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A new look at teacher interactional quality: Profiles of individual teacher-child relationship and classroom teaching quality among Head Start students

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Abstract

Preschool teachers' relationships with children are a critical component of classroom quality. We draw from a sample of N=2,114 children attending Head Start to examine child-centered profiles of experiences across two dimensions of classroom interaction quality that are often considered separately, individual teacher-child closeness and conflict and classroom-level instructional and emotional support. Findings reveal considerable heterogeneity in Head Start children's experiences, as the profiles differed on individual conflict, and classroom emotional and instructional support. The largest profile was characterized by a positive emotional climate and low instructional support. Higher teacher distress was associated with the highest quality and the highest conflict profiles. The results also revealed early evidence for gender and race and ethnicity-based disadvantages in Head Start classroom experiences.

Introduction

Improving the quality of Early Childhood Education (ECE) experiences, especially for children from socioeconomically disadvantaged backgrounds is the focus of considerable investment at the federal, state, and local levels. However, children's experiences in ECE settings are dynamic and variable across children, teachers, classrooms and ECE providers. This complexity which makes defining, describing, and promoting quality experiences to close socioeconomic achievement gaps for all children an ongoing and complex challenge for researchers, policy makers, and educators (e.g., Burchinal, 2018; Hong et al., 2019). We

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bring together what are often considered two separate aspects of preschool classroom quality – dyadic teacher-child relationships and classroom-level teacher support, which reflects the quality of interactions across all children and teachers in the classroom. Evidence linking these two aspects of classroom quality to school readiness is mixed (Burchinal et al., 2010; Hatfield et al, 2016; Howes et al., 2008; Guerrero-Rosada et al., 2021), as they are usually considered separately in the developmental literature. However, individual children experience these two aspects of classroom environments simultaneously (Mortensen & Barnett, 2014), and these indicators of interaction quality are likely interdependent (Hong et al., 2019). It is critical, therefore, to examine how these experiences cluster together at the individual level. Using a child-centered analysis, we drew from a sample of children attending Head Start in 2009 or 2010 to identify the profiles of interactional quality that characterize the experiences of children attending Head Start, as well as the child and teacher characteristics associated with these profiles.

Theoretical Approach

A developmental systems framework conceptualizes the ecology of child development as comprised of multiple contexts, each exerting their own influence on developmental change (Bronfenbrenner & Morris, 2006). For Head Start participants, the classroom context makes a unique contribution to child development, independent of home and family influences. For example, multiple reports from the Head Start Child and Family Experiences Survey (FACES) demonstrate that children's cognitive, language, social, and emotional development is supported in Head Start programs, over and above the influence of parental, family, and home characteristics (Aikens et al., 2016; Hindman et al., 2010; Moiduddin et al., 2012). The developmental systems framework also posits that within the classroom context, children's development is a direct result of transactional processes, consisting of bidirectional behavior exchanges between children and teachers (Sameroff, 2009). Transactional processes occur when teachers and children are engaged in exchanges such as conversations and scaffolded learning activities that are related to classroom instruction, emotional support and establishing and maintaining their relationship. These aspects of the preschool experience are the catalysts for children's early learning outcomes (Pianta et al., 2016). Further, these transactions are dynamic, and influenced by the individual characteristics of both parties (Hamre et al., 2014; Sroufe, 1995). Therefore, the interactions teachers and children establish in the classroom are dependent on the individual characteristics and behaviors of both, the teacher and the child (Sabol et al., 2017). The developmental systems framework characterizes children's experiences of teacher interactional quality from multiple perspectives and levels, including the teachers' reports of relationships with individual children as well as observer ratings of overall teacher interactional quality.

The transactional processes examined in the present study are operationalized as individual teacher-child relationship quality, as reported by teachers, and classroom-level instructional and emotional support, as observed by trained raters. These processes are malleable aspects of Head Start classrooms associated with early learning outcomes. (Aikens et al., 2016; Howes et al., 2008; Moiduddin et al., 2012). Further, research studies in this area have demonstrated that when individual relationship quality and classroom-level support

are considered together, each plays a unique role in children's early learning outcomes, suggesting that they are distinct and important elements of preschool process quality (Howes et al., 2008).

Individual Teacher-Child Interaction Quality

The relationships teachers and children build represent one important aspect of the transactional interactions that take place in preschool classrooms. From a developmental systems perspective, teachers and children elicit behaviors and responses in one another, providing a context for learning grounded in interpersonal relationships (Sabol & Pianta, 2012). This relationship is then used to create a foundation from which to scaffold school readiness skills in the classroom (Burchinal et al., 2021; Goble et al., 2014). These teacher-child relationships in preschool are dyadic and can be characterized along the dimensions of teacher-perceived closeness and conflict (as measured by the Student-Teacher Relationship Scale; Pianta, 2001). Teacher-child relationships characterized by a high degree of closeness are warm, affectionate, and comfortable. Alternatively, relationships characterized by a high degree of conflict are regarded as negative and lack a supportive rapport between the teacher and child (Sabol & Pianta, 2012). Further, a large body of literature provides evidence that preschool teacher-child relationships characterized by a high closeness and low conflict are linked to reduced behavior problems and improved social and emotional outcomes (e.g., Burchinal et al., 2021; Goble & Pianta, 2017; Howes, 2000; Lippard et al., 2018; Sabol & Pianta, 2012). When children participate in relationships with teachers characterized by high closeness and low conflict, they may be more likely to engage in other classroom experiences that promote language development and the acquisition of problem solving skills and literacy (Burchinal et al., 2021; Goble et al., 2019; Stuhlman & Pianta, 2002).

