# Differences between Pre-K and Kindergarten classroom experiences: do they predict children's social-emotional skills and self-regulation across the transition to kindergarten?

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**ABSTRACT**

Continuity of pre-k and kindergarten classroom experiences is a key area of interest for early childhood researchers interested in supporting public pre-k children's development over time. To advance the empirical evidence on this topic, this study examined whether differences in classroom experiences as children transition from pre-k to kindergarten are associated with kindergarten social-emotional and self-regulation skills among low-income, race- and language-diverse public pre-k children. Children attending public pre-K were assessed in the spring of pre-k and fall and spring of kindergarten on a range of social-emotional and self-regulation skills (N = 1,358; 67.1 months old (SD = 3.6) in kindergarten; 50% male; 60% Hispanic and/or Latine, 17% Black, 10% White, 13% other). Classroom experiences (teacher-child interactions, teacher-child closeness, and the amount of time spent in teacher-structured activities) were assessed using observations and teacher reports in both grade levels. Regression models adjusted for kindergarten nesting indicated that decreases in teacher-child closeness and the quality of teacher-child interactions were associated with children's lower social competence, learning behaviors, and inhibition in the fall of kindergarten, relative to spring of pre-k. There were limited associations with child gains from fall to spring. Results suggest that differences between pre-k and kindergarten academic and social environments may be difficult for children as they adjust to kindergarten. Findings are discussed in terms of the implications for efforts to align classroom experiences across grades.

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## Introduction

Significant research and public policy efforts across the United States have recently focused on understanding and mitigating the pre-kindergarten (pre-k) convergence effect, or the observation that children who attend public pre-k tend not to maintain benefits over similar non-attenders beyond two or three years into school (Ansari et al., 2020; Lipsey et al., 2018; Puma et al., 2012). With growing enrollment in public pre-k programs and interest in their impacts on subsequent school performance and adjustment (Friedman-Kraus et al., 2019), researchers have speculated that a lack of continuity between children's pre-k and kindergarten experiences may contribute to convergence over time (Bogard & Takanishi, 2005; Kagan, 2010). It is hypothesized that continuity or consistency of high-quality care in children's experiences fosters the success of rising kindergarteners who attended pre-k because it allows for more appropriate support of children's ongoing development across a range of early skills, while misaligned or inconsistent experiences may disrupt or impede learning and development (Ramey & Ramey, 2010).

Thus far, though, there has been little empirical research to explore whether and how children are affected by experiencing differences between classroom environments as they transition from pre-k to kindergarten. The current study addresses this gap in the research by examining the extent to which differences between pre-k and kindergarten classroom experiences are associated with social and self-regulatory functioning as students move from public pre-k into kindergarten. Differences are defined as discrepancies between measurable, developmentally salient aspects of children's classroom experiences across grade levels.

This study assesses three aspects of pre-k and kindergarten: classroom-level provision of warm, supportive, stimulating teacher-child interactions; teachers' ratings of closeness with each child; and the amount of time spent in teacher-structured activities; all of which are core elements of the social and self-regulatory en-

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vironment that children experience in these settings (Bodovski & Farkas, 2007; Burchinal et al., 2010; Gosse et al., 2014; Fuller et al., 2017; Pianta et al., 2020). Key to the current approach is an emphasis on understanding discontinuities or differences in children's educational experiences across settings and whether these differences themselves ie, the degree of discontinuity that children experience from one setting to another – are associated with child outcomes. The current study examines how differences are associated with children's social-emotional and self-regulation skills at kindergarten entry and at the end of kindergarten to determine whether they are associated with children's skills during the initial adjustment to school or to changes in skills from fall to spring.

## Experiences in Pre-K and Kindergarten

Pre-k programs are generally effective at improving children's academic skills (Lipsey, Farran, & Durkin, 2018), but the evidence for social-emotional and self-regulation benefits is less clear. Rigorous program evaluations suggest mixed or non-significant effects of pre-k on student outcomes such as social skills, self-regulation, and behavioral engagement, while consistent evidence indicates that children who attended pre-k tend to display elevated disruptive behaviors (Lipsey et al., 2018; Puma et al., 2012). Large-scale longitudinal studies also produce a range of estimates from negative to positive for social skills and self-regulation (Bassok et al., 2016; Winsler et al., 2008), suggesting that the overall effects may be minimal for positive aspects of social-emotional functioning and moderate for disruptive behaviors.

Despite the lack of consistent evidence for social-emotional or self-regulatory benefits of attending pre-k, higher quality pre-k programs do seem to produce better outcomes (Mashburn et al., 2008; NICHD Early Child Care Research Network (ECCRN), 2002). Higher quality classroom environments in early elementary school are also associated with better social skills, learning behaviors, and self-regulation (Broekhuizen et al., 2016; Curby et al., 2009; Mashburn et al., 2008). Reinforcing the importance of examining multi-grade experiences, students appear to benefit more from two consecutive years of high-quality interactions in pre-k and kindergarten compared with a mix of high and low quality (Broekhuizen et al., 2016; Cash et al., 2019). At a minimum, then, evidence indicates that higher quality and more supportive environments are resources that likely foster positive student adjustment and development both within and across grades; thus, further attention to cross-grade experiences is warranted.

## Continuity and Difference in Classroom Experiences

The concept of continuity is strongly rooted in developmental theory, which underscores the importance of consistency and predictability in children's lives to promote feelings of security (Rimm-Kaufman & Pianta, 2000). There are at least two pathways through which the degree of continuity (or difference) students experience across grades may contribute to their learning and development. First, there may be instances in which children's exposure to educational experiences is different across grades in ways that reflect sub-optimal experiences in one or both grades. For example, if a child's pre-k classroom was well-run, well-organized, and had clear expectations for behavior but the student's kindergarten classroom is highly permissive or has substantial student behavior problems, the difference occurs because the child transitions into a less optimal learning environment. It is useful to track children's exposures to high quality, supportive environments and relationships across grades as a way of gauging these forms of misalignment.

Second, discontinuities may pose a challenge for children's adjustment and success because of the potential for misaligned

settings to contribute to their stress. Stress can disrupt young children's cognitive control over behavior, emotions, and thought (Blair, 2010), and has negative effects on attention and working memory (Blair, 2016; Luksys & Sandi, 2011). It is reasonable to expect that stress associated with transitions, which involves adapting to a new and different teacher, new peers, and new routines and expectations, may affect children's adjustment to a new environment because of the increased demands, the difficulty of processing volumes of new information, and the challenges of self-regulating to meet social, behavioral, and academic expectations in the new setting. Evidence indicates that transitioning into a new educational environment is associated with increased levels of stress among young children (Bernard et al., 2015; Rickmeyer et al., 2017; Quas et al., 2002) and that greater discrepancies between the two educational environments can exacerbate children's stress responses (Quas et al., 2002). Thus, salient inconsistencies between environments that create stress for children may challenge their adjustment; greater continuity and greater similarity between environments, on the other hand, may ease the stressful nature of transitions (Quas et al., 2002; Scott-Little & Reid, 2010).

