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CSRP's Impact on Low-Income Preschoolers' Preacademic Skills: Self-Regulation as a Mediating Mechanism

C. Cybele Raver,
New York University

Stephanie M. Jones,
Harvard University

Christine Li-Grining,
Loyola University Chicago

Fuhua Zhai,
Stony Brook University

Kristen Bub, and
Auburn University

Emily Pressler
The Penn State University

Abstract

Based on theoretically driven models, the Chicago School Readiness Project (CSRP) targeted low-income children's school readiness through the mediating mechanism of self-regulation. The CSRP is a multicomponent, cluster-randomized efficacy trial implemented in 35 Head Start–funded classrooms ($N = 602$ children). The analyses confirm that the CSRP improved low-income children's self-regulation skills (as indexed by attention/impulse control and executive function) from fall to spring of the Head Start year. Analyses also suggest significant benefits of CSRP for children's preacademic skills, as measured by vocabulary, letter-naming, and math skills. Partial support was found for improvement in children's self-regulation as a hypothesized mediator for children's gains in academic readiness. Implications for programs and policies that support young children's behavioral health and academic success are discussed.

Over the past 5 years, rates of poverty in the United States have risen, with 18% of our nation's children currently living in families earning less than \$22,000 a year (Douglas-Hall & Chau, 2008). Two decades of developmental and clinical research suggest that poverty poses significant threats to young children's emotional and behavioral development, as well as for their chances of school success (see Aber, Jones, & Cohen, 2000; Costello, Keeler, & Angold, 2001; Morales & Guerra, 2006). For example, while many low-income children maintain resilient profiles of school readiness with teachers and peers, others do not appear to fare as well. Past research suggests that young children who persistently exhibit dysregulated and disruptive behavior in the classroom have been less engaged and less positive about their role as learners, and have fewer opportunities for learning from peers

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Correspondence concerning this article should be addressed to C. Cybele Raver, Department of Applied Psychology, New York University, 246 Greene St., Room 403W, New York, NY 10003. Electronic mail may be sent to cybele.raver@nyu.edu.

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and teachers (Arnold et al., 2006; Raver, Garner, & Smith-Donald, 2007). These and other correlational findings provided compelling rationale for the Chicago School Readiness Project (CSRP), an emotionally and behaviorally focused classroom-based intervention designed to support low-income preschoolers' school readiness.

The CSRP is a multicomponent, cluster-randomized efficacy trial implemented in 35 Head Start–funded classrooms ($N = 602$ children). Based on theoretically driven models of behavioral processes in the contexts of economic disadvantage, the CSRP was designed to support low-income children's self-regulation and their opportunities to learn in early educational settings. The CSRP intervention built on existing community resources to support children's optimal development, providing teachers with extensive training and support on effectively managing children's dysregulated behavior. Importantly, the intervention did not provide services or training on teachers' language, preliteracy, or math instruction, nor were curricula provided to support children's language, letter-naming, or math skills. In this way, randomizing the CSRP intervention services to some Head Start programs and not others offered a valuable opportunity to detect whether it was possible to experimentally induce change in children's self-regulation, and consequently allowed for a conservative test of the *causal* role of children's emotional and behavioral competence for their academic achievement (see Raver, 2002).

Are children's self-regulatory skills the mechanism through which such an intervention would have benefits for children's preacademic skills? And what were the results of such an intervention? The present study addresses these questions as well as highlights the implications of our findings for programs and policies supporting the school readiness of young low-income children. In so doing, our study is part of an emerging area of research at the intersection of developmental psychology and prevention science, where findings from theoretically driven intervention studies offer the opportunity to examine the modifiability of children's emotional and behavioral processes while also providing tests of the efficacy of new program approaches.

The Modifiability of Self-Regulatory Skills and Their Potential Role in Supporting Children's Preacademic Skills

Converging lines of inquiry from social developmental and neurobehavioral literatures suggest that children enter schools with distinct profiles of emotional and behavioral regulation that appear to facilitate or hinder their engagement with other learners, teachers, and the process of learning (Blair, 2002; Bruce, Davis, & Gunnar, 2002; Fantuzzo et al., 2007; Raver et al., 2007). For the purposes of our study, we anchor our discussion of children's self-regulation in two ways. Because of its relevance to preschoolers' ability to engage with teachers and the learning process, we first consider self-regulation from a global perspective, examining the impact of a multicomponent classroom-based intervention on (1) preschoolers' ability to modulate their attention and impulsivity. To better understand the possible developmental mechanisms that may be at work, we also assess the impacts of the CSRP intervention on specific components of children's self-regulation, including (2a) their executive functioning (EF) and (2b) their effortful control (EC). Extant research on each of these approaches to children's self-regulation and opportunities for learning is briefly reviewed below.

Investigators in applied developmental research have long identified ways that some young children face significant behavioral hurdles of inattention and impulsivity and that this global dimension of self-regulatory difficulty may significantly limit some children's opportunities for learning from teachers and peers (Campbell, Shaw, & Gilliom, 2000; Webster-Stratton, Reid, & Stoolmiller, 2008). While much research suggests that children's

prone to inattention and impulsivity emerges as early as infancy, recent research suggests that children's self-regulation is shaped by early experience as well (Gunnar, 2003; Noble, Norman, & Farah, 2005). If an intervention were able to affect children's global self-regulatory skill by boosting their ability to inhibit impulsive behavior and to control their attention, such an intervention might also support children in being able to focus on learning, and perform more skillfully on assessments of preacademic material in classroom settings (McClelland et al., 2007; Ponitz, McClelland, Matthews, & Morrison, 2009; Raver, 2002).

What specific developmental component processes might underlie those potential changes in children's attention and impulsivity? Recent research on children's EF and EC offers two more fine-grained neurodevelopmental and biobehavioral "lenses" through which linkages between children's self-regulation and their opportunities for learning may be understood (Blair & Razza, 2007; Diamond & Taylor, 1996; Greenberg, Riggs, & Blair, 2007). EF has recently been defined as "interrelated cognitive abilities that are required when one must intentionally or deliberately hold information in mind, manage and integrate information, and resolve conflict or competition between stimulus representations and response options" (Blair & Ursache, in press). In EF assessments, young children are often given a challenging set of "games" or tasks where they must suppress the natural tendency to respond to the most obvious or salient characteristics of the stimuli in one way in order to comply to the experimenter's request to complete the task along a less obvious dimension, in another (Espy, Bull, Martin, & Stroup, 2006). For example, in the "peg-tapping" task, children are instructed to lightly tap a wooden dowel against the table top twice when the experimenter taps once, and once when the experimenter taps twice: Successful performance is dependent on children's ability to remember the rule and to suppress the tendency to mimic the experimenter (Blair & Razza, 2007). EF is thought to involve the child's prefrontal cortex, which provides a "top-down," organizing role that allows the child to marshal working memory to remember the "rules of the game," to shift attention to the new dimensions of the stimuli, and to exert inhibitory control in order to suppress the tendency to respond automatically and instead to provide the response that is called for (Blair & Urshache, in press; Carlson, 2005; Diamond, Kirkham, & Amso, 2002).