Classroom Interaction Quality

Classroom-level support reflects the quality of interactions that take place across all children and teachers in the classroom (e.g., Classroom Assessment Scoring System (CLASS); Pianta & Hamre, 2009).This support represents a more distal aspect of process quality than dyadic relationships, and is distinct from traditional measures of classroom quality (e.g., the Early Childhood Environmental Rating Scale; Harms et al., 1998) that focus on interactions as one component of quality within the physical environment and safety of the classroom. Classroom-level support can be characterized by the degree of emotional and instructional support teachers provide to students. In emotionally supportive classrooms, teachers foster a climate of respect and communication, thus fostering positive relationships. They limit punitive and negative behaviors while being aware, responsive, and comforting towards children's needs. Emotionally supportive teachers are also flexible in their approaches and respect children's perspectives. In instructionally supportive classrooms, teachers foster learning through analysis, reasoning, and creativity. In addition, these teachers provide quality feedback to children and facilitate language with conversations, open-ended questions and extensions (Pianta & Hamre, 2009).

Instructional and emotional support are distinct dimensions of classroom quality, which means that teachers may have variable scores across these two scales (Hong et al., 2019), highlighting the importance of understanding how individual children experience both

instructional and emotional support simultaneously in their Head Start classrooms. Further, although instructional support plays a role in children's language and literacy development, it tends to be the lowest scoring domain (Perlman et al., 2016), including among Head Start classrooms (Aikens, 2016; Moiduddin et al., 2012). To date, we are aware of only one study that examined subgroups of children, or profiles, based on scores of both instructional and emotional supports. Specifically, in their analysis of 692 public preschool classrooms, LoCasale-Crouch and colleagues (2007) revealed five distinct profiles, one reflecting the highest levels of instructional and emotional support, three mid-range profiles reflecting varying good to moderate levels of support and one profile reflecting the lowest quality with the lowest levels of instructional and emotional support. Interestingly, the profiles were not clearly defined by structural features of the preschool programs and classrooms, however, the lowest quality profile contained higher proportions of children in poverty, children of color, and children whose mothers had the lowest levels of education.

Despite considerable evidence for the importance of classroom-level support, particularly instructional support, in the development of early learning skills, often times hypothesized effects are small or null (Perlman et al., 2016; Guerrero-Rosada et al., 2021), potentially indicating that the transactional processes that lead to change in outcomes are more nuanced than adequately captured by classroom-level assessment of interaction quality (Mortensen & Barnett, 2014). And, foundationally, it is important to understand how many children, particularly low-income children, are experiencing quality teacher interactions on both individual and classroom-levels. The reliance on classroom-level indicators of interactional quality does not capture the experiences of many individual children; some research suggests that within a classroom rated as high quality, only a small percentage of children are consistently engaging in high quality interactions with teachers (e.g., Jeon et al., 2010; Melhuish, 2001). Thus, it appears necessary to move away from direct effect models that consider individual relationships and classroom-level support as separate elements of children's experiences in preschool.

Classroom Support-Individual Relationships

When classroom-level support and individual relationship quality are considered together, children build warm and supportive relationships with teachers and engage in interactions with teachers and peers that promote learning, confidence, and prosocial skills (Hamre, 2014; Sabol & Pianta, 2012). Drawing data from a nationally representative sample and using a variable-centered approach, Lippard and colleagues (2018) reported that individual teacher-child relationship quality and observed classroom interactions interacted to predict children's preschool learning outcomes. These findings underscore the need to simultaneously consider these two dimensions of children's preschool classroom experiences. Yet, the interplay between these two-levels of interactional quality currently remains understudied. These complex processes may be better captured by analytic approaches that consider unique profiles of individual relationships and support as experienced by individual children in the classroom context. In the present study, we examine profiles of teacher-child closeness and conflict and instructional and emotional support, which reflect distinct patterns of individual children's interactional quality experiences in their Head Start classrooms. Currently, we are aware of only two studies

of preschoolers that examined profiles of instructional and emotional support – one study in Chinese preschools (Hu et al., 2018), and another in public pre-kindergarten classrooms in the United States (LoCasale-Crouch et al., 2007), but neither study considered individual teacher-child relationship quality, nor were they focused on economically disadvantaged children.

Teacher Interactional Quality as it Relates to ECE Programs, Policies, and Professional Development

Understanding the interplay of both global and individual teacher interactional quality is of considerable importance for measuring quality for ECE quality improvement purposes. Global classroom quality ratings are the focus of quality improvement initiatives (Keys et al., 2013), and 11 states use the CLASS measure, specifically, to inform their QRIS ratings (Build Initiative, 2021). However, quality rating determinations balance CLASS scores with other program characteristics, including teacher education level and teacher: child ratio; analyses of QRIS data in North Carolina and California found sizeable proportions of programs with low quality ratings having high CLASS scores (Hestenes et al., 2015; Zellman & Karoly, 2015), as other program-level characteristics outweighed the impact of CLASS and other global environmental scale scores. Analyses of QRIS data from ECE programs in Louisiana found that CLASS scores were associated with children's gains in language, literacy, and math skills, and that typical structural indicators were not associated with gains (Markowitz et al., 2020). Taken together, how much weight interactional quality scores have in the measurement of quality remains an important line of inquiry as states seek to build second-generation QRIS. And, given mounting evidence for the importance of individual teacher-child interactions in promoting children's learning and social competencies (Burchinal et al., 2021), it is important to understand if children in classrooms with high CLASS scores, who may be identified as experiencing high quality centers, are also experiencing high quality individual teacher-child relationships.

Child and Teacher Correlates of Individual and Classroom Interactional Quality

Characteristics of the child and teacher may alter the nature of transactional classroom processes (Palermo et al., 2007). Turning first to children's characteristics, in general, preschool teachers tend to report closer and less conflicted relationships with girls than boys (Baker, 2006; Hamre & Pianta, 2001; Choi & Dobbs-Oates, 2016). There is also some evidence that children of color in comparison to White children may be more likely to experience lower quality individual relationships with teachers that are characterized by higher conflict and lower closeness (Garner et al., 2021; Garner & Mahatmya, 2015), and lower levels of classroom-level teacher interactional quality, such as instructional and emotional support (LoCosale et al., 2007). These early inequities in the quality of preschool interactions may contribute to challenges in closing early race-based achievement gaps. However, these approaches to considering racial differences in interactional quality experiences have not simultaneously considered individual and classroom-level interactions, especially from a child-centered perspective.