There is as yet little evidence to show how discontinuities in children's experiences are associated with socio-emotional development or self-regulation, either in the short-term or over time. Descriptive studies suggest that it is not uncommon for pre-k and kindergarten classrooms to be substantially different from each other on factors like classroom structure, teacher-child interactions, and teacher-child relationships. For example, data from the Head Start FACES study show that children who participated in Head Start, on average, transitioned into larger kindergarten classrooms with lower teacher-child ratios and with substantially less time spent outdoors, suggesting a shift toward less individual contact with teachers and less unstructured time (Abry et al., 2018).

Such patterns of shifts in children's exposures to classroom experiences across grades are evident in prior analyses of the current study's sample. Observations indicated that kindergarten classrooms spent significantly more time in teacher-structured activities and provided less supportive teacher-child interactions compared with pre-k classrooms (Vitiello et al., 2020). These types of discrepancies may be developmentally significant discontinuities in children's education. In the current study, we focus on experiences of teacher-child interactions, teacher-child closeness, and time in teacher-structured activities.

### Teacher-child interactions

Effective teacher-child interactions are characterized by warmth, sensitivity to individual children's needs, proactive management of class time and student behavior, and instruction that promotes higher-order thought and language use (LoCasale-Crouch et al., 2007). A substantial body of research indicates that teacher-child interactions have a small but significant positive association with child gains in social-emotional and self-regulatory skills (Burchinal et al., 2010; Gosse et al., 2014; Mashburn et al., 2008). Much of the research has focused on teacher-child interactions in preschool classrooms, but evidence from elementary schools suggests similar positive associations in kindergarten and later grades (Hamre & Pianta, 2005; Rimm-Kaufman et al., 2005). Emergent evidence further suggests that two years of exposure to high-quality teacher-child interactions in pre-k and then kindergarten has an additive positive effect on child outcomes, vs when children experience a mix of high and low quality across years (Cash et al., 2019; Vernon-Feagans et al., 2019). Based on this research, we expected a decrease in interaction quality from pre-k to kindergarten to have a negative association with children's social-emotional skills and self-regulation, such that larger decreases would be associated with poorer student outcomes.

*Teacher-child closeness*

Teacher-child relationships characterized by trust, respect, and care are conceptually similar to children's attachment relationships to primary caregivers and have a similar role in promoting children's feelings of security and the ability to control emotions (Bergin & Bergin, 2009). Students who have closer relationships with teachers tend to show more positive engagement in school and report liking school more than peers with less close relationships, and they show better psychosocial adjustment in the early elementary grades (Birch & Ladd, 1997; Buyse et al., 2009; Pianta & Stuhlman, 2004).

Limited research suggests that students tend to experience some degree of consistency in teacher-child closeness from year to year (Jerome et al., 2009), although consistency in teachers' ratings of closeness is greater from year to year within preschool (eg, from a "threes" classroom to a "fours" classroom) and weaker when children transition between pre-k and kindergarten (Howes et al., 2000).

Disruptions to relationships with primary attachment figures like parents are highly damaging to children's development and can cause long-term trauma (Geddes, 2017). We do not suggest that teacher-child relationships carry the same weight as primary-caregiver relationships, but the loss of a close relationship with a pre-k teacher may be difficult for children, especially those facing adversity associated with racism, poverty, or the challenges of learning English as a second language. Thus, we hypothesized that a decrease in teacher-child closeness from pre-k to kindergarten would be associated with lower socio-emotional and self-regulation skills in kindergarten.

*Teacher-structured activities*

Teacher-structured activities refers to activities focused on literacy, math, art, or other content areas that are led or assigned by the teacher, as opposed to free-choice or child-selected activities (Vitiello et al., 2012). There is little research to determine how much time children should spend on structured activities in preschool or kindergarten. Evidence suggests that more structured learning time in preschool and kindergarten classrooms is associated with better academic outcomes (Bodovski & Farkas, 2007; Fuller et al., 2017; Ponitz & Rimm-Kaufman, 2011; Wang et al., 2016). However, children's engagement in learning tends to be lower during teacher-structured activities (Vitiello et al., 2012; Vitiello & Williford, 2016). Structured activities also provide fewer opportunities for social interactions and may inhibit the development of empathy and complex social skills (Miller & Almon, 2009). Kindergarten classrooms have become more academic in recent years (Bassok et al., 2016) and entering kindergarten likely represents an increase in teacher-structured time for most children. Based on prior research, we expected that experiencing large increases in teacher-structured activities would have negative associations with self-regulation, task engagement, and social skills.

## Social-Emotional Skills and Self-Regulation in the Adjustment to Kindergarten

This study focuses on children's social-emotional adjustment and self-regulation as key outcomes, not only because these are developmentally and educationally important outcomes in their own right (Caprara et al., 2000; McWayne et al., 2004), but also because they are aspects of children's psychosocial functioning that may be especially sensitive to changes in children's daily classroom experiences (eg, Buyse et al., 2009; Rimm-Kaufman et al., 2009).

Children's social-emotional skills and self-regulation have long-term implications for their success and well-being. Early social-emotional skills, including social competence and disruptive behavior problems, are predictive of later developmental and academic outcomes, (including achievement) that are important indicators of success in school (Caprara et al., 2000; Doctoroff et al., 2006). Self-regulation includes multiple aspects of cognitive, emotional, and behavioral functioning, such as children's learning behaviors and executive functions (ie, the cognitive skills that allow people to perform operations on information, including inhibition, working memory, and cognitive flexibility (Diamond, 2013; McWayne et al., 2004). Self-regulation is critical to the development of numerous adaptive capabilities that are educationally relevant, including forming social relationships, persistence in pursuing goals, refraining from engaging in disruptive behavior, and attention to academic instruction (Diamond, 2013; Duncan et al., 2007; McWayne et al., 2004). Not surprisingly, student's social-emotional skills and self-regulation at school entry – assessed directly or via teacher report – are among the best predictors of academic success and adjustment in kindergarten and into later grades and are considered key aspects of children's initial adaptation to school (Schmitt et al., 2019).

## Child Characteristics as Moderators

If students are negatively affected by large differences in classroom experiences, are the consequences borne equally by all students, or are some more affected than others? Child characteristics may signal the potential for greater vulnerability to challenging experiences. For example, racially minoritized children or children learning English as a second language may experience greater stress at leaving a known, trusted environment for one that is new and very different. Teachers tend to report closer relationships with girls than boys (Jerome et al., 2009), which may also contribute to differences in the experience of transitions. To explore whether these characteristics were associated with the effects of differences on outcomes, we examined differential effects by race and/or ethnicity, home language, and gender.