To handle routine classroom challenges, young children must not only exhibit the "top-down" cognitive control indicated by competent EF, but they must also be able to modulate their emotions and behavior from "the bottom up", indicated by competent EC (Blair & Ursache, in press, p. 9; Chang & Burns, 2005; Graziano, Reavis, Keane, & Calkins, 2007). EC is defined as the child's ability to inhibit a dominant response (such as grabbing a toy) to perform a subdominant response (such as turn taking) in response to demands of the situation (such as the classroom expectation that toys be shared with peers; Calkins & Fox, 2002; Rothbart & Bates, 1998; Rothbart, Sheese, & Posner, 2007). Tasks used to assess children's EC often involve delays of gratification, where children are faced with the temptation of an experimenter noisily wrapping a gift while also being asked not to "peek" (Smith-Donald, Raver, Hayes, & Richardson, 2007). Young children's biobehavioral tendency towards low versus high levels of EC is thought to involve the limbic system, and allows children to modulate their emotions, attention, and behavior in a range of frustrating or distressing classroom situations (Chang & Burns, 2005; Quas, Bauer, & Boyce, 2004; Raver, 2002). In support of these hypotheses, recent correlational research suggests that children with higher levels of self-regulatory skills show more proficient acquisition of math and language than do their more impulsive and inattentive peers (Blair & Razza, 2007; Bull, Espy, & Wiebe, 2008; Espy et al., 2004; Fantuzzo et al., 2007; Howse, Calkins, Anastopoulos, Keane, & Shelton, 2003; Kenney-Benson, Pomerantz, Ryan, & Patrick, 2006; McClelland et al., 2007; McWayne, Fantuzzo, & McDermott, 2004; Muller, Lieberman, Frye, & Zelazo, 2008; NICHD, 2003; Ponitz et al., 2009; Valiente, Lemery-Chalfant,

Swanson, & Reiser, 2008). In light of those findings, children's EF and EC have offered prevention scientists a highly promising target for intervention (Pears & Fisher, 2005; Riggs, Greenberg, Kusché, & Pentz, 2006). To review, the following study considers children's self-regulation across (1) global dimensions of children's attention/impulse control and specific component processes of (2a) EF and (2b) EC. Across these global and more fine-grained approaches, preliminary evidence suggests that young children's self-regulatory skills predict a substantial proportion of variance in concurrent assessments of academic performance, and significant (though smaller) proportions of variance in their acquisition of math and vocabulary skills over time (McClelland et al., 2007; Ponitz et al., 2009). Recent longitudinal findings by Duncan et al. (2007) across six large data sets yield evidence that is more mixed, with less convincing evidence of "crossover effects" of children's regulatory skills for their academic achievement, over time. The discrepancies in these sets of findings may have been due to a range of factors including greater precision in statistical modeling but less fine-grained measurements of children's EF and EC skills than have typically been used in lab-based studies (see Duncan et al., 2007, p. 1443). The following study addresses these discrepancies by employing an experimental paradigm that would allow for clearer grounds for causal inference while also utilizing direct assessments of preschoolers' self-regulation (including their attention/impulse control, their EF and their EC).

Intervention as a Solution to the Problems of Causal Inference

One challenge in examining the hypothesis that children's self-regulatory skills have benefits for their academic skills has been the intertwined and bidirectional nature of children's regulatory profiles and their opportunities for learning. For example, children with greater cognitive skills are better able to demonstrate optimal self-regulatory skills through planning, remembering rules, inhibiting impulses, and focusing their attention (Rothbart et al., 2007). Alternately, the covariances between children's self-regulatory and preacademic skills may likely be at least partially influenced by time-invariant individual and contextual variables that are often "omitted" from models. For example, individual differences in children's self-regulatory and academic skills might be jointly due to unmeasured environmental variables such as children's differential access to more versus less enriched ecological settings (see O'Connor & McCartney, 2007). As such, claims of the role of socioemotional competence for children's later academic achievement have recently received greater scrutiny (Duncan et al., 2007).

It is within this framework that cluster-randomized efficacy trials of interventions targeting children's self-regulatory skills could have a major impact to developmental science. First, interventions offer a means of directly testing whether children's self-regulatory skills (across both global dimensions of children's attention/impulsivity and specific neurocognitive dimensions of EF and EC) are environmentally modifiable, over short periods of time (Blair & Diamond, 2008). Second, we can test whether programmatic investments in children's self-regulatory skills yield additional cognitively oriented "payoffs" by supporting young children's academic skills (see Greenberg et al., 2007; Kellam, Ling, Merisca, Brown, & Ialongo, 1998, for further discussion). New evidence from several recently implemented preschool interventions is promising. For example, low-income children receiving the comprehensive preschool REDI (*Research-based, Developmentally Informed*) intervention designed to improve their socioemotional and preacademic skills were found to demonstrate stronger levels of self-regulation on a direct assessment of attention and impulsivity at post test, compared to low-income preschoolers in the control group (Bierman, Nix, Greenberg, Blair, & Domitrovich, 2008). These findings are in keeping with recent work by several other research teams, suggesting significant impact of classroom-based intervention on improving children's executive function (Diamond, Barnett, Thomas, & Munro, 2007; Riggs et al., 2006). In short, these findings

suggest substantial evidence for the modifiability of children's self-regulatory skills across the preschool year. We also ask whether those children exposed to comprehensive emotionally and behaviorally targeted intervention go on to show improvements in their preacademic readiness skills, as well.

Following recent statistical innovations in educational psychology and prevention science, we employed a clustered, randomized design, with Head Start sites as the unit of randomization and children as the units of analyses. Given the threat of omitted variables bias, we test our hypotheses using intent-to-treat (ITT) impact estimates of the CSRP intervention on children's self-regulatory and preacademic outcomes in spring of their Head Start year. To adequately take the role of children's early educational programs into account, we examined the impact of our classroom-based intervention on low-income preschoolers' school readiness outcomes using hierarchical linear modeling (HLM). HLM models (and a range of alternative specifications) increasingly represent the "industry standard" for testing school-based efficacy trials of intervention impact, as the data are nested and standard errors are corrected (Raudenbush & Bryk, 2002). We then use additional multilevel HLM analyses to peer inside the "black box" of the possible mechanisms that might explain the CSRP's treatment impacts. With this second set of analyses, we asked questions that are principally more predictive than causal in nature. Additional details regarding specific models to be tested are provided below.