Regarding teachers' characteristics, teachers likely rely on their own professional experiences and characteristics to create close relationships and a supportive climate

in the classroom. However, research linking teacher characteristics such as years of experience, salary, credentials, and educational attainment to individual and classroom-level interactional quality is mixed, with most studies reporting no direct effects of teacher qualifications on interactional quality (Burchinal, 2018; Early et al., 2007; Lin & Magnuson, 2018; Manning et al., 2017). In addition, preschool teachers' psychosocial stressors, including work stress, have been linked to reduced effectiveness in classroom behavior management, educational activities in the classroom, CLASS scores (Jeon et al., 2014; Kwon et al., 2020; Li-Grining et al., 2010; Pianta et al., 2005), and increased challenges in developing positive relationships with children in Head Start. For example, according to Whitaker and colleagues (2015), Head Start teachers who indicated higher work stress reported greater teacher-child conflict. Thus, it is critical to examine teacher education and experience, as well as teacher reported stress, as factors associated with quality interactions at the individual and classroom levels. Understanding these links will inform the development of classroom interventions that meet the needs of early education teachers and children.

The Present Study

The present study uses a person-centered, in this case child-centered, analytical approach to examine constellations of quality experienced by individual children. This approach allows us to move beyond mean-level comparisons and identification of average patterns of associations among variables to identify distinct subgroups of children that share exposure to specific combinations of individual teacher-child relationship quality and classroom-level support. Garnering this level of information is critical for understanding the classroom experiences of children enrolled in Head Start. In addition, the latent profile analyses will reveal the types of profiles of interactional quality that exist and how many children with particular characteristics are likely to fall into each profile. Essentially, this approach provides prevalence rates of specific profiles that can be generalized to the Head Start population and is particularly useful in determining where to direct resources for teacher professional development. Further, by examining which child and teacher characteristics are associated with those distinct profiles, these study's findings can inform the identification of children and teachers who may benefit the most from interventions to enhance their interactions and classroom experiences. For example, teachers with less experience may require targeted interventions to build their individual relationships with children along with their global classroom support. Equally important, this work further informs the targeting of interventions and QRIS to enhance classroom quality experiences for all children.

Method

Participants

We utilize secondary data from the Head Start Classroom-based Approaches and Resources for Emotion and Social-skill Promotion (HS CARES) project. This study of preschool-aged children, their teachers, and their classrooms is one of the most comprehensive studies of classroom quality available, and it is both the largest and most recent longitudinal study of classroom quality and child kindergarten readiness. Unlike more recent studies of the

nationally representative Head Start population (e.g., FACES), the HS CARES dataset includes measures of individual teacher-child relationship quality.

The HS CARES dataset includes data from 17 Head Start grantees located in 10 states selected to represent the geographic, racial and ethnic diversity of the national Head Start population. Grantees were distributed evenly across four regions of the country, with four grantees in the Northeast, four in the West, three in the South and six in the Midwest/Plains states. Grantees were selected to represent community action agencies, stand-alone non-profit entities and large local school systems and had 4–8 participating centers.

Teachers participating in the study were generally representative of the national Head Start teaching population in terms of age (average age was 43 years), sex (96% female), education (62% had a bachelor's degree), years of experience (63% had taught for at least 10 years), and race/ethnicity (Morris et al., 2014). There were some slight demographic differences between the children in the sample and the national Head Start population. As reported by Morris and colleagues (2014), children in the sample were generally from slightly more economically disadvantaged backgrounds than children in the national Head Start population in 2014, with the average monthly household income reported as $1,800 in HS CARES in comparison to $1,900 nationally. Only 19% of families in HS CARES reported that they owned their homes in comparison to 23% nationally. Further, the race/ethnicity of the children was 43% Hispanic, 33% non-Hispanic African American and 16% non-Hispanic White, indicating that the sample in the study was more Hispanic (national = 33%) and less White (national = 23%) than the national Head Start population. Approximately 48% of the children were female.

Our analysis includes data from the baseline and spring pre-k waves. The original HS CARES dataset included 307 classrooms and 3,949 children. Given the research focus of the present study and available data, we only included children who were at least four years old at the baseline assessment. Our analytic sample included 290 classrooms and 2,114 children.

Measures

Descriptive statistics of study variables are included in Table 1.

Classroom level teacher interactional quality.—Classroom level teacher interactional quality was assessed by a trained observer with two dimensions from the Classroom Assessment Scoring System (CLASS)-Preschool Version (Pianta et al., 2008). The two dimensions included were: 1) Emotional Support, a composite of four aspects of classroom-level teacher classroom quality: positive climate, negative climate, teacher sensitivity and regard for student perspectives (Cronbach's alpha = .88); and 2) Instructional Support, a composite of three aspects of classroom-level teacher interactional quality: concept development, quality of feedback, and language modeling (Cronbach's alpha = .91). Each dimension was measured on a Likert-scale and the composites were created by averaging scores across the individual aspects. CLASS scores in the HS CARES sample were comparable to nationally representative Head Start centers (Morris et al., 2014; see Table 1).

Individual teacher-child relationship quality.—The lead teacher of each classroom reported their levels of closeness and conflict with each participating child in their classroom using the 23-item short form of the Student-Teacher Relationship Scale (STRS; Pianta, 2001). The closeness subscale included 11 items (e.g., I share an affectionate, warm relationship with this child), and the conflict subscale included 12 items (e.g., This child and I always seem to be struggling with each other). For each item, the lead teacher indicated the extent to which the statement applied to the relationship with each child. Responses ranged from 1 (Definitely does not apply) to 5 (Definitely applies). Items on each subscale were averaged to calculate scale scores of closeness and conflict, with higher scores indicating higher closeness and conflict, respectively. Cronbach's alphas for Closeness were .76 and Cronbach's alphas for Conflict were .90.