## The Current Study

The current study examined whether differences between classroom educational environments that students experience in the transition from pre-k to kindergarten are associated with changes in children's social-emotional and self-regulation skills. Although there is considerable speculation that these types of differences (discontinuities or lack of alignment between experiences) hinder positive development (Scott-Little & Reid, 2010), little empirical research has examined this. We explore this issue by studying whether the magnitude of the difference between environments is associated with student adjustment in the fall of kindergarten, in the spring of kindergarten, and in gains from fall to spring.

We examined social-emotional skills and self-regulation as outcomes because they are the most closely associated, theoretically, with the areas of development in which we would expect to detect negative effects of a stressful or discontinuous transition. For social-emotional skills, we included teacher-reported social competence and disruptive behavior problems. For self-regulation, we included teacher reports of children's learning behaviors (task orientation and frustration tolerance) as well directly assessed executive functions (inhibitory control, cognitive flexibility, and working memory). We hypothesized that, once accounting for the levels that children experienced in pre-k, a decrease in teacher-student interactions and teacher-child closeness would have negative associations with children's social-emotional skills and self-regulation, an indicator of challenges in adjusting to the changes in the classroom setting. For teacher-structured activities, we hypothesized that larger increases in structured learning would be associated

with lower social-emotional and self-regulation functioning, based on the evidence that structured learning time is associated with lower positive classroom engagement (Vitiello et al., 2012).

## Method

### Recruitment and Participants

Data for this study come from a larger longitudinal study of pre-k children in a large, culturally and linguistically diverse school system. Teachers were recruited in the fall of 2016 from publicly funded, center-based classrooms that served children from low-income families. Participating teachers sent home consent forms and family demographic surveys to eligible children. Children were eligible for the study if they turned four by September 30 and did not have an Individualized Education Program (IEP) other than for speech. Eighty percent of parents had children who were eligible to participate and consented to allow their child's participation, resulting in 1498 children. Included in the current analyses were children who attended kindergarten in the school district in a participating school the following year (n = 1358). More detailed information about this sample is provided in Pianta et al., 2020.

At the start of kindergarten, children were 67.1 months old on average (SD = 3.6 months), had parents with an average of 11.7 years of education (SD = 3.7), and were 50% male. The sample was racially and ethnically diverse, with 17% Black, 60% Hispanic and/or Latine, 10% White, and 13% other ethnicity or multi-racial. Fifty-seven percent of children spoke Spanish, and 23% of children spoke another non-English language at home. Income-to-needs ratios indicated that, on average, families were living at or near the poverty line (M = 1.07, SD = 0.73). Classrooms in pre-k (n = 113) and kindergarten (n = 286) were balanced in terms of the proportion of boys and girls (50%-51% boys) and those identified as limited English proficient (52%-63%) and included a small proportion of students with special needs (7%-8%). Forty-eight percent of pre-k teachers spoke Spanish, whereas in kindergarten 28% of teachers spoke Spanish.

Pre-k teachers reported their race and/or ethnicity as Black (21.4%), White (58%), Hisapnic and/or Latine (10.7%), Asian (3.6%), multiracial (1.8%), and other ethnicities (4.5%). They reported an average of 16.9 years of education (SD = 1.6) and 15.7 years of teaching experience (SD = 9.7). Thirty-nine percent had a degree with a major in early childhood education. Kindergarten teachers reported their race and/or ethnicity as Black (5.1%), White (78.2%), Hispanic and/or Latine (3.1%), Asian (4.8%), multiracial (7.2%) and other ethnicities (1.7%). They reported an average of 17.4 years of education (SD = .9) and 6.9 years of experience (SD = 6.5). Thirty-eight percent had a degree with major in early childhood education.

## Measures

Parents completed a demographic survey about themselves and their children (ethnicities, home languages, family income, children and adults in the home) at study enrollment. Schools provided additional information on home language as well as each child's age and gender. Teachers completed questionnaires that included teacher and classroom demographic information.

### Classroom environment indicators

The quality of teacher-child interactions was observed using the Classroom Assessment Scoring System (CLASS; Pianta et al., 2008). The CLASS is coded in multiple 25 minute cycles which include 15 minutes to observe and record classroom interactions and 10 minutes to code the 10 CLASS dimensions. Codes from each cycle are averaged together to arrive at a single set of classroom scores. Dimensions are coded on a seven-point scale with detailed behavioral descriptors of interactions at the low (1-2), mid (3-5), and high (6-7) ranges of effectiveness. Double-coded observations indicated strong agreement between coders (intraclass correlations (ICC) = .73 in pre-k, .69 in kindergarten). Dimensions were collapsed to form an overall teacher-child interactions score in keeping with previous research indicating that collapsing the scores is acceptable (Vitiello et al., 2018).

The amount of structured learning time was observed using the Classroom Snapshot during CLASS observation cycles. The Classroom Snapshot captures classroom-level activity settings (whole group, small group, individual time, free play and/or stations, routines and/or transitions, and meals). Activity settings are recorded using a continuous timing feature within the CLASS coding application: coders select setting code at the start of the observation and change it as the activity setting changes. Codes represent the proportion of each cycle that was dedicated to each setting and are averaged across cycles to arrive at classroom averages. Intraclass correlations indicated good agreement between coders (ICCs = .92 in pre-k, .83 in kindergarten). A variable representing teacher-structured activities was calculated by combining time spent in whole group, small group, and individual work time.

Each participating child's closeness with his or her teacher was measured using the Student-Teacher Relationship Scale (STRS; Pianta, 2001). The STRS asks teachers to report on their relationships with individual children in the classroom. Teachers responded to four items on closeness with each child ($\alpha$ = .82 and .83 for spring of preschool and fall of kindergarten, respectively), including items on the degree of warmth and open communication they share with the child.

### Child outcome measures

### Direct assessments

Three tasks measuring executive functioning skills were used to assess children's cognitive self-regulation. Working memory was measured using the Backwards Digit Span subtest (BDS; Carlson, 2005), which asks children to repeat sequences of numbers in reverse that increase in length. It has a median reliability coefficient of .88. This task has been widely used in the developmental literature as a test of working memory. Next, the Head-Toes-Knees-Shoulders assessment (HTKS; McClelland, Cameron, Connor, Farris, Jewkes, & Morrison, 2007) was used to examine a combination of children's inhibitory control, cognitive flexibility, and working memory. This task requires children to do the opposite behavior to what is stated verbally by the tester (eg, "When I say touch your head, you touch your toes") in a series of item sets with changing rules. Inhibitory control was also assessed using an adapted version of a standard peg-tapping task with pencils rather than pegs (adapted from Diamond & Taylor, 1996; Smith-Donald et al., 2007). This Pencil Tap assessment asks children to tap once when the assessor taps twice and vice versa. Percent of correct responses on this assessment has demonstrated good concurrent and construct validity with other measures of inhibitory control as well as predictive validity for school readiness outcomes such as phonemic awareness (Blair & Razza, 2007; Smith-Donald et al., 2007).