Brief Overview of the CSRP Intervention

Based on the theoretically grounded models outlined earlier, the CSRP was designed to support low-income children's development of optimal self-regulation. Our concern was that within the context of relatively few clinical resources and limited staffing support, early childhood classrooms may become difficult to manage as children with more emotional and behavioral difficulty engage in escalating, emotionally dysregulating "coercive processes" with teachers (Arnold, McWilliams, & Arnold, 1998; Conduct Problems Prevention Research Group, 1999; Kellam et al., 1998). Few teachers report receiving preservice training in managing classrooms effectively or in handling children's disruptive behaviors; one concern is that chronic engagement in escalating cycles of conflict might exacerbate children's acting out, disruptive behavior, as well as leading to teachers' rising feelings of exasperation, disengagement and burnout (Brouwers & Tomic, 1998).

Based on this theoretical framework, the CSRP provided teachers with training in strategies (e.g., implementing clearer rules and routines, rewarding positive behavior, redirecting negative behavior) that they could employ to provide their classrooms with more effective regulatory support and better management (Raver et al., 2008; Webster-Stratton et al., 2008). Additional components of ongoing classroom-based and child-focused consultation were provided by a mental health consultant (MHC) who supported teachers while they try new techniques learned in the teacher training (Donohue, Falk, & Provet, 2000; Gorman-Smith, Beidel, Brown, Lochman, & Haaga, 2003). As an additional component, MHCs spent a significant portion of the school year conducting stress reduction workshops to help teachers to limit burnout. One critique might be that MHCs bring both "an extra pair of hands" to the classroom in addition to their clinical expertise. To control for improvements in adult-child ratio introduced by the presence of MHCs in treatment classrooms, control classrooms were assigned a lower cost teacher's aide (TA) for the same amount of time per week.

The principal aim of the CSRP intervention was to marshal these primary programmatic components to improve low-income preschool-aged children's school readiness by increasing their emotional and behavioral adjustment. As a preliminary test of whether the

intervention was successfully implemented, we recently tested whether the CSRFP made a difference in teachers' classroom management behaviors. Our initial analyses suggest that teachers in treatment-assigned Head Start sites were successfully able to provide children with more well-managed and emotionally supportive classroom environments than were teachers in control group assigned Head Start sites (Raver et al., 2008). Additional analyses suggest that the intervention also led to significant improvements in teachers' reports of children's externalizing and internalizing behavior problems (Raver et al., 2009). To date, the following analyses represent the first time we have tested the impact of the CSRFP intervention on directly assessed child school readiness outcomes.

Hypotheses

Our first set of hypotheses is that an intervention designed to support well-structured, emotionally positive, and less disruptive classroom climates would have a clear, measurable impact on children's socioemotional and preacademic readiness. Children in experimental classrooms were expected to develop more effective behavioral self-regulation than their control group-enrolled counterparts, even after controlling for their initial behavioral profiles at the start of the Head Start preschool year. These treatment impacts were expected to be detected after controlling for the characteristics of children, teachers, classrooms, and sites. Children in Head Start sites that were randomly assigned to treatment were also expected to gain greater academic competence over time, with greater learning opportunities than children in control classrooms.

Our second set of hypotheses were that children's preacademic outcomes in the spring of their Head Start year would be statistically mediated by experimentally induced changes in children's self-regulatory skills during the school year. That is, we hypothesized that paths from treatment to children's letter-naming, early math, and vocabulary gains would be predicted by gains in children's ability to marshal their attention and control their behavior (as indexed by improvements in their global attention/impulse control scores and in their directly assessed EF and EC skills). In sum, tests of these hypotheses offer a means of putting theoretical models of program effects to work in "real-world" settings of Head Start centers serving low-income, ethnic minority preschoolers.

Method

Sample

Following recent school-based intervention models, this study used a cluster-randomized design. As such, random assignment occurred at the site level, with matched pairs of Head Start-funded programs assigned to treatment and control conditions.

School and participant selection—In an effort to balance generalizability and feasibility, preschool sites were selected on the basis of (a) receipt of Head Start funding; (b) having two or more classrooms that offered "full-day" programming; (c) location in one of seven high-poverty neighborhoods that were selected on the basis of a set of criteria including high poverty, exposure to high crime, and lower rates of mobility; and (d) completion of a screening and self-nomination procedure (see Raver et al., 2008; Raver et al., 2009, for more details). Two classrooms within each site were randomly selected for participation, with a research coordinator and research staff successfully able to recruit 83% of the children enrolled in classrooms. In addition, direct assessments of children's self-regulation and pre-academic skills were collected for a large proportion of the full sample.

Randomization—Pairwise matching and randomization procedures were used to match pairs of sites, with one member of each pair randomly assigned to treatment and the other

member of the pair assigned to the control group (see Raver et al., 2009, for details). Within each of the nine treatment sites, 2 classrooms participated, for a total of 18 treatment classrooms. Across the 9 control sites, there were 17 classrooms (2 classrooms in eight sites, and 1 classroom in the remaining site that lost one Head Start–funded preschool classroom due to funding cuts). Treatment classrooms received the multiple components of the intervention package across the school year, and control classrooms were paired with teaching assistants as described above.

The CSRP intervention was implemented for two cohorts, with Cohort 1 participating in 2004–2005 and Cohort 2 participating in 2005–2006. As with other recent multisite, multicohort efficacy trials, the sites enrolled in Cohorts 1 and 2 differed on several demographic characteristics, and therefore those characteristics were included in all analyses (see, e.g., Gross et al., 2003).

Because we planned to model child outcomes as potentially responsive to both the intervention and to baseline teacher- and classroom-level characteristics, teachers were also included as research participants. As with classrooms, teachers were enrolled in two cohorts, which were also pooled into a single data set ($n = 90$). A total of 87 teachers participated in the CSRP at baseline. The number of teachers increased to 90 by the spring of the Head Start year, with the entry of 7 more teachers and the exit of 4 teachers who either moved or quit during the school year.

At baseline, a total of 543 children participated in the CSRP. By the spring, the number of participating children was reduced to 509. Nearly all exits were due to children voluntarily leaving the Head Start program, though 1 child was requested to leave the program and 1 parent opted to withdraw her child from the CSRP (due to the parent's increased work and family demands). Children were 49.4 months in age, on average ($SD = 8.0$). Families were predominantly low income with a mean yearly income of \$13,440. Other demographic characteristics of these children and their families are presented in Table 1.

General procedures—In the fall, families with children ages 3–4 were recruited from each of the 35 classrooms to participate in the study, with approximately 17 children in each classroom enrolling in the CSRP. (In two exceptions, 1 child as young as 26 months and 1 child as old as 73 months managed to be enrolled in their respective Head Start programs). We collected data on children's behaviors, background, classroom, and site characteristics from five sources: parents, teachers, classroom observers, children themselves, and site directors; this parallels recent literature that incorporates multiple reporters to increase the validity and robustness of data (see Hill et al., 2004).