Classroom level covariates

Teacher education and experience.—For each classroom at the baseline, binary variables were created to assess the lead teacher's highest education (0 = high school or equivalency, 1 = bachelor's degree or higher) and teaching experience (0 = less than 10 years of teaching experience, 1 = 10 or more years of teaching experience). We used this categorical variable, derived by the dataset managers, due to limited variability in years of experience, namely, years of experience less than 10 years.

Teacher emotional exhaustion.—The lead teacher's emotional exhaustion and overextension at work as assessed using 9 out of 20 items from the Maslach Burnout Inventory (MBI; Maslach, Jackson, & Leiter, 1996). On each item, the lead teacher indicated the frequency of the feelings that were described in each item (e.g., I feel burned out from my work). Response ranged from 0 (never) to 6 (every day). Scores on the nine items were summed to calculate the final scale score, with higher scores indicating higher exhaustion and overextension. Scores ranged from 0 to 54. Cronbach's alpha was .89 in the present study.

Teacher distress.—The lead teacher's distress was measured using the 6-item short form of the Kessler Psychological Distress Scale (K-6, see Kessler et al., 2002). On a 5-point Likert scale ranging from 0 (none of the time) to 4 (all of the time), each teacher indicated how often they experienced feelings such as "hopeless" during past 30 days. Scores for each item were averaged to obtain the final score, with higher scores indicating higher distress. Scores ranges from 0 to 24. Cronbach's alpha was .72 in the present study.

Individual Level Covariates

Child gender was coded as 1 = female and 0 = male. Full day program was also included (full day = 1, part day = 0), as well as children's race and ethnicity into discrete subgroups of non-Hispanic Black (Black), non-Hispanic White (White) and Hispanic. Other racial and ethnic groups were too small to analyze specifically in the covariates analysis.

Analytic Plan

To address the research aims, we employed multi-level Latent Profile Analysis (ML-LPA) in Mplus 8.4 (Muthén & Muthén, 2019). Our ML-LPA estimated distinct, homogeneous

subgroups of children defined by their average experiences in the classroom, both in terms of individual teacher-child relationships and the quality of the teacher classroom-wide. Given the nested nature of children within classrooms within centers, we aimed to estimate a three-level ML-LPA, but due to mathematical and software limitations, we are only able to model two levels: children and classrooms. We examined the threat of bias inherent to ignoring the nesting of classrooms within centers, finding it to be low on our focal variables (IRR < .10 for all four focal variables).

First, we examined missing data, finding rates were very low (2 – 3 %) on our focal variables of interest. We then conducted the focal analyses using recommendations from previous studies (Henry & Muthén, 2010; Masyn, 2013; Nylund, 2007). We freely estimated the two latent profile parameters: conditional response means, or the average within-profile mean for each item, and profile membership probabilities, or the prevalence of each profile within the population. Additionally, we added random effects to account for variation in the probability of Level 1 (child-level) latent class membership across classrooms, and a random factor for the indicator-specific Level 2 (classroom-level) variances (Henry & Muthén, 2010; Muthén & Asparouhov, 2008). Beginning with a 1-profile model, we estimated multi-level latent profiles, increasing the number of profiles in each model until convergence was no longer reached. Several relative fit statistics were compared to choose the most parsimonious and conceptually and empirically valid and well-differentiated model (Nylund et al., 2007). These included the Bayesian Information Criteria (BIC), the Consistent Akaike's Information Criteria (CAIC), and the Bayes Factor (BF). Briefly, the lower the information criteria, the better fit of model to data, and the Bayes Factor quantifies the magnitude of differences between information criteria, with values <.10 considered evidence for the model over the model with one less profile. Entropy is reported as a statistic of overall model classification and not enumeration; values above .80 are considered high (Muthén, 2004). All relative fit statistics are displayed in Table 2. Next, categorical and continuous covariates were examined in relation to profile membership using a Wald's test and a Bonferroni correction was applied (Asparouhov & Muthén, 2014; Lanza, Tan, & Ray, 2013).

Results

Profile enumeration.

As shown in Table 2, the model with the lowest information criteria was the five profile solution model. Solutions beyond five profiles (up to eight profiles were estimated) resulted in convergence issues, even when convergence criteria were loosened. The five profile model also yielded five conceptually meaningful and distinct profiles.

After selecting the five profile solution, we further examined statistics that indicated the fitness of the model to the data, including the average posterior class probability (AvePP), an indication of how well-classified individuals are into each profile, as well as the separation between profiles (e.g., an indication that the profiles are empirically distinct from each other). AvePP values ≥ .80 indicate adequate classification (Masyn, 2013) and all six profiles demonstrated values above .84. In addition, each profile was distinct from every other

profile by at least one of the four teacher interactional quality indicators (see Table 3 for interpretation).

Teacher interactional quality profiles.

The five profiles were labeled based on their feature characteristics and their distinction from the other profiles. The profile-specific means are presented in Table 3 and Figure 1.

Three of the profiles were characterized by positive individual teacher-child relationships, which is low conflict and high closeness. These three profiles were differentiated by classroom-level interaction quality. Specifically, approximately 8% of children were in classrooms characterized as *Positive Individual, Low CLASS* (P1). The largest profile, representing almost 60% of the sample was characterized as *Positive Individual, Moderate CLASS* (P2). The second largest profile, representing almost 19% of children was characterized as *Positive Individual, High CLASS* (P3), indicating high quality experiences based on individual and classroom-level interactions. In contrast, the remaining two profiles, were characterized as high on individual conflict. *High Conflict, Moderate CLASS* (P5) represented 7.4% of children in the sample. The smallest profile representing approximately 6% of children, *High Conflict, Low CLASS* (P4), was marked by low individual and classroom quality.