### Teacher report measures

Teacher ratings were used to assess children's social skills, learning behaviors, and disruptive behavior problems using the Teacher-Child Rating Scale (TCRS; Hightower et al., 1986). Teachers rated items on a 5-point Likert scale indicating how well each item characterized the child (1 = *not at all*, 3 = *moderately well*, 5 = *very well*). The task orientation subscale (eg, completes work,

works well without adult support; $\alpha = 0.92$), social competence scale (eg, has many friends, is friendly toward peers; $\alpha = 0.93$) and frustration tolerance scale (eg, accepts things not going his and/or her way, copes with failure $\alpha = 0.90$) were each comprised of five items. The conduct problems subscale included 6 items (eg, disruptive in class, defiant, overly aggressive with their peers; $\alpha = 0.89$).

## Procedure

At the beginning of the pre-k school year, participating teachers sent all parents or guardians of students enrolled in public pre-k slots in their classrooms a consent form and short family demographic survey. After parents provided consent, missing demographic information was provided by the pre-k program.

### Classroom observations

Classrooms were observed using the CLASS and the Classroom Snapshot observation measures, conducted on 2 to 3 days during the pre-K year (M = 2.72, SD = .49) and two days (M = 2.16, SD = .43) in kindergarten. Observation scores were averaged across days. During both years, observers arrived and began observations at the start of the school day and observed until the end of the day (around 2:30 pm for kindergarten classrooms and up until nap time for pre-K classrooms). Classrooms were observed across all activity settings except for "specials" (art, music, physical education, library) led by a "specials" teacher in a separate classroom, outside free-play and/or recess, or meals in cafeterias. During the pre-K year, observers alternated between cycles of CLASS observation and cycles of another observation rubric (mean CLASS cycles = 10.9, SD = 2.0, min/max = 4 - 16). During the kindergarten year, observers coded continuously with the CLASS (mean CLASS cycles = 17.0, SD = 2.5, min/max = 7 - 24).

### Surveys and teacher report measures

Teachers completed a survey in the fall and spring reporting their demographic characteristics, teaching practices, and attitudes. Teachers also completed rating scales on each participating child's social-emotional skills and behavioral self-regulation in the fall and spring of each study year and received a small stipend at each time point.

### Direct assessments

Direct assessments of children's executive functions skills were conducted for all children in the fall and spring of each year by trained data collectors. Data collectors completed a one-day training to learn the measures prior to assessing children and attended half-day refresher trainings before each subsequent wave of assessments. Children were assessed in a quiet space, outside of the classroom when possible. In pre-k, children were assessed in English unless they failed the language screener (PreLAS; Duncan & De Avila, 1998). Those that failed the language screener and spoke Spanish were then also assessed with parallel Spanish measures in the fall and spring of pre-k. In kindergarten, children were assessed in English unless their teacher indicated a concern that the child could not understand and respond to the assessments in English, in which case children were assessed in Spanish if Spanish was indicated as their home language.

An additional teacher survey measure was included in the current manuscript's sensitivity analyses to control for teachers' beliefs about children. The Ideas About Children Scale (also called the caregiver modernity scale; Schaefer & Edgerton, 1985) is a measure of child-centered vs adult-centered beliefs about children (eg, *Children should always obey the teacher; Children have a right to their own point of view and should be allowed to express it*). It includes sixteen items rated on a 5-point scale from strongly disagree to strongly agree. The scale had good internal consistency in the current sample ($\alpha = .78$).

## Analytic Approach

Three sets of regression models were tested using MPlus Version 7, with standard errors adjusted for kindergarten clustering. We used full-information maximum likelihood to account for missing data. Differences between pre-K and kindergarten were calculated by subtracting kindergarten experience values from pre-k values, so that positive values indicated a decrease from pre-k to kindergarten. The first set of models tested the associations of these differences (in teacher-child interactions, teacher-child closeness, and structured activities) with children's social-emotional skills and self-regulation in the fall of kindergarten, controlling for child skills in the spring of pre-k and pre-k classroom experiences. These models evaluated whether experiencing greater differences between grades was associated with children's well-being as they adjusted to kindergarten. The second set of models tested the associations between these differences and children's end of year scores (controlling for spring of pre-k scores) to determine whether the statistical effects of the differences persisted into the spring. The third set of models tested the associations between differences and children's lagged gains from fall to spring in kindergarten by adding fall of kindergarten scores into the models. Last, we tested interactions between the difference variables and children's race and/or ethnicity, home language, and gender predicting fall kindergarten scores to determine whether there were differential effects based on child characteristics. Outcome variables were each tested in separate models. All models controlled for student covariates (race and/or ethnicity, age, home language, and gender). For all models, we present standardized coefficients that can be interpreted as standard deviation units as an estimate of effect sizes. Note that correlational data analyses do not provide causal estimates and the "effects" should be interpreted as upper-bound or inflated effects relative to the effects that might be produced by a randomized control trial (Kraft, 2020). With that important caveat, we use Kraft's (2020) proposed benchmarks for interpreting the magnitude of effects in education research: under .05 is a small effect, from .05 to < .20 is a medium effect, and .20 and higher is a large effect.

Two additional sets of analyses were run to evaluate the sensitivity of results to different model specifications. First, we re-tested models one through three without controlling for pre-k classroom experiences to check that the difference scores themselves (and not the additive effects of the pre-k measures plus the difference between pre-k and kindergarten measures) were associated with the outcomes. Second, we re-tested the models with an expanded set of covariates (family income-to-needs, pre-k and kindergarten teachers' child-centered vs adult-centered teaching beliefs, and whether the student changed schools during the transition from pre-k to kindergarten).

