quite different than it is today. For example, preschool attendance was much less common, and the effects of intensive model preschool programs were typically compared with home care. In America, almost 70% of all four-year-old children now attend some type of center-based early learning program, and in other developed countries such as the UK, Australia, and Japan, pre-kindergarten attendance is nearly universal (Herman, Post, & O'Halloran, 2013; Melhuish & Petrogiannis, 2006). In this current context, longitudinal studies comparing enriched preschool to no preschool are less relevant; instead, research is needed to identify preschool characteristics that optimize long-term benefits for economically-disadvantaged children (Belsky & Melhuish, 2007; Duncan & Magnuson, 2013). For programs serving low-income children, this need is particularly keen. The recent randomized-controlled impact study of Head Start, the federally-sponsored preschool program for low-income children in the US, showed few sustained benefits for children after they transitioned into elementary school (Puma et al., 2012), raising questions about the cost-effectiveness of the federal investment. Similarly, recent evaluations of Sure Start, the largest early childhood program in the UK have demonstrated mixed findings, with benefits evident in areas of social development and

health, but not language skills (Belsky & Melhuish, 2007). These studies suggest that more work is needed to document the kinds of preschool programs and practices that offer the most promise for reducing the socio-economic achievement gap by promoting sustained school benefits.

One promising strategy for increasing the impact and sustained effects of early learning programs for low-income children involves enriching preschool classrooms with evidence-based curricula that build skills progressively in specific learning domains, and providing teachers with professional development support for the effective implementation of those curricula (Yoshikawa et al., 2013). This was the approach taken by the REDI classroom program (REDI-C), which used the Preschool PATHS (Promoting Alternative Thinking Strategies) curriculum (Domitrovich, Cortes, & Greenberg, 2007) to promote child social-emotional skills (e.g., emotional understanding, prosocial skills, intentional self-control, and social problem-solving skills). REDI-C also included three curriculum components with demonstrated efficacy for building language and emergent literacy skills: interactive reading to build oral language skills (Wasik, Bond, & Hindman, 2006), sound games to promote phonological awareness (Adams, Foorman, Lundberg, & Beeler, 1998), and alphabet center activities to foster letter knowledge (Lonigan, 2006). Lessons in each domain were organized sequentially to support learning progressions, moving systematically from basic to more complex skills throughout the year.

In the first trial, 25 Head Start centers with 44 classrooms were randomly assigned to REDI-C or usual practice Head Start, and 356 Head Start children were followed as they transitioned into elementary school. At the end of the Head Start year, REDI-C produced significant gains in child vocabulary ($d = .15$), emergent literacy skills ($d = .16$ to $.39$), emotional understanding and social problem-solving skills ($d = .21$ to $.35$), learning engagement ($d = .29$), and reduced aggression ($d = .28$; Bierman et al., 2008). Significant effects in the social-emotional domain were sustained after children transitioned into kindergarten, evident in areas of social problem-solving skills ($d = .40$), teacher-rated learning behaviors ($d = .28$), and reduced teacher- and parent-rated aggression ($d = .22$ to $.26$; Bierman et al., 2014).

Next, evidence-based materials complementing REDI-C were designed for parents to use at home. Four years after the first study, a second randomized trial tested the REDI-Parent program (REDI-P), by recruiting 200 children and parents from Head Start classrooms using REDI-C. Families were randomly assigned to receive REDI-P home visits or alternative learning activities in a different domain delivered via mail (the control condition). In an intervention designed to coordinate with and complement the classroom program, REDI-P parents were taught how to implement interactive reading and use literacy-based play and learning games at home. They also received coaching in caregiving behaviors associated with the development of children's learning and self-control (Bierman et al., 2015). Relative to children who received REDI-C only, children who received REDI-C and REDI-P showed significantly better early literacy skills at post-intervention assessments in kindergarten ($d = .25$), and were rated more positively by their kindergarten teachers on measures of academic performance ($d = .28$), self-directed learning ($d = .29$), and social competence ($d = .28$).