The profiles were not differentiated by scores on the closeness subscale, reflecting minimal variability in this construct. However, profiles differed in their levels of conflict. Those labeled with *Positive Individual*, P1 – P3, had markedly low levels of conflict (in addition to high levels of closeness). The profiles were very distinctly differentiated based on their CLASS scores, with profiles 2, 3 and 5 scoring higher on both the emotional support and instructional support subscales compared with profiles 1 and 4.

Association with covariates.

As shown in Table 4, children in the profiles characterized by high conflict (P4 and P5) and P3, *Positive Individual, High CLASS* had teachers with statistically significant higher levels of emotional exhaustion, in comparison to those in the two profiles characterized by low conflict and lower quality CLASS scores (P1 and P2). Teacher distress was significantly higher for children in the *Positive Individual, High CLASS* profile (P3) than for children in the other low conflict profiles, with significantly higher teacher distress also evident for those children in the *High Conflict, Moderate CLASS* (P5) profile in comparison to the profile characterized by low conflict and instructional support and high emotional support (P2). Taken together, these findings indicate that children in the profile characterized by high individual and classroom-level quality (P3) had teachers who reported statistically significantly higher levels of exhaustion and psychological distress. No differences among profiles were found by teacher experience, but children in the *Positive Individual, High CLASS* profile (P3) were more likely than children in all of the other profiles to have a teacher with a bachelor's degree. There were many statistically significant differences among profiles on child characteristics. Girls were less likely than boys to be in a profile characterized by high conflict. Black children were more likely to be in a profile characterized by high conflict and low CLASS scores (P4) than a classroom characterized

by low conflict and high CLASS scores. White children were more likely to be in profiles characterized by high or average CLASS scores (P3 and P5) than profiles characterized by low CLASS scores. Hispanic children were more likely to be in the low conflict and mixed CLASS quality profile (P2) than the profile characterized by high conflict and moderate CLASS scores. Finally, children who were enrolled in full day programs were more likely to be designated in the two profiles characterized by the lowest quality CLASS scores (P1 and P4).

Discussion

By using a child-centered approach to simultaneously capture the classroom experiences of children based on two dimensions of individual teacher-child relationship quality (closeness and conflict) and two dimensions of classroom-level interaction quality (emotional and instructional support), the results point to notable differences in Head Start experiences that may have important implications for children's developmental trajectories. Overall, the results indicate considerable heterogeneity in the experiences of children that would be lost in independent examinations of individual or classroom interaction quality alone, or in variable-centered approaches to measuring classroom interactional quality. As we discuss in detail below, these findings provide clear implications for future research and applied work in four pivotal areas. First, the findings highlight the need for teacher professional development to support the quality of individual teacher-child relationships, specifically around conflict, and instructional support in Head Start. Second, the findings linking children's interactional quality experiences to teachers' characteristics underscore the need to address teachers' mental health to improve retention of effective teachers. Third, the findings linking children's characteristics to interactional quality suggest that efforts to increase equity in ECE to close early achievement gaps for boys and children of color should incorporate improvement of individual and classroom-level interactions. Fourth, the overall pattern of findings indicates the potential value of including measures of individual teacher-child interactions in QRIS.

We begin by discussing the meanings of the profiles that emerged, as the type and prevalence rates of these interactional quality profiles provide a first look at how children in Head Start simultaneously experienced individual and classroom-level interaction quality. Given the similarity of the HS CARES subsample to the population of children enrolled in Head Start nationally (Mattera et al., 2013), we can draw inferences from our results to this larger population of children. Two notes are important for interpretation. First, we developed profile labels informed by our sample's distribution as well as the distribution of scores from a random sample of Head Start grantees from 2015 (Head Start Early Learning and Knowledge Center, 2018). Our labels do not necessarily reflect the thresholds set forth by CLASS or ones that may reflect another population's distribution. Second, profiles reflect experiences aggregated at the classroom level, allowing for variation at the individual level on Closeness and Conflict from the STRS. This was a necessity of the mixed model design using both individual and classroom level indicators of quality. This means the profiles are interpreted as overall classroom climate, and do not reflect each child's experience on an individual level. Rather, children's individual experiences are aggregated, such that a higher conflict score represents an average of higher conflict across the classroom for an

individual child. This is one way to consider children's individual teacher-child relationships and is a practical way of quantifying individual children's experiences at the classroom level. Furthermore, our analysis indicated that aggregating individual children's experiences reveals greater variation than a whole-classroom tool, such as the CLASS. We discuss this point more throughout this section.

First, less than 20% of children enrolled in Head Start programs were experiencing the kinds of classroom interactions that were likely to set them on trajectories for early school success. Although it was the smallest profile, we found that almost 6% of children enrolled in Head Start classrooms were in what we might consider the lowest quality profile, characterized by low quality teacher interactions at the individual student and classroom level. The majority of children were in profiles experiencing a mix of individual and classroom quality; experiences of children in these mixed individual and classroom quality profiles would be overlooked in classroom assessments focused solely on classroom-level teacher interactional quality as has been observed in previous studies (Keys et al., 2013). Consistent with a developmental systems perspective, children's development is likely jointly shaped by exposure to interactions at these two-levels of classroom experiences.