## Results

### Descriptive Analyses

Descriptive analyses for children's experiences of differences are presented in Table 1 and children's social-emotional and self-regulation skills from the spring of pre-k through kindergarten are in Table 2. Results indicate that children experienced, on average, decreased quality of teacher-child interactions from pre-k to kindergarten, decreased closeness with teachers, and increased

**Table 1**

Comparisons of classroom processes across pre-kindergarten and kindergarten.

| Classroom processes* | Pre-k | | Kindergarten | | Child-Level Discontinuity(Pre-k – K) | |
|---|---|---|---|---|---|---|
| | M | SD | M | SD | M | SD |
| Teacher-child interactions | 4.39 | 0.49 | 4.09 | 0.51 | 0.34 | 0.70 |
| Teacher-child closeness | 4.33 | 0.73 | 4.03 | 0.83 | 0.33 | 0.95 |
| Prop. of teacher-structured activities | 0.36 | 0.12 | 0.77 | 0.09 | -0.40 | 0.15 |

* Teacher-child closeness was measured at the child level; Teacher-child interactions and teacher-structured activities were measured at the classroom level. All differences between pre-k and kindergarten were calculated at the child level

**Table 2**

Descriptive statistics for student outcomes across pre-k and kindergarten.

| | Spring of Pre-k M(SD) | Fall of K M(SD) | Spring of K M(SD) |
|---|---|---|---|
| Social-Emotional Skills | | | |
| Social Competence | 4.09(0.84) | 3.91(0.88) | 3.98(0.87) |
| Disruptive Behavior | 1.78(0.91) | 1.85(0.90) | 1.85(0.93) |
| Learning Behaviors | | | |
| Task Orientation | 3.68(0.96) | 3.33(1.06) | 3.40(1.09) |
| Frustration Tolerance | 3.40(1.00) | 3.36(0.97) | 3.37(0.99) |
| Executive Functions | | | |
| Heads-Toes-Knees-Shoulders | 30.55(27.72) | 44.51(27.96) | 55.52(26.43) |
| Pencil Tap | 0.71(0.31) | 0.86(0.23) | 0.93(0.17) |
| Backwards Digit Span | 1.41(0.75) | 1.61(0.86) | 2.21(1.09) |
| N, unique observations | 1358 | 1260 | 1207 |

time in teacher-structured activities. Teacher reports of social-emotional skills and learning behaviors appeared to stay level or decrease slightly over the study period, while direct assessments of executive functions increased between each time point.

### Differences and Kindergarten Entry Scores

The first set of models (Table 3) examined associations between differences in children's classroom experiences across the transition from pre-k to kindergarten and children's social-emotional skills and self-regulation in the fall of kindergarten. These analyses address whether differences experienced during the transition to kindergarten show an early association with children's adjustment as they start the school year.

*Teacher-child interactions*

Controlling for the level of interactions children experienced in pre-k, a one unit decrease in the quality of teacher-child interactions from pre-k to kindergarten was associated with marginally higher teacher-reported conduct problems (B = .110, SE = .050, $P < 0.05$) and lower scores on the HTKS executive functions task (B = -.105, SE = .039, $P < 0.01$). For education research, these effects may be considered medium (Kraft, 2020).

*Teacher-child closeness*

Controlling for spring pre-k teacher-child closeness, experiencing a one-unit decrease in teacher-child closeness from pre-k to kindergarten was associated with lower teacher ratings of social competence (B = -.472, SE = .039, $P < 0.001$), higher ratings of conduct problems (B = .135, SE = .035, $P < 0.001$), lower ratings of task orientation (B = -.280, SE = .036, $P < 0.001$) and frustration tolerance (B = -.255, SE = .038, $P < 0.001$), and marginally lower scores on the inhibition task (B = -.084, SE = .040, $P < 0.05$). The effects of changes in teacher-child closeness may be considered medium (inhibition, conduct problems) to large (frustration tolerance, task orientation, social competence) within the context of education research (Kraft, 2020).

*Teacher-structured time*

Controlling for pre-k experiences of teacher-structured time, a one-unit decrease in teacher-structured time was associated with marginally increased HTKS executive functions scores (B = .100, SE = .047, $P < 0.05$; and, therefore, *increased* teacher-structured time was associated with lower HTKS scores). This correlational effect falls into the medium range (Kraft, 2020).

### Differences and Spring Kindergarten Scores

The next set of models (Table 4) examined whether the associations between difference scores and student's social-emotional skills and self-regulation remained significant to the end of kindergarten without controlling for fall kindergarten skills. These models help to determine whether the mean-level effects associated with the discontinuities persist across the kindergarten year.

*Teacher-child interactions*

Controlling for pre-k experiences of teacher-child interactions, experiencing a decrease in the quality of teacher-child interactions from pre-k to kindergarten was associated with higher conduct problems (B = .172, SE = .045, $P < 0.001$) and marginally lower scores on the HTKS executive functions task (B = -.105, SE = .044, $P < 0.05$) at the end of kindergarten. These effects fall into the medium range for education studies (Kraft, 2020).

*Teacher-child closeness*

Controlling for spring pre-k teacher-child closeness, experiencing a decrease in closeness from pre-k to kindergarten was associated with lower ratings of social competence (B = -.309, SE = .043, $P < 0.001$), task orientation (B = -.187, SE = .039, $P < 0.001$), and frustration tolerance (B = -.127, SE = .040, $P < 0.01$) and marginally lower scores on the HTKS executive functions task (B = -.103, SE = .042, $P < 0.05$). These effects fall into the medium to large ranges (Kraft, 2020).

**Table 3**
Differences predicting fall kindergarten scores.

| Predictors | Social-Emotional Skills | | | | Learning Behaviors | | | | Executive Functions | | | | | |
| | Social Competence | | Conduct Problems | | Task Orientation | | Frustration Tolerance | | Inhibition/ Working Memory/ Switching (HTKS) | | Inhibition (Pencil Tap) | | Working Memory (BDS) | |
| | B | SE | B | SE | B | SE | B | SE | B | SE | B | SE | B | SE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Spring of Pre-K Score | .258*** | .039 | .496*** | .031 | .425*** | .033 | .400*** | .033 | .588*** | .024 | .528*** | .025 | .454*** | .031 |
| Interactions Pre-K | .064 | .058 | -.141** | .048 | .117** | .041 | .130* | .051 | .114** | .037 | .016 | .037 | .070* | .034 |
| Decrease in Interactions | -.016 | .060 | .110* | .050 | -.076 | .045 | -.091 | .052 | -.105** | .039 | .006 | .041 | -.036 | .045 |
| Closeness Pre-K | .290*** | .046 | -.015 | .035 | .139*** | .035 | .119* | .046 | .056 | .032 | .081* | .035 | .093** | .028 |
| Decrease in Closeness | -.472*** | .039 | .135*** | .035 | -.280*** | .036 | -.255*** | .038 | -.004 | .035 | -.084* | .040 | -.025 | .036 |
| Teacher-Structured Time Pre-K | -.043 | .068 | -.056 | .050 | .043 | .067 | <.001 | .069 | -.097* | .044 | .053 | .038 | -.054 | .045 |
| Decrease in Structured Time | .084 | .076 | -.007 | .057 | -.003 | .075 | .069 | .078 | .100* | .047 | -.022 | .042 | .040 | .047 |
| Significant Interaction Terms | | | | | | | | | | | | | | |
| Male* Decrease in Interactions | | | .133* | .055 | | | | | -.127** | .048 | | | | |
| Male* Decrease in Closeness | -.492*** | .054 | .130** | .042 | -.326*** | .047 | -.257*** | .054 | | | | | | |
| English* Decrease in Teacher-Structured Time | | | | | | | | | | | | | .062* | .031 |

Analyses control for child gender, age, race/ethnicity, and home language.
* P < 0.05;
** P < 0.01;
*** P < 0.001.