Children's self-regulatory skills and preacademic skills were collected individually from each child who was enrolled in the study by a multiracial group of master's level assessors who had been extensively trained and certified in direct assessment procedures in both September and May (see Smith-Donald et al., 2007, for details of training and certification of assessors). Data on CSRP-enrolled children's performance on eight self-regulation tasks were collected using the Preschool Self-Regulation Assessment (Smith-Donald et al., 2007). In addition, we collected a cognitively oriented, federally mandated assessment of Head Start-enrolled preschoolers' vocabulary, letter naming, and math skills (Zill et al., 2003), and assessors' global ratings using the Preschool Self-Regulation Assessment (PSRA) Assessor Report (Smith-Donald et al., 2007). Assessments were conducted with children in quiet areas of their Head Start programs during the school day, with 20% of assessments videotaped and double-coded by trained assessors to establish interrater reliability.

To account for classroom-level covariates, additional data were collected from observers in the fall. Trained observers, who were blind to randomization, assessed the quality of children's classrooms using the Classroom Assessment Scoring System (CLASS; La Paro, Pianta, & Stuhlman, 2004) and the Early Childhood Environment Rating Scale (ECERS-R; Harms, Clifford, & Cryer, 2003). The team consisted of 12 individuals who each had at least a bachelor's degree. Of the 12 members, 6 were African American and 6 were Caucasian or Asian; thus, approximately half the time, the observers' race matched the race of most children. Observers noted the number of children and adults in the classroom as well. In the fall, administrators at each site also provided the CSRP with access to site-level characteristics.

Measures

Self-regulation skills—The PSRA (Smith-Donald et al., 2007) was used to capture children's strengths and difficulties in behavioral self-regulation along (a) global dimensions of attention/impulse control as well as (b) component dimensions of EF and EC. Importantly, the PSRA has demonstrated measurement equivalence across African American and Latino children, and across boys and girls (Raver et al., 2008). Procedurally, the PSRA first obtains a direct assessment of children's EF and EC, where the assessor records live-coded latencies or performance levels for a range of labbased tasks that have been adapted for field administration (see Smith-Donald et al., 2007). For this study, two tasks were included as tasks of EF, including Balance Beam (Murray & Kochanska, 2002) and Pencil Tap, which was adapted from the peg-tapping task (Blair, 2002; Diamond & Taylor, 1996). In addition, four delay tasks were used to tap children's EC skills and were adapted from the lab-based work of Kochanska and colleagues: Toy Wrap, Toy Wait, Snack Delay, and Tongue Task (see Murray & Kochanska, 2002). Assessors were trained extensively by the first author and her team members to pass three levels of certification (see Raver et al., 2010, for additional details regarding certification procedures). Children's performance on the two EF tasks and the four EC tasks were standardized and then averaged into two composites (two additional PSRA tasks [Gift Return and Block Task] yielded data with insufficient variance [ceiling effects] and were therefore omitted). Interrater reliability was calculated from doublecoded videotaped assessments for 20% of the sample. The consistency of the assessor and coder responses on those forms was evaluated for all continuous variables, and Cronbach's alphas ranged from .73 to .99 across all PSRA tasks with an average alpha of .93.

After the tasks were administered, the 28-item PSRA Assessor Report was completed (Smith-Donald et al., 2007). Providing a global picture of children's emotions, attention and impulsivity throughout the assessor-child interaction, the Assessor Report was adapted from the 15-item Leiter-R social-emotional rating subscale (examiner version; Roid & Miller, 1997) and a small number of additional items from the Disruptive Behavior- Diagnostic Observation Schedule coding system (DB-DOS; Wakschlag et al., 2005). Items were coded using a Likert scale ranging from 0 to 3, with some items reverse coded to minimize automatic responding. Factor analyses based on pilot data yielded robust evidence for two factors: Attention/Impulse Control (with 16 items loading $> .4$) and Positive Emotion (with 7 items loading $> .4$; Smith-Donald et al., 2007). These results were largely replicated using data collected as part of the CSRP intervention. Again, two factors representing Attention/Impulse Control and Positive Emotion emerged. The final aggregate for the Attention/Impulse Control subscale is used here as a global assessment of children's self-regulation, with the subscale demonstrating good internal consistency ($\alpha = .92$).

Preacademic skills—Before children participated in the cognitive assessments, assessors determined children's comprehension of spoken English by playing "Simon Says" ($\alpha = .92$;

PreLAS Simon Says; Duncan & DeAvila, 1998). Here, the assessor plays the role of “Simon” and directs the children to act out certain movements only when the assessor prompts the child with “Simon says” in order to gauge how well the child understood spoken English. If children speaking Spanish and English passed this screener, they were assessed twice, in Spanish and in English. We then compared each child’s scores based on the Spanish and English assessments and used the child’s highest score in analyses. Children who spoke English only were assessed one time in English.

A shortened version of the Peabody Picture Vocabulary Test (PPVT; $\alpha = .78$) with 24 items was administered to the child by the assessor following Simon Says (PPVT–III; Dunn & Dunn, 1997; Zill, 2003b). A parallel Spanish-language version of the PPVT, entitled the Test de Vocabulario en Imagenes Peabody (TVIP; Dunn, Lugo, Padilla, & Dunn, 1986) was administered to Spanish-proficient and bilingual children. In the PPVT and TVIP, children are asked to point to the one picture out of a group of four that corresponded to the word spoken by the assessor.

The letter naming portion ($\alpha = .92$) of the cognitive assessment consists of the 26 letters of the English alphabet divided into three groups of 8, 9 and 9 letters (30 letters for the Spanish assessment). The letters are arranged in approximate order of item difficulty. Because the English language has 26 items and the Spanish language assessment has 30 items, the scores were calculated in terms of total percent correct out of 26 or 30, respectively ($\alpha = .92$). Also, the Early Math Skills ($\alpha = .82$) portion of the cognitive assessment consists of 19 items. This simple assessment of children’s early math skills covers basic addition and subtraction (Zill, 2003a).

Child, family, and classroom characteristics—Child-level demographic characteristics were included as covariates in the following analyses. These included (a) child gender, (b) child membership in the race/ethnic category of African American versus Hispanic, (c) parent’s self-identification as Spanish speaking in the home, (d) large family size (with 4 children), (e) single-parent household, and (f) family’s cumulative exposure to three poverty-related risks (including mothers’ educational attainment of less than high school degree, family income-to-needs ratio for the previous year being less than half the federal poverty threshold, and mothers’ engagement in 10 hr or fewer of employment per week). Children’s school readiness scores at the fall of the Head Start year were also included as covariates for the corresponding outcomes in the spring.