Notably, almost three-quarters of the children in our sample were in a profile with a low instructional quality as measured by the CLASS, despite the emphasis on global interactions in professional development initiatives and measurement of classroom-level teacher interactional quality in most QRIS (Burchinal et al., 2021). Further, looking within classroom quality indicators, we found variability in instructional and emotional support within classrooms. Specifically, two profiles, including the largest profile (59.4%) were characterized by moderate to high emotional support and low to moderate instructional support. This finding is consistent with variable-centered research in Head Start and other preschool settings, in which instructional support was generally lower than emotional support (Perlman et al., 2016; Aikens et al., 2016; Moiduddin et al., 2012). This pattern of findings suggests that professional development for teachers aimed at classroom-level behaviors may need to be very specifically targeted for instructional versus emotional support activities. In fact, increases in teachers' instructional support scores across the preschool year have been linked to gains in children's literacy and regulation skills (Goble & Pianta, 2017). However, as noted below, these professional development efforts may be most successful if paired with strategies to reduce individual-teacher child conflict.

The findings also highlight the importance of considering classroom emotional climate that is developed by individual teacher-child relationship quality. We found that although most children experienced climates of low conflict and high closeness, according to teachers' reports, high conflict differentiated two of the five profiles. Although it was uncommon to be in a classroom with high levels of teacher-reported conflict, this indicator is telling as it differentiated the profiles. Further, experiencing relationships with teachers characterized by low conflict and high closeness has the potential to establish positive foundational relationships with teachers that help children succeed in the preschool classroom and into elementary school (McNally & Slutsky, 2018; Sabol & Pianta, 2012). On the one hand, these high-quality interactions may be particularly promotive of positive developmental trajectories for children at risk for low school readiness, such as those children who

qualify for Head Start (McNally & Slutsky, 2018; Mortensen & Barnett, 2014; Hamre & Pianta, 2005). On the other hand, children with high conflict relationships with teachers in preschool are likely to continue to experience conflict in relationships with teachers in elementary school (Howes et al., 2000; Jerome et al., 2009). These findings suggest that teachers and students may benefit from targeted professional development that provides strategies for reducing conflict with students.

Overall, the findings identified unique constellations of individual and classroom-level interactional quality that can inform professional development efforts, which, to date, focus on improving the domains included in the CLASS. Moreover, there is limited rigorous evidence suggesting that professional development training targeting the CLASS domains improves child outcomes. There is, however, a small pool of evidence that professional development aimed at one-on-one instruction and interaction can improve both quality and child outcomes (Farran et al., 2017; Manship et al, 2016). In addition, recent research suggests that the experiences of individual children, as well as the individual teacher-child relationship, are important indicators of classroom quality (Burchinal et al., 2021; Lippard et al., 2018; McNally & Slutsky, 2018). For example, in an analysis of children from 63 pre-kindergarten classrooms, Burchinal and colleagues (2021) found that measures of the content and quality of individual teacher-child interactions is as strong a predictor of child outcomes as global indicators of quality.

Teacher Characteristics Associated with Profile Membership

Our findings contribute to growing calls to consider the mental health and wellbeing of early childhood educators along with efforts to improve quality and expand access (Johnson et al., 2020; Kwon et al., 2020; Tebben et al., 2021). Additionally, our findings may help explain some inconsistencies in past research studies that have focused primarily on observed classroom quality among samples of teachers serving low-income children (Hindman & Bustamante, 2019; Johnson et al., 2021). Interestingly, children in the highest quality profile *and* those in the profile with the most teacher-reported conflict had teachers with the lowest mental health, in terms of emotional exhaustion and psychological distress. Variable-centered approaches and/or studies focusing on either individual or classroom-level interaction quality indicators would not have revealed what may be two different processes linking teacher distress to classroom interactions. More specifically, we found that children with teachers with the highest self-reported emotional exhaustion were most likely to be either in profiles characterized by high teacher-child conflict or the highest quality profile, that is the profile characterized by low conflict and high CLASS scores. A slightly different pattern emerged for teacher distress, with the teachers in the highest quality profile reporting more distress than those teachers in the other two profiles with low conflict. Further, teachers in the profile characterized by high conflict and average CLASS scores reported higher distress than those in the profile characterized by high conflict and low CLASS scores. Taken together, these findings indicate that children in the highest quality profile had teachers with the lowest mental health outcomes in terms of distress and emotional exhaustion. It is important to note, though, that levels of distress and emotional exhaustion were quite low in the overall study sample (Morris et al., 2014), and were the lowest in two classes with positive individual relationships and low or moderate CLASS scores.

Given the cross-sectional nature of this study's data, these findings could suggest that emotional exhaustion and concomitant psychological distress stem from the effort required to maintain high quality interactions with individual children and high quality support at the classroom level. And ironically, the highest quality teachers may be most at risk for burning out and leaving the profession due to the demands to maintain these high-quality interactions. On the other hand, we also see that children in the high conflict profiles had teachers reporting high levels of emotional exhaustion and psychological distress, indicating that either engaging in these conflicts is contributing to teacher stress, or the most stressed teachers have the greatest difficulty managing conflictual relationships with children. For example, qualitative interviews with Head Start teachers indicated that teacher stress and children's behavior problems contributed to teachers' perceptions of conflictual relationships with children (Chen et al., 2018). Exhaustion and distress are also multiply determined, including by malleable characteristics such as workplace climate, number of employer-provided benefits, and classroom size (Hindman & Bustamante, 2019; Jeon, Buettner, & Grant, 2018). Moreover, our study could not address how teachers' interpretations of other factors, including comparisons to other students, their working conditions and their own mental health may have influenced their ratings of conflict with children. Managing personal distress may be particularly likely to interfere with teachers' ability to help children regulate their own emotions and reduce conflict (Johnson et al., 2020). Regardless of directionality, our findings support developmental systems approaches to considering classroom interactions as bidirectional exchanges and highlight promoting mental health and reducing stress levels of the ECE workforce as key levers to improve ECE quality (Johnson et al., 2020; Magnuson & Schindler, 2019; Tebben et al., 2021). Overall, these findings point to the heterogeneity of the Head Start teacher workforce and the need to provide mental health support both to improve and maintain quality classroom experiences.