**Table 4**
Differences predicting spring kindergarten scores (without controlling for fall kindergarten scores).

| Predictors | Social-Emotional Skills | | | | Learning Behaviors | | | | Executive Functions | | | | | |
| | Social Competence | | Conduct Problems | | Task Orientation | | Frustration Tolerance | | Inhibition/ Working Memory/ Switching (HTKS) | | Inhibition (Pencil Tap) | | Working Memory (BDS) | |
| | B | SE | B | SE | B | SE | B | SE | B | SE | B | SE | B | SE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Spring of Pre-K Score | .312*** | .042 | .532*** | .029 | .410*** | .032 | .392*** | .038 | .459*** | .025 | .320 | .035 | .342*** | .030 |
| Interactions Pre-K | .067 | .055 | -.148** | .043 | .069 | .048 | .059 | .055 | .105** | .038 | .059 | .048 | .070 | .042 |
| Decrease in Interactions | -.049 | .065 | .172**** | .045 | -.092 | .060 | -.072 | .056 | -.105* | .044 | -.059 | .054 | -.078 | .046 |
| Closeness Pre-K | .174*** | .044 | .047 | .033 | .096* | .040 | .046 | .047 | .136*** | .039 | .057 | .041 | .118** | .034 |
| Decrease in Closeness | -.309*** | .043 | .056 | .036 | -.187*** | .039 | -.127** | .040 | -.103* | .042 | -.015 | .052 | -.075 | .043 |
| Teacher-Structured Time Pre-K | -.009 | .073 | -.078 | .060 | .025 | .072 | .006 | .072 | -.043 | .051 | -.052 | .051 | -.038 | .052 |
| Decrease in Structured Time | .032 | .082 | .039 | .060 | -.015 | .073 | .034 | .078 | .087 | .056 | -.005 | .057 | .012 | .054 |

Analyses control for child gender, age, race/ethnicity, and home language.
* P < 0.05;
** P < 0.01;
*** P < 0.001.

*Teacher-structured time*

There were no associations between differences in teacher-structured activities from pre-k to kindergarten and children's outcomes at the end of kindergarten.

## Differences and Lagged Gains from Fall to Spring of Kindergarten

The final set of models examined whether experiencing larger differences between pre-k and kindergarten were associated with children's gains from fall to spring in kindergarten by including fall kindergarten scores in the analyses (Table 5). These analyses help to determine whether larger differences are associated with children's rate of change from fall to spring in kindergarten; addressing the question, do children who experience larger differences develop social-emotional and self-regulation skills at a faster or slower rate than children who experience smaller differences?

*Teacher-child interactions*

Controlling for children's experiences of teacher-child interactions in pre-k, experiencing a decrease in the quality of teacher-child interactions from pre-k to kindergarten was significantly associated with greater gains in conduct problems in kindergarten (B = .113, SE = .037, $P < 0.01$), with a medium effect size.

*Teacher-child closeness*

Controlling for children's experiences of teacher-child closeness in pre-k, experiencing a decrease in closeness from pre-k to kindergarten was associated with smaller fall-to-spring gains on the HTKS executive functions task (B = -.103, SE = .037, $P < 0.01$), with a medium effect size.

*Teacher-structured time*

There were no associations between differences in teacher-structured time from pre-k to kindergarten and children's gains across the kindergarten year.

## Interactions with Race/Ethnicity, DLL Status, and Gender

We tested interactions between difference scores and children's race and/or ethnicity, home language, and gender predicting kindergarten entry skills to examine the degree to which some students experienced differential effects of discontinuities during the transition to kindergarten. Race and/or ethnic categories included Black, White, Hispanic and/or Latine, and Asian and/or Other, with Hispanic and/or Latine as the referent group. Home language categories included English, Spanish, and other languages, with Spanish as the referent group. Gender included males and females with females as the referent group. Although a small number of interactions emerged as significant, results should be interpreted cautiously. There was only one significant interaction for children's home language – indicating that English-speaking students had higher working memory scores when they experienced greater increases in teacher-structured time. There were no significant interactions detected for race and/or ethnicity.

There was a consistent pattern of interactions for gender (see the bottom of Table 3) indicating stronger associations between differences in classroom experiences and outcomes for boys, rather than girls. When boys experienced larger decreases in teacher-child closeness, they showed lower social competence, task orientation, and frustration tolerance, and higher conduct problems, compared

**Table 5**
Differences predicting lagged gains in scores from fall to spring in kindergarten.

| Predictors | Social-Emotional Skills | | | | Learning Behaviors | | | | Executive Functions | | | | | |
| | Social Competence | | Conduct Problems | | Task Orientation | | Frustration Tolerance | | Inhibition/ Working Memory/ Switching (HTKS) | | Inhibition (Pencil Tap) | | Working Memory (BDS) | |
| | B | SE | B | SE | B | SE | B | SE | B | SE | B | SE | B | SE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Spring of Pre-K score | .153*** | .041 | .266*** | .042 | .121*** | .027 | .118*** | .032 | .194*** | .030 | .076* | .033 | .191*** | .032 |
| Fall of K Score | .614*** | .030 | .586*** | .038 | .673*** | .024 | .694*** | .024 | .456*** | .030 | .434*** | .046 | .339*** | .033 |
| Interactions Pre-K | .025 | .038 | .062 | .036 | -.012 | .038 | .030 | .038 | .053 | .036 | .051 | .043 | .044 | .040 |
| Decrease in Interactions | -.054 | .045 | .113** | .037 | -.057 | .043 | -.021 | .041 | -.057 | .040 | -.063 | .049 | -.065 | .042 |
| Closeness Pre-K | -.01 | .033 | .053 | .028 | .011 | .030 | -.032 | .028 | .113** | .034 | .018 | .039 | .087** | .032 |
| Decrease in Closeness | -.013 | .040 | -.019 | .029 | -.005 | .03 | .041 | .030 | -.103** | .037 | .031 | .048 | -.067 | .038 |
| Teacher-Structured Time Pre-K | .034 | .053 | -.058 | .048 | .007 | .044 | .009 | .048 | .005 | .046 | -.072 | .049 | -.021 | .049 |
| Decrease in Structured Time | -.027 | .059 | .059 | .046 | -.005 | .030 | -.013 | .049 | .037 | .050 | .031 | .048 | .004 | .052 |

Analyses control for child gender, age, race/ethnicity, and home language.
* $P < 0.05$;
** $P < 0.01$;
*** $P < 0.001$.

with girls. When they experienced larger decreases in teacher-child interactions, boys showed higher conduct problems and had lower scores on the HTKS executive functions task compared with girls.