A set of teacher characteristics were also included as classroom-level covariates and were assessed through teacher report and observer ratings in fall (at baseline). These included self-reports of teachers’ education (attainment of BA), age, and several psychosocial characteristics that might affect teachers’ performance (see Anthony, Anthony, Morrel, & Acosta, 2005). Teachers’ depressive symptoms were briefly assessed at baseline using the six-item K6, a scale of psychological distress developed for the U.S. National Health Interview Survey (Kessler et al., 2002). With a metric of 0–4, the K6 items were summed ($\alpha = .65$). In addition, teachers reported job overload on the six-item “job demands” ($\alpha = .67$) and five-item “job control” ($\alpha = .56$) subscales of the Child Care and Early Education Job Inventory, which had a rating scale of 1–5 (Curbow, Spratt, Ungaretti, McDonnell, & Breckler, 2000). Scores were then averaged across all teachers in each classroom. To control for additional variation in classroom quality, classroom observations were independently collected in the fall using four subscales of the CLASS (La Paro et al., 2004) and the 43-item version of the ECERS–R (Harms et al., 2003). Three fourths of the observations were double coded “live” by two observers and intraclass correlation values (α) indicated adequate to high levels of interobserver agreement (α s = .66–.87). Class size and number of adults in the class were also added as covariates.

In order to test the role of “settings-level” program characteristics, a limited number of site-level covariates were entered into models, including the availability of a full-time family worker at the Head Start site, the size of the program, the proportion of teachers with a bachelor’s degree, the proportion of TAs with some college, the proportion of families with at least one parent employed, and the proportion of families receiving Temporary Assistance for Needy Families.

Overview of Analytic Plan to Test Direct Effects of Treatment

In this study, we first employed multilevel modeling (HLM) techniques to estimate ITT estimates of the CSRP intervention on preschoolers’ school readiness (Raudenbush & Bryk, 2002). We considered children’s EF, EC, and attention/impulse control, assessed in the spring of the intervention year as dependent measures of the CSRP program influence. We then repeated our analyses with children’s preacademic skills (i.e., PPVT, letter naming, and early math skills) as dependent variables. Following recent recommendations, our models take into account children’s baseline performance in the fall of their Head Start year, regressing school readiness outcomes captured in the spring of children’s Head Start year on a set of predictors that include those same measures assessed in the fall (NICHD Early Child Care Research Network & Duncan, 2003; Votruba-Drzal, 2006). Thus, our treatment estimates represent the association between treatment and residualized changes in children’s school readiness from October to May. Specifically, the direct impact of the CSRP intervention is examined after controlling for a set of demographic characteristics of children and their families at Level 1, including baseline school readiness measures, classroom/ teacher characteristics at Level 2, and site characteristics at Level 3.

The overall impact of intervention was modeled using the following equations:

$$Y_{ijk} = \pi_{0jk} + \sum_m \pi_{mjk} X_{mijk} + \varepsilon_{ijk} \quad (1)$$

where Y_{ijk} is the school readiness score of child i in classroom j within CSRP site k ; $\sum_m \pi_{mjk} X_{mijk}$ represents the sum of m child-level covariates. ε_{ijk} is a random error term.

$$\pi_{mjk} = \beta_{m0k} + \sum_n \beta_{mnk} C_{nj k} + r_{mjk} \quad (2)$$

where $\sum_n \beta_{mnk} C_{nj k}$ is the sum of n teacher- and classroom-level covariates.

$$\beta_{mnk} = \gamma_{mn0} + \gamma_{001} T_k + \sum_p \gamma_{mnp} S_{pk} + u_{mnk} \quad (3)$$

where T_k is treatment/control assignment while $\sum_p \gamma_{mnp} S_{pk}$ represents the sum of p site-level characteristics. β_{00k} , the adjusted mean level of child school readiness in site k , varies as a function of whether or not the site was assigned to the treatment or control group; γ_{000} is the adjusted mean level of school readiness scores across all control group sites; and γ_{001} represents the average difference between the treatment and control sites. Effect sizes are calculated by dividing that difference by the standard deviation of the measure in the full sample.

Overview of Analytic Plan to Test Mediating Role of Self-Regulation

We then examined the mediating role of self-regulation for children's pre-academic skills to take a post hoc, empirical look inside the "black box" of the CSRPs' impact on low-income children's school readiness. In the literature two approaches have been suggested for modeling mediating analyses (e.g., Bauer, Preacher, & Gil, 2006; Krull & MacKinnon, 2001; Stice, Presnell, Gau, & Shaw, 2007; Tate & Pituch, 2007). One approach is first to estimate the effects of the CSRPs' treatment (T_k) on pre-academic skills (Y_{ijk}), $\hat{\gamma}_c$, based on Equations 1–3, as shown in Figure 1. The next step is to estimate the treatment effects $\hat{\gamma}_{c'}$ using Equations 2–4. Equation 4 is the same as Equation 1, except that Equation 4 controls for the mediators (i.e., M_{ijk} , self-regulation measures), as can be seen below:

$$Y_{ijk} = \pi_{0jk} + \sum_m \pi_{mj k} X_{mijk} + \pi_b M_{ijk} + \varepsilon_{ijk} \quad (4)$$

The differences between $\hat{\gamma}_c$ and $\hat{\gamma}_{c'}$ (i.e., $\hat{\gamma}_c - \hat{\gamma}_{c'}$) are the mediated effects (Krull & MacKinnon, 2001; Preacher & Hayes, 2004).

The second approach is first to estimate the treatment effects on the mediators, $\hat{\gamma}_a$ (with standard errors of \hat{S}_{γ_a}), using Equations 1–3, where the mediators are modeled as outcomes. Next, we estimate the effects of the mediators on children's preacademic outcomes, $\hat{\pi}_b$ (with standard errors of \hat{S}_{π_b}), using Equations 2–4, as shown in Figure 1. The product of $\hat{\gamma}_a \hat{\pi}_b$ is the mediated effect (Bauer et al., 2006; Krull & MacKinnon, 2001; Tate & Pituch, 2007). Empirical and simulation studies have shown that the $\hat{\gamma}_a \hat{\pi}_b$ estimator is more efficient and provides more information than the $\hat{\gamma}_c - \hat{\gamma}_{c'}$ estimate; thus, it is preferred in cluster-based intervention studies (Krull & MacKinnon, 2001; Tate & Pituch, 2007). Therefore, we adopted $\hat{\gamma}_a \hat{\pi}_b$ as the estimates of the mediated effects by children's self-regulation on their preacademic outcomes, with standard errors that are based on the multivariate delta method and that perform well across a range of sample sizes (Krull & MacKinnon, 2001; Tate & Pituch, 2007), as shown in Equation 5:

$$\hat{S}_{\gamma_a \pi_b} = \sqrt{\hat{S}_{\gamma_a}^2 \hat{\pi}_b^2 + \hat{S}_{\pi_b}^2 \hat{\gamma}_a^2} \quad (5)$$

Results

In this section, we first provide descriptive statistics for the CSRPs-enrolled sample on all demographic, mediating, and outcome variables across treatment and control group-enrolled children. We then present the results for our tests of the direct and mediated impacts of the CSRPs intervention on children's school readiness outcomes.