This study tested for sustained effects in second grade, three years after children made the transition into elementary school. To better understand the relative contributions of classroom and home-visiting program enrichments to children's sustained gains, the samples from the two REDI randomized trials were combined. The present study had two goals: 1) to evaluate the sustained impact of the REDI-C program on child outcomes in second grade relative to usual practice Head Start, and 2) to evaluate the sustained impact of adding the REDI-P parent program to REDI-C, compared to the REDI-C classroom program alone.

Methods

Participants

The combined sample of the two randomized-controlled trials included 556 children (55% European American, 25% African American, 19% Latino; 49% male; 4.48 years old on average [$SD = .30$] at the start of pre-kindergarten). Families were low-income (median annual income = \$16,800; 38% single parents), recruited from Head Start centers in three counties in Pennsylvania. Half of the participating classrooms came from a large, fairly densely populated county in the southeastern part of the state, which included an urban community surrounded by smaller communities. The other classrooms came from two smaller counties in the central part of the state, characterized by small towns and rural areas. All parents provided signed informed consent and all research procedures were approved by the institutional review board of the Pennsylvania State University.

In both trials, letters describing the study were sent to parents of all 4- and 5-year-old children in Head Start who were eligible to start kindergarten the following year. In the first trial, all program activities took place at school. There were 412 potentially eligible children; 398 families agreed to participate in the study, and 356 families completed pre-intervention assessments and were randomized (by Head Start center) to Head Start with REDI-C (intervention) or usual practice Head Start (control). In the second trial, parents had to indicate an interest in using home learning materials and participate in a lottery to determine whether they received those learning materials via home visits (REDI-P intervention) or an alternative set of materials via mail (control group). There were 509 potentially eligible children; 299 families agreed to participate in the study, and 264 families were available for assessment. Given limitations in intervention delivery capacity, 200 were assessed and randomized (by child) to intervention (Head Start REDI-P plus REDI-C) or comparison groups (REDI-C alone; see Figure 1). Likely reflecting some selection effects in the second trial, the two samples showed some demographic differences in child sex (54% vs. 44% male), family income-to-needs ratio (.88 vs. 1.08), and parents with college degrees (2% vs. 4%).

To adjust for those differences, logistic regression was used to create propensity scores, using 44 covariates from the initial baseline assessment. Data from families in the second trial were weighted with transformations of those propensity scores, and the effectiveness of weighting was evaluated by examining the standardized mean differences of the 44 covariates, which were equivalent across the two samples (within 0.2 standard deviations), reflecting an effective statistical control for selection factors that differed across the two

phonemes), and 3) a set of activities and materials to use in their print centers to promote acquisition of letter names and related print concepts. In addition to curriculum guides and activities, teachers were coached in the use of positive classroom management practices to promote children's self-control (e.g., positive support, emotion coaching, problem-solving dialogue), and strategies to enrich classroom language (e.g., using rich vocabulary, expansions, and questions).

To strengthen the impact of the classroom program, REDI-P was designed to increase parent support for learning at home as children navigated the transition into kindergarten. Visits followed a well-specified manualized curriculum, coordinated with the REDI-C curriculum and targeting the same two domains of child social-emotional and language-literacy skills. To support social-emotional skill development, the REDI-P home learning curriculum included Preschool PATHS activities, such as compliment lists and the use of feelings faces, as well as interactive stories for parents to read with their children featuring Preschool PATHS characters and teaching basic social-emotional skill concepts. REDI-P also provided parents with learning games and pretend play activities that taught letters and letter-sound recognition. These learning games were sequenced developmentally, and adjusted to child skill levels, to help children progress from naming letters to recognizing letter-sound associations, blending sounds, recognizing phonetic word families, and reading simple sight words. To make REDI-P materials accessible for parents with limited educations, activities were streamlined and ready-to-use, with embedded guidelines and illustrations that minimized literacy demands. In addition to providing learning materials, home visitors reviewed positive parenting strategies, emphasizing the provision of learning support, conversation, joint planning, and problem-solving dialogue. Three times during the program, home visitors videotaped the parent and child interacting with the learning materials, and reviewed these videotapes with parents to encourage optimal use. Parent participation was good, with parents receiving (on average) 12 of the 16 planned home visits ($SD = 5.48$, range = 0 – 16). Only a small number of families (13%) participated minimally, accepting 0-3 home visits. The present analyses are 'intent to treat' and include all families as randomized. (Additional information about the REDI-C and REDI-P interventions, implementation processes and fidelity are available in Bierman et al. 2008 and Bierman et al. 2015).