Turning to other indicators of teacher interactional quality that are often the focus of quality improvement and professional development initiatives, we find mixed results. First, years of experience was similar across profiles, although we were limited to a measure that distinguished between ten or more versus ten or fewer years of experience, which may have obscured differences within these broad bands of experience. Second, children in the highest quality profile (positive individual and CLASS ratings) were most likely to have teachers with a bachelor's degree. This finding adds to the mixed research linking teacher education to classroom quality (Burchinal, 2018; Early et al., 2007; Manning et al., 2017). The finding that teachers in this profile also experienced higher emotional exhaustion and psychological distress underscores the need to provide emotional support to teachers along with investments to increase access to professional development and educational opportunities, to attract, advance and retain highly educated teachers in the Head Start workforce.

In terms of Head Start program characteristics, we found that children in the profiles with the lowest CLASS scores were likely to be attending full day programs. Although recent policies mandating Head Start expansion to full day programs may fulfill parent needs for child care (Ceglowski, 2009), there is limited evidence for the effectiveness of these programs regarding outcomes for child development. For example, Leow and Wen (2017) reported no differences across five measured academic and social child outcomes for

children enrolled in full-day Head Start programs in comparison to those children enrolled in half-day Head Start programs. Perhaps differences in classroom quality contribute to those findings. In contrast, beyond Head Start, Reynolds et al. (2014) reported that among a predominantly low-income and ethnic minority sample, children enrolled in a full day preschool program generally achieved higher social and cognitive skills than a matched group in a part day program. The potential for lower quality experiences in full day Head Start programs points to the need for teacher professional development to enhance classroom interactions. Thus, it will also be important to replicate these findings in future research, and to link quality in full and partial day programs to children's development of school readiness in Head Start and other preschool programs (Reynolds et al., 2014).

Child Characteristics Associated with Profile Membership

We also found systematic variation in profile membership by children's characteristics. In line with other research on teacher-child relationship quality (Ewing & Taylor, 2009), we found that boys were more likely to belong to profiles characterized by lower individual teacher-child relationships, and were more likely than girls to be in the lowest interactional quality profile. Further, we found evidence of race-based equity disadvantages. Specifically, Black children were more likely to be in the lowest quality profile compared to the highest quality profile. In contrast, White children were more likely to be in the profiles characterized by high or moderate CLASS scores in comparison to the profiles characterized by low instructional support scores. Findings for Hispanic children were less clear except that they were more likely to be in the profile characterized by low conflict and high emotional support and low instructional support scores than the profile characterized by high conflict and average CLASS scores. This may suggest that although Hispanic children were likely to be exposed to a positive emotional classroom climate, they were likely to lack exposure to instructional support to bolster academic school readiness skills. Given early academic achievement gaps, especially for boys of color from economically disadvantaged families (Iruka, 2016; Reardon & Portilla, 2015), our findings again point to the value of simultaneously considering multiple dimensions characterizing individual children's experiences in Head Start classrooms.

Implications for Quality Rating Systems

Most states use an observational rating system such as CLASS to capture the quality of the environment and/or teacher interactional quality (i.e., process quality). These tools are helpful but may fall short of capturing teacher and environmental quality (Burchinal, 2018; Hamre & Maxwell, 2011). The present study's findings suggest these approaches to measuring process quality do not entirely capture the quality children experience in the classroom. That is, whole group observation describes only one part of the story; individual teacher-child conflict should also be considered, as it is linked to teacher well-being, and the quality a child experiences includes both the overall classroom environment and the relationship with their teacher. Future research is needed to continue to probe the interplay of both classroom and individual teacher-child interaction assessments to determine the best assessments for describing classroom and center quality for QRIS that may ultimately lead to improvements in access to high quality ECE experiences, especially for children who are the most disadvantaged, such as children of color and those from low

socioeconomic backgrounds. Furthermore, there are practical and methodological challenges when considering how to quantify individual teacher-child relationships in the context of a global assessment of quality at the classroom or center level. Our approach – in which individual experiences are aggregated at the classroom level based on teacher reports – is one of many perspectives that should be examined and tested to determine feasibility and utility of incorporating individual teacher-child relationship quality into quality ratings.

Study Limitations and Future Directions

The child-centered study design that included examination of teacher interactional quality at individual child and classroom levels among a large sample of Head Start children is a significant strength of this study. At the same time, this study includes several limitations that point to the need for future research in this area. First, although the HS CARES data are roughly comparable to the Head Start population, this sample is not nationally representative and likely shares common experiences related to professional development and limited heterogeneity in teacher education, which could have limited the number and characteristics of the profiles. In addition, data are 8 years old at the time of publication, and the state of ECE and Head Start is continuously changing. Thus, the findings are unlikely to generalize to the larger population of children participating in center-based preschool. It will be important to replicate these findings in other ECE settings. However, despite these limitations, the relative lack of consistency across profiles provides critical information regarding the heterogeneity of children's experiences across Head Start classrooms and programs that may contribute to challenges in identifying the effects of Head Start on children's acquisition of school readiness skills at the national level. Second, we were limited to teacher reports of teacher-child conflict and closeness. In future studies, it will be important to include observer ratings of these individual-level teacher-child interactions. Future work should also consider different designs and analytic techniques to determine the best way to study individual and global quality measures. Third, CLASS and STRS scores were collected at different waves, and the only timepoint during which they overlapped was Spring of the Pre-K year. Thus, we were limited to examination of profiles at the end of the school year only and are unable to identify how those profiles may have changed across the school year. Fourth, we only included children's demographic characteristics as covariates of the teacher interactional quality profiles. The data did not include other child behavioral characteristics such as aggression that may have influenced teacher-child conflict (Chen et al., 2018) and, thus, profile membership. A critical next step is to connect profile membership to children's development of school readiness skills while accounting for children's and teacher's characteristics that may shape profile membership to ultimately reduce early socioeconomic achievement gaps.