Descriptive Statistics

Table 1 presents descriptive statistics for all predictors of children's school readiness at the site, classroom, and child levels. As can be seen from the descriptive statistics in Table 1, many measures of child and family background covariates at baseline appear to be slightly different between the treatment and control group. However, these differences were not statistically significant, based on *t* tests comparing means on these covariates across the treatment and control groups (Raver et al., 2008). Similarly, no significant differences were found between the treatment and control groups on children's fall pretest scores on self-regulatory and preacademic domains of school readiness, or on classroom- and site-level covariates. Nevertheless, the heterogeneity among sites and classrooms (see Table 1)

reinforces the importance of including classroom- and site-based covariates when analyzing the treatment impact of small-scale trials.

Results of Direct Treatment Effects

Table 2 presents the results from analyses regarding the treatment effects of the CSRP intervention on children's preacademic skills and self-regulation. The coefficients and standard errors of the treatment variable (1 = *treated*, 0 = *controlled*) are shown in the second and third columns, while the corresponding effect sizes, calculated by dividing the coefficients by the standard deviation of the respective measures in the full sample, are presented in the last column.

As shown in Table 2, consistent with our hypotheses, overall we found significant treatment effects of the CSRP intervention on all three preacademic skills (i.e., PPVT, letter naming, and early math skills) and two out of the three measures of children's self-regulation (i.e., EF and attention/impulsivity) in spring of the Head Start year. Specifically, children in the CSRP treatment group had significant gains in all three measures of preacademic skills in spring of their Head Start year, compared to their peers in the control group. In particular, compared to children in the control group, those in the treatment group on average gained about 1.5 points more ($p = .04$) on the shortened version of the PPVT from fall to spring of their Head Start year. In addition, compared to the control group, children in the treatment group had significant gains in their letter naming skills ($p = .00$) and early math skills ($p = .00$) from fall to spring of their Head Start year.

The results in Table 2 also show that children in the treatment group had statistically significantly higher scores in EF ($p = .05$) and were rated by assessors as manifesting better attention skills and lower levels of impulsivity during the standardized direct assessment ($p = .05$) than did children in the control group, after controlling for their baseline scores. No statistically significant differences were found between treatment and control group children's spring scores on direct assessments of EC ($p = .22$).

Results Testing the Mediating Role of Self-Regulation on Pre-academic Outcomes

Table 3 presents the mediating role of children's self-regulation on preacademic skills. Overall we found significant mediated "effects" for two of three self-regulation measures (i.e., global ratings of attention/impulse control and EF) on all three preacademic outcomes. Specifically, the mediated role of children's globally rated attention/impulse control was marginally significant for their PPVT scores ($p = .08$) and statistically significant for their letter-naming skills ($p = .04$) and early math skills ($p = .02$). Similarly, the mediating role of children's EF was statistically significant for PPVT ($p = .01$), letter-naming ($p = .01$), and early math skills ($p = .01$). In contrast, we did not find evidence of statistically significant mediation for children's EC on any preacademic outcomes.

Discussion

As the United States approaches an era of increasing economic uncertainty, our field faces the stark reality that rates of poverty will likely have deleterious consequences for young children's school readiness. The prospect of widening economic and educational disparities among our nation's youngest children represents tremendous incentive for our field to find feasible means of supporting their school readiness.

The descriptive results of our study underscore the cause for our concern: The low-income children in our study faced substantial economic disadvantage. The children in our sample demonstrated a range of strengths and struggles: As a group, CSRP-enrolled children demonstrated considerable self-regulatory competence and academic skills. That said, the

low-income children in our sample were also at significant risk, with vocabulary, math, and letter-naming skills that place them in significant jeopardy relative to their more affluent peers. Our central question was whether a multicomponent intervention implemented in Head Start could substantially improve low-income children's chances for later educational success by supporting their self-regulatory and preacademic skills.

Results of our ITT analyses suggest clear evidence of the benefits of a comprehensive classroom-based intervention for children's self-regulation. Children enrolled in Head Start programs that were randomly assigned to the CSRP intervention demonstrated significantly higher attention skills and greater impulse control as well as higher performance on EF tasks than did their control group counterparts, even after statistically taking into account children's initial regulatory skills in the fall of their preschool year. The magnitude of residualized change in improvement in these dimensions of CSRP-enrolled children's self-regulatory skills is substantial (with effect sizes ranging from .37 to .43). Our findings are similar in magnitude to the self-regulatory benefits of other cluster-randomized interventions targeting young children's school readiness (Bierman et al., 2008; Diamond et al., 2007; Webster-Stratton et al., 2008). It is important to note, however, that the impact of the CSRP intervention was not detected for direct assessments of children's EC. How do we interpret these CSRP intervention findings? Our results suggest that CSRP supported young children's development of the kinds of global self-regulatory skills that matter to learning: These included children's ability to sit quietly and to follow directions when asked to, as well as the ability to focus attention on specific cognitively and behaviorally challenging tasks. Inclusion of direct assessments of children's EF and EC allowed us to take a closer look at the component processes that might underlie this finding. Specifically, children in the treatment group demonstrated significantly higher skill in handling the cognitive complexity, planning, and inhibitory control demanded by our directly administered PSRA EF tasks, relative to their control group-assigned counterparts. Based on our recently published classroom-level findings, we speculate that children in the treatment group benefited from classroom environments that offered more structure, clearer routines, and fewer episodes where teachers and students engaged in more positive and less conflictual or coercive interaction (Raver et al., 2008). This may have aided children in gaining practice in organizing and planning their activities and behavior, in remembering and following classroom rules, and may have offered longer and more sustained opportunities for focusing and maintaining their executive attention (see Blair, 2002; Riggs et al., 2006).