Measures

Across both of these trials, pre-intervention data were collected at the start of children's pre-kindergarten year in Head Start. Follow-up data on child outcomes were collected 3.5 years later, when children were finishing second grade. At each time point, trained research assistants visited schools, distributed rating forms to teachers, and conducted standardized child assessments during individual pull-out sessions. The research assistants who conducted assessments and second grade teachers who provided ratings were naïve concerning child intervention or control-group status.

Mental health outcomes included teacher ratings of social-emotional adjustment (classroom participation, learning behaviors, social competence, student-teacher relationship quality, peer problems) and child self-ratings (self-perceptions of social competence and peer

problems). Teachers rated classroom participation on the 14-item School Readiness Questionnaire (e.g., can work independently, has the self-control to do well in school; Bierman, Domitrovich et al., 2008, $\alpha = .96$), and they rated learning behaviors using an abbreviated 8-item version of the Learning Behaviors Scale (responds in a manner that shows attention; accepts new tasks without resistance; McDermott, Green, Francis, & Stott, 1999; $\alpha = .83$). Teachers also completed the Social Competence Scale (Conduct Problems Prevention Research Group [CPPRG], 1995), which included prosocial behaviors (e.g., sharing, helping) and emotion regulation (e.g., ability to calm down when upset), $\alpha = .94$. Teachers rated the quality of interpersonal relationships with adults using the Student–Teacher Relationship Scale, tapping closeness and conflict (Pianta, 2001, $\alpha = .92$), and the quality of peer problems using four items from the Excluded by Peers subscale of the Child Behavior Scale (disliked by classmates, left out, teased or picked on, Ladd & Profilet, 1996, $\alpha = .84$)

Child self-ratings reflecting mental health included their perceived social competence rated on 3 items from the Perceived Competence Scale for Children (have friends at school, get along with other kids at school, have kids to play with at school; Harter, 1982; $\alpha = .65$). They also reported on peer problems, using 3 items from the Loneliness Scale (Asher, Hymel, & Renshaw, 1984) and 2 items from the Friendship Questionnaire (Bierman & McCauley, 1987) to rate feeling lonely and left out, and whether they were teased or excluded by others, $\alpha = .67$.

Academic outcomes were assessed directly with three achievement tests of emergent literacy skills – the Letter-Word Identification scale of the Woodcock-Johnson Tests of Achievement III – Revised (Woodcock, McGrew, & Mather, 2001, $\alpha = .83$), and Test of Word Reading Efficiency sight words and phonemic decoding scales (TOWRE; Torgesen, Wagner, & Rashotte, 1999, $\alpha = .83$ and $\alpha = .85$, respectively). In addition, teachers rated academic performance (reading and math skills). In the first study, they completed the Academic Success subscale of the Academic Performance Rating Scale (APR; DuPaul & Rapport, 1991), rating the grade level and quality of student reading/language arts skills, speaking skills, and written language arts work on 4 items ($\alpha = .90$), and rating the grade level and accuracy of student mathematics skills on 2 items ($\alpha = .75$). In the second study, teachers also completed the reading/language arts and mathematics subscales of the Academic Competence Evaluation Scales (ACES; DiPerna & Elliott, 2000), including 11 items rating different facets of children’s reading decoding and comprehension skills, as well as the quality of their written work which were combined with the APR reading items ($\alpha = .97$). The ACES also included 8 items rating different aspects of children’s mathematics skills (computation, measurement, mental math), which were combined with the APR math items ($\alpha = .97$).