## Sensitivity Analyses

We conducted analyses that examined associations between difference scores and student outcomes *without* controlling for pre-k classroom experiences, to determine whether the discrepancy or experience of change itself was associated with the outcomes, without reference to the pre-k classroom experience. These results showed a similar pattern but with slightly smaller effects and no significant associations for the direct assessments of executive functions. Analyses that included additional covariates showed the same pattern of results, but with slightly larger effects. Tables depicting these results are available as online supplemental material.

## Discussion

There is currently a great deal of research and theory that seeks to understand children's transitions into kindergarten and how transition experiences contribute to adjustment to school. Much of this has centered on issues of academic continuity between pre-k and kindergarten systems, with a growing emphasis on continuity in children's daily classroom experiences across grade levels. However, although there are policy initiatives that aim to increase continuity (Stipek et al., 2017), much of this work is theoretical and very little research has attempted to understand the effects that continuity and difference may have on students, especially in terms of social-emotional development and self-regulation. A greater focus on empirical work is needed to confirm or disconfirm theory-driven hypotheses regarding the effects of transitions on students and to drive future research and intervention. This is the gap that the current paper sought to address.

Results of this study suggest that differences between pre-K and kindergarten classroom experiences do show associations with children's social-emotional skills and self-regulation, especially early in the kindergarten year. The results also suggest that differences are, for the most part, not associated with rates of development in kindergarten, and that student race and/or ethnicity and home language do not systematically interact with differences to affect outcomes. Taken together, findings indicate that experiencing a decrease in teacher-child interactions and teacher-child closeness between pre-k and kindergarten is associated with lower social-emotional skills and self-regulation at the beginning of kindergarten. Some of these effects persist to the end of kindergarten, but the persistent effects largely represent stable mean-level differences between students rather than changes in children's rates of growth in kindergarten. Additionally, boys appear to experience larger negative effects than girls during the initial transition into kindergarten.

### Experiences from Pre-k to Kindergarten

In keeping with prior research on Head Start children's transitions (Abry et al., 2018) as well as previous analyses of this sample comparing pre-k and kindergarten classrooms (Vitiello et al., 2020), most students in this study experienced substantial changes in their daily classroom experiences from pre-k to kindergarten. Students tended to move from classrooms with more positive and supportive teacher-child interactions into classrooms with less supportive interactions. Individual teacher-child relationships were less close at the start of kindergarten than they were at the end of pre-k, when children and teachers had established close relationships. Additionally, children experienced large increases in teacher-

structured activities as they transitioned into kindergarten. This is well in line with studies that have shown that kindergarten has become more academic and more structured over the past few decades (Bassok et al., 2016). These findings underscore the fundamental differences between pre-k and kindergarten and the challenges in determining what it might mean to bring these experiences into closer alignment (Scott-Little & Reid, 2010).

Do these areas of discontinuity matter for children? The most striking result of this study was the consistent finding that children experiencing a decrease in teacher-child closeness from pre-k to kindergarten were rated lower on social-emotional skills and self-regulation by their new teachers and demonstrated marginally lower levels of inhibitory control. These effects ranged from moderate to large, suggesting that they are educationally meaningful. The results suggest the possibility that children with prior experiences of close teacher-child relationships may react to a more distant relationship with their new kindergarten teachers by withdrawing from social partners, having difficulty maintaining behavioral engagement with tasks, struggling to maintain cognitive control, or even acting out. If confirmed in subsequent studies, this would concord with developmental theories, such as attachment theory, which suggest that losing a connection to a caregiver can be harmful to children's psychosocial development (Bergin & Bergin, 2009), as well as research indicating that children transitioning into a new environment show elevated levels of stress (Rickmeyer et al., 2017). Alternatively, it may be that children feel less supported in classrooms that provide lower levels of a key classroom resource, like a close and trusting teacher-child relationship, than they were accustomed to.

Notably, students who experienced decreased teacher-child closeness from pre-k to kindergarten had poorer outcomes for social skills, task orientation, frustration tolerance, and the HTKS executive functions task that persisted to the end of kindergarten; and lagged models indicated that children's gains on the HTKS were also negatively affected. This suggests that students may be affected by the loss of a close teacher-child relationship past the initial transition into kindergarten.

Teacher-child interactions showed less consistent associations but a similar pattern of results. While pre-k teacher-child interactions were associated with multiple positive outcomes in the fall of kindergarten, experiencing a decrease in teacher-child interactions was associated with increased conduct problems and lower HTKS executive functions scores. This suggests that children had more difficulty with cognitive and behavioral regulation after experiencing decreases in the quality of interactions. Beyond close teacher-child relationships, high quality interactions provide children with safe structure, predictable routines, and opportunities to actively engage with learning (Pianta et al., 2008). Young children who have benefited from these supports in pre-k may struggle to adapt to a new environment that provides less of these supports.

Contrary to expectations, differences in time spent in teacher-structured activities were not consistently associated with child outcomes. More structured time in pre-k was associated with lower HTKS executive functions scores in the fall of kindergarten, and experiencing a decrease in structured time was associated with increased executive functions scores in the fall. These effects did not persist to the end of kindergarten, though, and there was no evidence that discrepancies in structured time were associated with the magnitude of children's gains from fall to spring. It may be that teacher-child relationships and interactions were more salient to children's social-emotional and self-regulation skills than time spent in structured learning. It is also possible that the content of teacher-structured activities is more important than the amount of time in these settings, or that the combination of structure and quality jointly influences outcomes (Rimm-Kaufman et al., 2005).

## Gender and the Transition to Kindergarten

Boys had poorer outcomes than girls when they experienced larger decreases in classroom resources, especially when those differences were in teacher-child closeness. These findings are in line with prior research showing differences between boys and girls both in terms of teacher-rated skills and in how they respond to transitions in early childhood. Boys tend to be rated lower on social-emotional and self-regulation skills than girls by their teachers (Barbarin, 2013; Matthews et al., 2009), and teachers tend to report less close relationships with boys than girls overall (Jerome et al., 2009). There is also evidence that interventions to improve school entry social-emotional skills may be less effective for boys than girls (Berlin et al., 2011). Two separate profile analyses of Black and Latino boys using the Early Childhood Longitudinal Study – Birth Cohort (ECLS-B) identified skill profiles that showed declining academic skills (Latino boys) and declining academic and social-emotional skills (Black boys) from age four to kindergarten (Iruka et al., 2020; Iruka et al., 2014). Boys in these profiles were more likely than boys in other profiles to have attended center-based pre-k, providing further indication that boys who attended pre-k may be vulnerable to challenges as they start kindergarten (Iruka et al., 2020; Iruka et al., 2014). The current findings add to this larger picture, suggesting that early educators should be concerned about boys' development across the transition into school. It may be that boys have unique vulnerabilities to stressful transition experiences, whether because they are more strongly affected by specific stressors or because they are viewed differently by teachers. These are areas in need of further exploration.