Alternately, we offer several reasons for our failure to find corresponding treatment impacts for children's EC. First, it may be the case that EC tasks tap a more stable, temperament-based component of self-regulation that may serve to moderate, rather than mediate the impact of intervention (Lengua, 2008). Alternately, the limbic and neuroendocrine systems that underlie children's EC may be earlier developing and more substantially shaped by longstanding patterns of caregiving in the home as well as in school contexts (Calkins & Fox, 2002; Gunnar, 2003; Li-Grining, 2007). Accordingly, if intervention is successfully able to target preschoolers' development of EC, it may need to include attention to both classroom and parenting processes that are associated with children's optimal attentional focus and emotional arousal (Brotman et al., 2007; Fisher, Stoolmiller, Gunnar, & Burraston, 2007). Together, our findings have substantial policy implications when searching for promising strategies for supporting the emotional and behavioral well-being of children who face a host of significant poverty-related stressors. This may be particularly important in a period of rapid expansion of early childhood classrooms where policy professionals may struggle to expand the quantity of preschool slots without sacrificing the classroom quality of the programs in which those "slots" are offered (Blau, 2002; Magnuson, Meyers, & Waldfogel, 2007; Zigler, Gilliam, & Jones, 2006).

The findings of our study also suggest that this emotionally and behaviorally oriented intervention increased children's learning opportunities, as evidenced by treatment-enrolled children's significant improvements in vocabulary, letter-naming, and math skills relative to children in the control group. Our analyses indicate that CSRP services targeting children's self-regulation through classroom-based processes led to significant preacademic benefits for treatment-enrolled children, with effect sizes ranging from .34 to .63. Importantly, because we did not provide any assistance or materials to teachers on ways to improve their instructional practices on academic domains, we have confidence in asserting that the statistically significant impacts on children's academic outcomes can be attributed to our socioemotionally oriented intervention. In addition, post hoc examination of the mediating role of children's self-regulation point us in promising directions in understanding potential mechanisms that might explain children's academic gains. Evidence from these post hoc models suggests that estimates of program impacts are smaller, though they continue to be statistically significant and of meaningful magnitude for most (but not all) hypothesized paths.

In sum, our findings lend support to the claims made in previous longitudinal, nonexperimental studies that the social, emotional and behavioral contexts of young children's early educational experiences "matter" for their opportunities to learn (Fantuzzo et al., 2007; McClelland & Morrison, 2003; Raver, 2002). It is important that our findings are not construed to suggest an "either-or" approach to investments in both academic and socioemotional-behavioral domains, but rather that it provides evidence for ways that children's socioemotional competence is key rather than peripheral to their opportunities for learning, in early childhood contexts.

Limitations

This study's conclusions are constrained by several limitations. A key limitation is that the current analyses are across a relatively short period of time, from fall to spring of a single year in Head Start. For more robust estimates of the CSRP's efficacy, it will be important to see whether evidence of the benefits of our classroom-based intervention extend into children's kindergarten year (Flay et al., 2005). A second key limitation is that the analyses presented above were sufficiently complex that they have not yet been extended to include tests of the moderating role of children's race/ethnic category membership or gender. We plan to address these limitations in subsequent papers, focusing on the equivalence of our models across subsamples of children differing by race/ethnicity, English language learner status, and gender. Finally, this study's external validity is significantly constrained: We relied on the generosity of staff, teachers, and families at 18 Head Start sites in seven neighborhoods of concentrated economic disadvantage on Chicago's South and West sides that were willing to be randomly assigned to the receipt of two different types of services (comprehensive, multicomponent intervention vs. receipt of a teacher's aide 1 day a week). We can only be cautiously optimistic until these findings have been replicated in other studies, in other locales, and with other intervention teams.

Future Directions

With those limitations in mind, what are the implications of these hypothesized and demonstrated short-term gains in children's EF, attention/impulse control, and preacademic skills? An optimistic hypothesis might be that children with improved profiles of school readiness may be placed on a more positive developmental trajectory, better able to capitalize on future learning opportunities. A less optimistic hypothesis is that children will only sustain these school readiness benefits when school systems make continued investments to provide ongoing classroom supports for their optimal development. Our next

step is test these alternative hypotheses to learn whether children are able to carry these benefits forward, into new elementary school settings.

In the short term, however, it is important to highlight that this study's news is good: These findings, combined with the findings of significant improvements at the classroom level (Raver et al., 2008), suggest that significant investment in CSRP intervention components such as training, coaching, and mental health consultation yields significant school readiness benefits for low-income children. Importantly, our approach targeted support of children's optimal behavioral regulation at the classroom setting level rather than the child level (Diamond et al., 2007; Ialongo, Poduska, Werthamer, & Kellam, 2001; Riggs et al., 2006). The CSRP drew from the strengths of previous intervention approaches conducted with older children, emphasizing the importance of providing significant adults in children's lives with the knowledge and skills to effectively promote children's self-regulation and reduce their behavior problems (see Jones, Brown, Hogg, & Aber, 2010). In sum, our results contribute to a growing literature that suggests ways teacher training and mental health consultation efforts can be extended "downward" to settings where an increasingly large fraction of preschool children are served. These services show significant promise for Head Start-funded programs serving low-income, ethnic minority preschoolers in neighborhoods of concentrated disadvantage.

Translational Implications

In an era of rising economic difficulty for families with children in the United States, this study highlights the ways we can support low-income children's social and behavioral development as well as maximize chances of success in the academic sphere, within preschool settings where communities are deeply dedicated to supporting the optimal development of low-income children. In our view, recent federal investments in cluster-randomized preschool efficacy trials represents a "watershed" moment in prevention science research: A new set of intervention studies has recently provided compelling evidence and guidelines for the steps that programs can take to substantially improve children's chances of succeeding in school (U.S. Department of Health and Human Services, 2008). In our view, CSRP is part of this growing trend, demonstrating the multiple steps agencies and early childhood programs can take to support school readiness.

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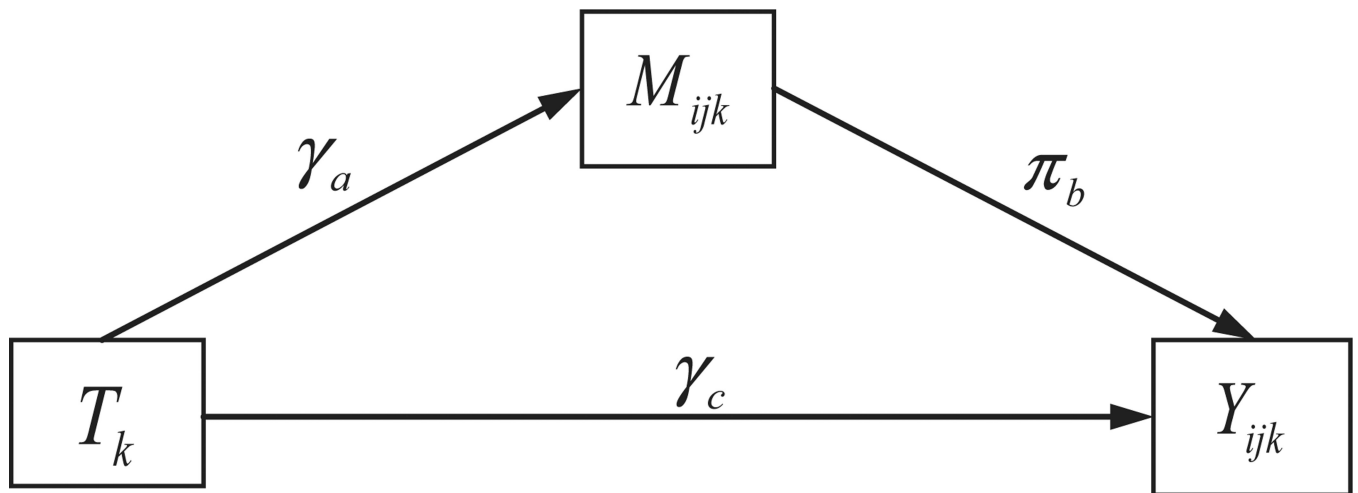


Figure 1.