Plan of analyses

Multiple imputation was used to estimate missing data (Schafer & Graham, 2002). Data were analyzed with regression equations, which included dummy variables representing intervention condition, and covariates representing child and family demographic characteristics (e.g., child sex, race, age, family income-to-needs ratio, single-parent status,

parental depression, and household organization), pre-intervention child functioning (e.g., vocabulary, non-verbal reasoning, executive functioning, aggression, and baseline scores of the outcome when available), and study design features (e.g., cohort, REDI trial). Two specific contrasts evaluated intervention effects: 1) REDI-C versus usual practice Head Start, and 2) REDI-C alone versus REDI-C plus REDI-P. Because all outcomes were standardized (mean = 0, SD = 1), the coefficients for these two contrasts reflect the difference in average predicted score for children in the different study conditions, as a proportion of a standard deviation, adjusted for all model covariates. Thus, they represent effect sizes.

Results

Intervention effects and group means for second grade outcomes are shown in Table 1. Mental health outcomes, shown in the top half, reveal that REDI-C (relative to usual practice) produced significant sustained benefits for students on four of the five teacher-rated measures (classroom participation, social competence, student-teacher relationships, and reduced peer problems) and near-significant benefits on the fifth measure (learning behaviors). Adding REDI-P to REDI-C had no additional effects beyond REDI-C alone on any of these teacher ratings. However, both REDI-C (relative to usual practice Head Start) and REDI-P plus REDI-C (relative to REDI-C alone) significantly enhanced children's perceptions of their social competence in second grade. REDI-P also reduced child perceptions of peer problems. Interestingly, there was a different pattern of intervention effects on the academic outcomes, shown in the bottom half of Table 1. Relative to usual practice Head Start, REDI-C did not produce significant effects on the second grade academic measures. In contrast, children who received REDI-P plus REDI-C, relative to those who received REDI-C alone, showed significantly higher second grade scores on three of the five academic measures (directly assessed sight words, teacher-rated reading and math skills) and nearly-significant benefits on a fourth measure (directly assessed letter-word identification). Only phonemic decoding showed no evidence of a REDI-P intervention effect in second grade. These complementary effects of REDI-C and REDI-P are illustrated in Figures 2 and 3, showing the effect size for REDI-C in light gray and the additional effect size for REDI-P in dark gray.

Discussion

REDI took advantage of the well-established infrastructure of Head Start and its capacity to reach children living in poverty, and enriched the classroom and home-visiting programs with evidence-based curriculum components and instructional support. REDI enrichments were coordinated across school and home contexts, and focused on strengthening both social-emotional and language-literacy skills at the transition into kindergarten. Three years after entering elementary school, when children were finishing second grade, sustained effects were evident, showing a distinctive and complementary pattern for the classroom and home-visiting program enhancements. Enriching the classroom produced sustained mental health benefits, including higher levels of classroom participation and social competence, and better interpersonal relationships with teachers and peers than children who received usual practice Head Start. Enriching home visits in ways that were synchronized with the classroom intervention led to additional improvements in children's academic performance

and mental health, namely self-perceived social competence and peer problems, in second grade. These findings are consistent with the REDI-C and REDI-P outcomes in kindergarten, when each trial was analyzed separately (Bierman et al., 2014; Bierman et al., 2015). The present study confirms that this pattern of complementary benefits was sustained three years after intervention, and evident when the two samples were combined for direct comparison of the REDI-C and REDI-P effects.

REDI-C placed a heavy emphasis on building children's social-emotional skills, based on research linking poverty with delays in the social-emotional and behavioral aspects of school readiness (Coughlan et al., 2009; Duncan & Magnuson, 2013; Ryan et al., 2006). Developmental researchers postulate that the adversities associated with poverty (crowded living conditions; family instability; reduced social supports; unpredictable and negative life events) increase stress levels for both parents and young children, contributing to mental health problems that disproportionately burden low-income and minority families (Blair & Raver, 2012; Ritsher et al., 2001). Children growing up under conditions of socio-economic disadvantage are at considerably heightened risk for exposure to adverse events (Flouri, Tzavidis, & Kallis, 2010). During early childhood, exposure to adverse events and chronic stressors dysregulates the hypothalamic-pituitary adrenal (HPA) axis and undermines the development of executive functions and self-control, contributing to early difficulties in areas of attention, impulse-control, behavior problems, and social difficulties (Blair & Raver, 2012). To address these early mental health concerns, REDI-C enriched Head Start with the evidence-based Preschool PATHS program (Domitrovich et al., 2007), providing children with classroom support for the development of social skills, emotional understanding, and self-control. The REDI-C interactive reading program utilized books that reinforced the PATHS themes, providing an additional platform for classroom discussions of social issues and emotional concepts. Moreover, teachers were coached to use positive behavioral management strategies, emotion coaching, and problem-solving dialogue throughout the day to help children manage their feelings, focus their attention, and interact effectively.