## Implications and Future Directions

It is encouraging that differences between early educations settings were, for the most part, not negatively associated with gains in kindergarten. However, it would have been more encouraging to see that students bounced back from challenging transition experiences by regaining lost ground. This would have been apparent if students who experienced larger differences had larger gains in kindergarten from fall to spring, suggesting that negative effects were temporary and diminished over the school year. Instead, the pattern of results implies a potential mediation pathway: larger pre-k-to-kindergarten discrepancies are associated with students having poorer social-emotional and self-regulation skills at school entry, and then children's skills remain fairly stable (in terms of rank-order) in kindergarten from fall to spring. This possibility is underscored by the stability of children's fall and spring kindergarten assessments. If this mediation is confirmed in future research, it suggests that poor transition experiences may have longer-term implications for children's social-emotional and self-regulation standing within their classes, at least as perceived by teachers. Future studies should examine whether these long-term associations hold.

This study examined a limited set of pre-k to kindergarten differences, and other factors may be salient during children's transitions. For children from racially minoritized backgrounds, teachers' use of culturally sensitive pedagogy and culturally sensitive interactions will be important to consider in future work. For dual language learners, how teachers incorporate home languages and home cultures may be developmentally salient across the transition, as well as how effectively teachers can communicate with parents. Other authors have also suggested the importance of measuring content alignment between pre-k and kindergarten (McCormick et al., 2021). Future studies should delve into these and other factors that may affect children's transition experiences.

Because all children in the current analysis attended pre-k, it is impossible to determine whether the results of this study have any bearing on the pre-k convergence effect. If anything, transitioning from being at home with family members or from a family child-care program would likely present non-attenders with even starker differences to overcome. For children cared for by family members, though, the transition into kindergarten may not disrupt a trusted caregiver relationship in the way that leaving a pre-k teacher does. A close relationship with a caregiver at home should support children in forming close relationships with adults at school (Bergin & Bergin, 2009). More research is needed to understand how transition experiences are associated with early social-emotional and self-regulation development among a broader range of children, including pre-k attenders and non-attenders and children with more and less exposure to adversity.

The sensitivity analyses that examined the difference scores alone, without controlling for pre-k experiences, largely confirmed the associations found in the main analyses. The exception is that none of the difference scores alone were associated with outcomes on the direct assessments. This may mean that different processes are at work for children's directly assessed executive functions. For example, executive functions may be sensitive to children's exposure to quality over two years rather than the experience of change from pre-k to kindergarten. Further work is needed examine and confirm this finding.

Although this research is not causal, we propose several policy implications for consideration. School systems should consider approaches to supporting closer teacher-child relationships in kindergarten. Several intervention programs have shown promise for improving teachers' relationships with children who demonstrate elevated behavior problems by supporting teachers to engage in specific, positive ways with these children (Sutherland et al., 2018; Williford et al., 2017). Some of these techniques may be more broadly applicable to children entering school from public pre-k. Providing time and incentives for teachers to conduct home visits may also strengthen relationships between teachers, children, and families, and lay the groundwork for closer teacher-child relationships (Sayers et al., 2021). Additionally, even in non-tested grades like kindergarten, teachers report high levels of standardized test-related stress (Saeki et al., 2018) which may impede the formation of close relationships. Intentionally creating time for children and teachers to connect at the beginning of the year could counteract this source of stress.

Improving teacher-child interactions in kindergarten may also support better transitions for children. Coaching and professional development programs that focus on improving interactions at the classroom level have been effective in this regard (Pianta et al., 2008). These programs help teachers recognize and adjust their interactions with children in the moment, seeking to increase the amount of warm, supportive, and cognitively stimulating interactions that teachers provide. Programs that target effective interactions may draw on peer mentors or existing instructional coaches to decrease costs and increase feasibility.

## Limitations

This work has several limitations that are worth noting. First, the study relied heavily on teacher reports. It is particularly important to note that the measure of teacher-child relationships was completed from the perspective of the teacher, not the child. Teacher reports can be racially biased (Jamil et al., 2018) or unreliable (Mashburn & Cash, 2004), and there is evidence that teachers self-norm their ratings so that scores are more valid for comparing students to each other within classrooms rather than across classrooms (Vitiello & Williford, 2021). However, sensitivity analyses that controlled for teacher attitudes did not affect the results, and

findings indicated small to moderate associations between pre-k and kindergarten teachers' ratings of students, indicating that they likely captured some consistent information about students as individuals.

Another limitation is that these analyses examined difference scores between pre-k and kindergarten experiences. Difference scores can be prone to error, although this is not always the case, especially when the two scores are not highly correlated (Grimm, 2018). In the current study, pre-k and kindergarten observation data were not significantly correlated, and teacher ratings of closeness were correlated at $r = 0.26$, so the reliance on difference scores may not be a major concern. However, it is worth noting that other analytic approaches may help shed further light on the questions addressed in this analysis. Future work may look at classroom profiles in pre-k and kindergarten, for example, or use longitudinal models that treat classroom experiences as time-varying predictors. Yet another approach could be to create something akin to a risk index (Pratt et al., 2016), which would identify children who experienced substantial changes across multiple classroom indicators; this would reduce continuous data to categorical indicators, but has the advantage of answering the question, "are there greater effects associated with experiencing multiple shifts in classroom experiences?" All of these approaches have merits and should be the foci of future work.

This research examined key elements of children's pre-k and kindergarten experiences, but there are other aspects of the early education environment that will be important to explore in more depth in future studies. For example, we had little information about children's cultural and family backgrounds beyond basic demographic characteristics, and we did not collect information on classroom cultural sensitivity or teachers' views or practices related to children's racial, ethnic, and language backgrounds. This is a limitation in the current study that will need to be addressed in the future through different data sources.

Three additional limitations warrant discussion. First, this research was conducted within a single school district. All of the children were from low-income families and had been enrolled in public pre-k within the district. These factors may limit the generalizability of the findings, both beyond this district and to other populations of children. Second, this study used measures that have typically not been studied with child samples as ethnically and linguistically diverse as we had, factors which may affect their reliability. Third, this is an observational study and cannot support causal inferences. Although we statistically controlled for multiple potential confounders, observational studies cannot replace randomized trials and must be interpreted cautiously.

## Conclusions

The current findings provide evidence that differences between pre-k and kindergarten experiences may have implications for children's development of social-emotional and self-regulation skills. In particular, transitioning from having a closer teacher-child relationship to a less-close relationship was associated with lower ratings of social competence and learning behaviors and higher ratings of disruptive behavior; and a similar (though more limited) pattern of results was found for teacher-child interactions. These findings need replication and expansion, but at this preliminary level they suggest that school leaders should pay further attention to the quality of teacher-child interactions and relationships as children transition into kindergarten. While this research underscores the challenges in understanding and aligning children's early classroom experiences, it also provides important directions for future work in this area.

## Disclosures

None.

## Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.ecresq.2021.11.009.

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