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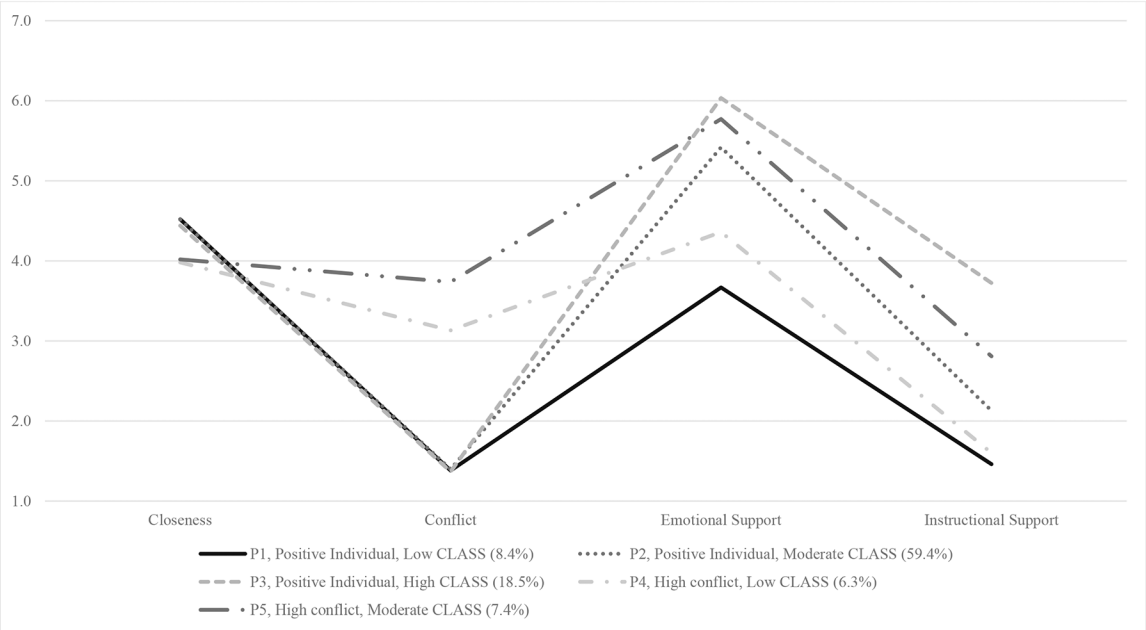

Figure 1.

Teacher Interactional Quality Profiles

Note. Closeness and conflict are on scales of 1–4, while Emotional Support and Instructional Support are on scales of 1 – 7.

Table 1

Descriptive Statistics of Study Variables

Variable	Mean	SD
CLASS instructional support	2.49	1.03
CLASS emotional support	5.15	0.93
STRS closeness	4.23	0.62
STRS conflict	1.75	0.88
Teacher emotional exhaustion	13.70	10.74
Teacher psychological distress	3.02	3.32
	% Yes	
Teacher has Bachelor's degree or higher	60%	
Teacher has 10+ years of experience	63%	
Child was female	49%	
Full day program	65%	

Table 2

Relative Fit Statistics and Entropy of Latent Profile Models

# Classes (*K*)	LL	BIC	CAIC	BF	Entropy
1	−8643.15	17361.59	17328.99	--	1.00
2	−8252.14	16609.682	16564.05	< .10	0.92
3	−8042.13	16227.32	16165.40	< .10	0.90
4	−7845.91	15872.53	15794.30	< .10	0.82
5	−7700.60	15619.54	15525.02	< .10	0.85

Table 3

Profile-Specific Means of STRS and CLASS Subscales

	P1, Positive Individual, Low CLASS (8.4%)	P2, Positive Individual, Moderate CLASS (59.4%)	P3, Positive Individual, High CLASS (18.5%)	P4, High Conflict, Low CLASS (6.3%)	P5, High Conflict, Moderate CLASS (7.4%)	Differences (OR > 2.00)
Closeness	4.5	4.5	4.4	4.0	4.0	None
Conflict	1.4	1.4	1.4	3.1	3.7	4, 5 > 1, 2, 3
Emotional support	3.7	5.4	6.0	4.4	5.8	2, 3, 5 > 1, 4
Instructional support	1.5	2.1	3.7	1.6	2.8	3 > 5 > 1, 4; 2 > 1

Table 4

Covariates of Teacher Interactional Quality

	P1, Positive Individual, Low CLASS (8.4%)	P2, Positive Individual, Moderate CLASS (59.4%)	P3, Positive Individual, High CLASS (18.5%)	P4, High Conflict, Low CLASS (6.3%)	P5, High Conflict, Moderate CLASS (7.4%)	Differences based on χ^2 test of means/ probability equivalence
Teacher emotional exhaustion	4.2	9.2	18.8	16.0	18.1	3, 4, 5 > 1, 2
Teacher distress	1.3	1.6	4.9	3.6	4.2	3 > 1, 2; 5 > 2
Teacher education	61.6%	59.2%	80.3%	56.9%	63.5%	3 > 1, 2, 4, 5
Teacher 10+ years exp.	43.1%	42.9%	25.0%	41.2%	21.3%	none
Ch. Female	54.6%	51.7%	51.2%	30.3%	38.5%	1, 2, 3 > 4; 2 > 5
Ch. Race Black	37.6%	34.5%	22.1%	53.1%	34.6%	4 > 3
Ch. Race White	12.3%	12.0%	29.6%	7.8%	25.4%	3, 5 > 1, 2, 4
Ch. Ethnicity Hispanic	45.2%	48.9%	34.9%	38.0%	28.1%	2 > 5
Full day program	87.9%	66.6%	60.4%	89.3%	69.0%	1, 4 > 2, 3, 5

Note. Comparisons were made with a corrected *p*-value of < 0.01.