Evidence that enriching Head Start can produce social-emotional gains that are sustained in elementary school is important, given the role that 'non-cognitive' skills (e.g., social skills and self-control) play in predicting positive adaptation and health over time (Heckman, 2006). Indeed, research on model programs, such as Perry Preschool, suggests that for children growing up in poverty, preschool may have its strongest impact on later well-being by boosting early learning engagement, social competence, and self-control, which are linked with later educational attainment, reduced risky behaviors, employment, and health (Heckman, 2006).

Interestingly, it was the home-visiting program, REDI-P, rather than the classroom program, that boosted child academic gains in second grade. Like many preschool programs serving low-income families, Head Start is committed to supporting parents. However, there is currently no evidence-based or standard curriculum to guide Head Start home-visiting services in preschool, nor prior research documenting 'value-added' for Head Start home-visiting in terms of boosting elementary school child outcomes. The present findings illustrate the value of providing parents with a home learning curriculum and encouraging evidence-based teaching practices at home, and document the power of such programming

to improve child academic outcomes in ways that extend beyond enriched classroom programming.

The positive impact of REDI-P on child academic outcomes may reflect several key innovations in program design. First, home learning materials were streamlined, focused on key school readiness skills, and organized in developmental sequence, adjusted to each child's skill level. These features created fun and efficient learning opportunities for parents and children. Second, the home learning curriculum was carefully coordinated and synchronized with the classroom curriculum. Parents were able to follow-through with skill concepts and activities introduced by teachers. This feature may have increased children's interest level in the materials, and it may have helped parents feel successful in the teaching role, thereby increasing the likelihood of future efforts. Third, REDI-P extended home visits at the critical juncture before and after children transitioned into kindergarten. The timing may have capitalized on parental motivation to engage in home learning activities to support their children's early school success. In addition, extending REDI-P through the fall of the kindergarten year provided continuity over the course of the school transition, thereby bridging the gap that typically separates Head Start programs from elementary school programs.

REDI-P also boosted children's feelings of well-being and efficacy, promoting gains in child self-ratings of their perceived social competence and peer relations. In the classroom, teachers were able to work with children directly on the behavioral skills needed for school success. However, because of parents' role as significant sources of emotional support, positive parent feedback may be uniquely important to build children's self-views of their adequacy and competence, in ways that go beyond the direct feedback they receive from teachers or peers in the classroom. It may also be that, by encouraging positive support and parent-child play, REDI-P strengthened the parent-child relationship in ways that improved attachment and felt-security, thereby facilitating children's stress regulation and capacity for learning (Bakermans-Kranenburg, van IJzendoorn, & Juffer, 2003).

Limitations and future directions

Given the study design, it is not possible to determine the specific mechanisms that account for the different patterns of sustained benefits across REDI-C and REDI-P; the discussion of those mechanisms remains speculative. Because the parent program was delivered only in combination with the classroom program, this study provides no insight into the possible effects of REDI-P if delivered alone without REDI-C, and the evaluation of REDI-P is limited because of the lack of a direct comparison with a no-treatment group. Finally, whereas most of the eligible children participated in the REDI-C trial, only 52% of the eligible parents agreed to participate in the lottery associated with the REDI-P study recruitment. Most of the parents who agreed and were randomized to the home-visiting intervention participated at a moderate to high level. Although case weighting was used to control for selection effects, it remains unknown whether the 48% of parents who did not elect to participate in REDI-P would have used the home learning materials under different recruitment conditions or whether the program would have had similar benefits for their children.