A mediating model of Chicago School Readiness Project's (CSRP) impact on low-income children's preacademic skills

Note. T_k = CSRP treatment; Y_{ijk} = preacademic outcomes; M_{ijk} = mediators (i.e., self-regulation measures); γ_c = effects of treatment on preacademic outcomes; γ_a = effects of treatment on mediators; π_b = effects of mediators on preacademic outcomes.

Table 1

Descriptive Statistics in Full Sample and Treatment and Control Groups

	Full sample (n = 467)	Treatment group (n = 238)	Control group (n = 229)
Outcome variables in spring			
Executive functioning score	0.04 (0.81)	0.08 (0.85)	-0.01 (0.76)
Effortful control score	0.03 (0.66)	0.00 (0.65)	0.05 (0.67)
Attentive/impulse control	2.29 (0.52)	2.29 (0.55)	2.29 (0.49)
PPVT score	13.55 (4.33)	13.81 (4.30)	13.27 (4.36)
Letter naming score	0.46 (0.39)	0.50 (0.39)	0.42 (0.38)
Early math skill score	10.02 (4.01)	10.06 (3.85)	9.98 (4.19)
Baseline scores in fall			
Executive functioning score	-0.01 (0.83)	0.06 (0.82)	-0.09 (0.84)
Effortful control score	-0.00 (0.68)	0.05 (0.66)	-0.06 (0.69)
Attentive/impulse control	2.18 (0.59)	2.22 (0.56)	2.14 (0.62)
PPVT score	10.68 (3.88)	11.00 (3.67)	10.36 (4.06)
Letter naming score	0.22 (0.30)	0.24 (0.31)	0.19 (0.29)
Early math skill score	7.49 (3.78)	7.80 (3.51)	7.18 (4.03)
Child characteristics			
Boy	0.48 (0.50)	0.52 (0.50)	0.43 (0.50)
Child race/ethnicity (Black)	0.66 (0.48)	0.67 (0.47)	0.64 (0.48)
Child race/ethnicity (Hispanic)	0.26 (0.44)	0.27 (0.45)	0.25 (0.44)
Child race/ethnicity (Other)	0.08 (0.27)	0.06 (0.24)	0.10 (0.31)
Family poverty-related risks	1.08 (1.00)	1.15 (1.00)	1.01 (1.00)
Single-parent families	0.68 (0.47)	0.71 (0.45)	0.65 (0.65)
Four or more children in household	0.26 (0.44)	0.25 (0.43)	0.28 (0.45)
Parent Spanish speaking	0.19 (0.39)	0.17 (0.38)	0.21 (0.40)
Teacher and class characteristics			
Teacher bachelor's degree	0.65 (0.54)	0.71 (0.57)	0.59 (0.49)
Teacher age	40.72 (11.86)	38.42 (12.37)	43.11 (10.81)
Teacher K6 score	2.57 (2.07)	3.19 (1.64)	1.91 (2.27)
Teacher job demand	2.67 (0.59)	2.86 (0.63)	2.47 (0.47)
Teacher job control	3.29 (0.70)	3.36 (0.70)	3.21 (0.68)

	Full sample (<i>n</i> = 467)	Treatment group (<i>n</i> = 238)	Control group (<i>n</i> = 229)
Teacher behavior management	4.91 (1.03)	4.65 (1.05)	5.19 (0.93)
Classroom emotional climate	16.24 (2.69)	15.58 (2.65)	16.92 (2.56)
Classroom overall quality	4.71 (0.79)	4.48 (0.73)	4.95 (0.78)
Class size	16.42 (2.65)	16.61 (2.68)	16.22 (2.61)
Number of adults in class	2.40 (0.69)	2.52 (0.77)	2.28 (0.56)
Site characteristics			
Number of family support workers on staff	1.24 (2.44)	0.39 (0.49)	2.12 (3.22)
Number of children aged 3–5	111.84 (120.14)	94.07 (50.46)	130.31 (161.81)
Proportion of teachers with bachelors degree	0.45 (0.40)	0.52 (0.37)	0.38 (0.42)
Proportion of teacher assistants with college	0.49 (0.37)	0.37 (0.33)	0.62 (0.38)
Proportion of families employed	0.73 (0.27)	0.80 (0.22)	0.66 (0.29)
Proportion of families receiving TANF	0.35 (0.34)	0.30 (0.33)	0.41 (0.35)

Note. Means with standard deviations in parentheses. PPVT = Peabody Picture Vocabulary Test; TANF = Temporary Assistance for Needy Families.

Table 2Chicago School Readiness Project Treatment Effects on Children's School Readiness ($n = 467$)

	Coefficient	Standard error	Effect size
Preacademic skills			
PPVT	1.46*	0.60	0.34
Letter naming	0.24**	0.05	0.63
Early math skills	2.21**	0.51	0.54
Self-regulation			
Executive functioning	0.28*	0.13	0.37
Effortful control	0.13	0.10	0.20
Attention/impulsivity	0.20*	0.09	0.43

Note. Coefficient is unstandardized; PPVT = Peabody Picture Vocabulary Test.

* $p < .05$.

** $p < .01$.

Table 3

Mediated Effects by Children's Self-Regulation on Preadademic Skills

	Mediated effect	Standard error	Effect size
PPVT			
Executive functioning	0.38**	0.15	0.09
Effortful control	0.08	0.07	0.02
Attention/impulsivity	0.20 [†]	0.12	0.05
Letter naming			
Executive functioning	0.03**	0.01	0.09
Effortful control	0.01	0.01	0.03
Attention/impulsivity	0.03*	0.01	0.08
Early math skills			
Executive functioning	0.37**	0.15	0.09
Effortful control	0.12	0.10	0.03
Attention/impulsivity	0.43*	0.19	0.11

Note. Mediated effect is unstandardized.

[†] $p < .10$.

* $p < .05$.

** $p < .01$.