Several important steps for future research include investigation of whether the REDI interventions (particularly REDI-P) can be scaled up for wider use, and whether the findings replicate in different contexts. The generalizability of the program across countries needs to be examined, particularly in light of the recent failure to replicate another early childhood program (Nurse-Family Partnerships) in the UK, perhaps due to the more intensive early supports provided as ‘usual practice.’ In addition, the inclusion of widely-used measures, such as the Strengths and Difficulties Questionnaire, would aid comparison of impact with other studies. Finally, additional follow-up studies are needed to determine the long-term program impact.

Conclusions

Due to the notable increases in preschool attendance in the US and other countries over the last few decades and the growing prevalence of publicly-funded prekindergarten programs, it is of considerable importance to understand the types of preschool learning experiences that can optimize later school outcomes for low income children (Melhuish & Petrogiannis, 2006). This study suggests that enriching Head Start classroom and home-visiting programs with evidence-based curriculum components in the key areas of social-emotional and language-literacy skills can produce complementary and sustained benefits for children. Targeting early education to promote the well-being of children growing up in poverty is highly strategic; the hope is that the sustained gains found here in areas of language, self-control, and social engagement may leverage future benefits for children in domains as wide-ranging as educational attainment, employment, and reduced criminal activity (Duncan & Magnuson, 2013; Sammons et al., 2004; Yoshikawa et al., 2013).

The present findings extend the existing scientific literature documenting the value of high-quality early education in two ways. First, they show that the use of a systematic, evidence-based curriculum that combines a social-emotional and language-emergent literacy focus can increase the impact of Head Start in ways that sustain well into elementary school. Second, these findings document the value of enriching both classroom and home learning environments for low-income children.

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Key points

- Growing up in poverty impairs early learning, creating a gap in school readiness associated with life-long disparities in adjustment and attainment. Early interventions can close this gap, but benefits often fade in enter elementary school.
- The REDI intervention enriched preschool programs for low-income children with evidence-based components, increasing impact on social-emotional and cognitive skills in preschool. In this study, children were followed longitudinally for three years.
 - Benefits of the REDI classroom enrichments sustained on: classroom participation; student-teacher relationships; social competence; and peer relations.
 - Benefits of the REDI home-visiting enrichments sustained on: self-perceived competence; self-perceived peer relations; reading skills; and academic performance.
 - Enriching classrooms and home-visits with evidence-based components had lasting and complementary benefits for children, evident well after the transition into elementary school.

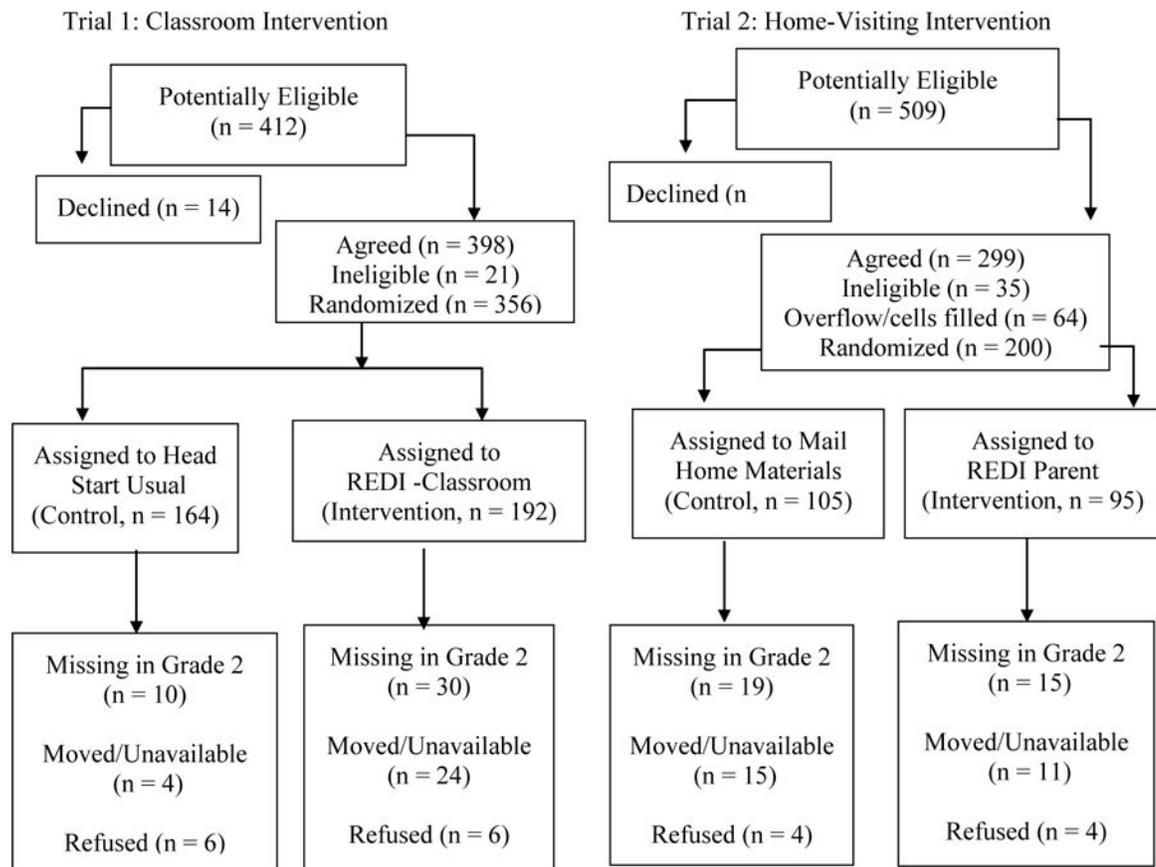


Figure 1.
Participant Flow Diagram

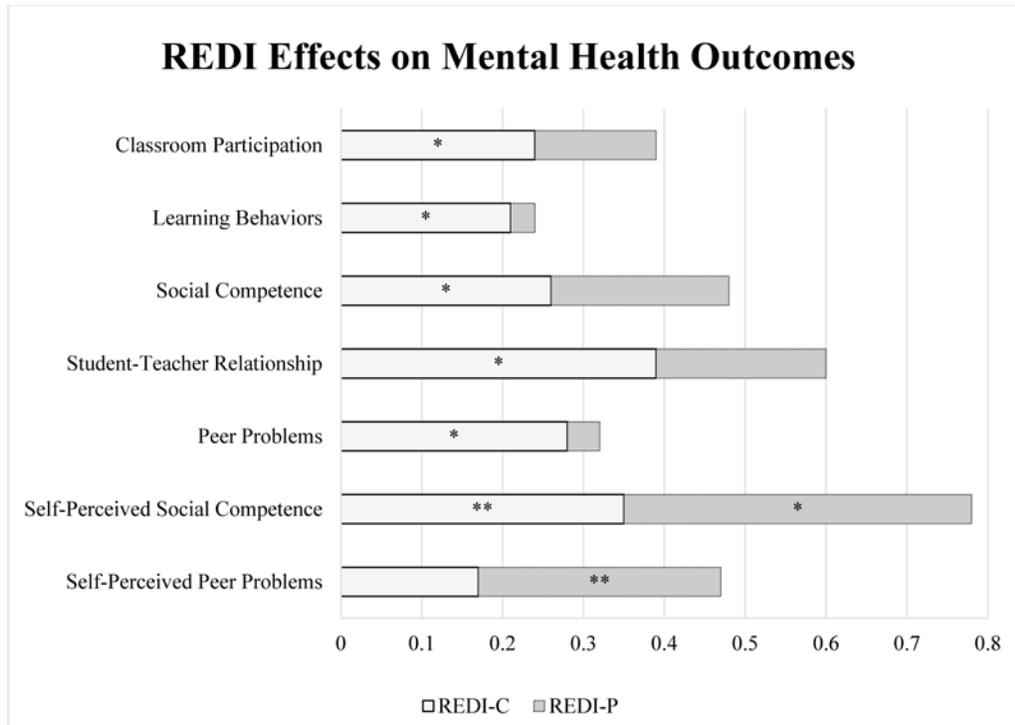


Figure 2. REDI-C and REDI-P Intervention Effects on Mental Health Outcomes

** $p < .01$, * $p < .05$, + $p < .10$

Note: In this figure only, values for Peer Problems and Self-Perceived Peer Problems have been reverse scored, so that the positive intervention effects represent a reduction in actual problems. Light gray bars show effects for REDI-C relative to ‘usual practice’ Head Start, with significant effects on all measures except for self-perceived peer problems. Dark gray bars show additional effects for REDI-P plus REDI-C relative to REDI-C only, with significant effects for self-perceptions.

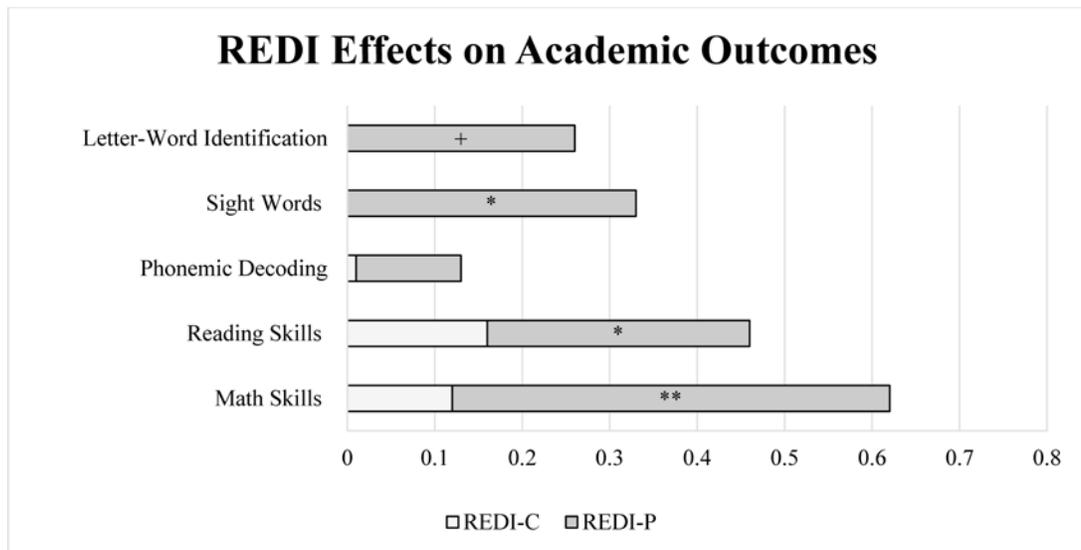


Figure 3. Additive REDI-C and REDI-P Intervention Effects on Academic Outcomes

** $p < .01$, * $p < .05$, + $p < .10$

Note: Light gray bars show effects for REDI-C relative to 'usual practice' Head Start, with no significant effects on these measures. Dark gray bars show additional effects for REDI-P plus REDI-C relative to REDI-C only, with significant effects for directly assessed sight words and teacher-rated reading and math skills.

Table 1

Group Means and Intervention Effects for Second-Grade Outcomes

Second Grade Outcomes	Group Means				Intervention Effects	
	Usual Practice	REDI-C Only	REDI-C & REDI-P	REDI-C Vs. Usual Practice	REDI-P & C Vs. REDI-C	
<u>Mental Health Outcomes</u>						
Classroom Participation	4.40	4.67	4.84	.24*	.15	
Learning Behaviors	1.41	1.50	1.51	.20 ⁺	.03	
Social Competence	4.03	4.29	4.52	.26*	.22	
Student-Teacher Relations	3.97	4.25	4.41	.39**	.21	
Peer Problems	2.00	1.78	1.81	-.28*	.04	
Perceived Social Competence	3.01	3.24	3.51	.35**	.43*	
Perceived Peer Problems	2.15	2.07	1.85	-.17	-.47**	
<u>Academic Outcomes</u>						
Letter-Word Identification	40.17	40.00	42.08	-.02	.26 ⁺	
Sight Word Reading	48.80	48.21	53.62	-.01	.33*	
Phonemic Decoding	20.48	20.54	21.85	.00	.12	
Reading Skills	3.05	3.20	3.49	.16	.30*	
Math Skills	3.44	3.54	3.98	.12	.50**	

Note: Means are adjusted for covariates.

** $p < .01$,

* $p < .05$,

⁺ $p < .10$