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ORIGINAL ARTICLE

Beyond Neighborhood Socioeconomic Status: Exploring the Role of Neighborhood Resources for Preschool Classroom Quality and Early Childhood Development

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Highlights

- Neighborhoods in nine US cities exhibit heterogeneity in socioeconomic status (SES) and resources.
- Classroom instructional support is one mechanism through which neighborhoods matter for development.
- Neighborhood resources matter for child development via levels of classroom quality.
- Instructional quality is highest in neighborhoods with higher levels of both SES and resources.

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Abstract The neighborhood literature consistently documents associations between neighborhood socioeconomic status (SES) and child development. Yet, this approach may miss important heterogeneity in neighborhood resources (e.g., libraries, doctors' offices) that have important implications for children. Moreover, the mechanisms that explain the relation between neighborhood characteristics and child outcomes are poorly understood. Using a sample of 955 children situated in preschool neighborhoods across nine United States cities, the present study aimed to (1) describe the relation between neighborhood SES and resources among our sample neighborhoods and (2) explore whether neighborhood SES and resources may be (a) independently and (b) jointly associated with young children's gains in language/literacy and executive function skills via differences in preschool classroom process quality. Our results suggested that neighborhoods were heterogeneous in both SES and resources, thereby indicating a diverse range of resource availability among lower SES neighborhoods. Moreover, we found that both neighborhood SES and resources were individually associated with benefits to children's development through levels of classroom process quality and that these associations were magnified in communities that were particularly high in both SES and resources. These findings point to potential policy levers at both neighborhood and classroom levels to support children's development.

Keywords Early childhood development · Neighborhood socioeconomic status · Neighborhood resources · Preschool · Classroom process quality

Introduction

Decades of research have demonstrated the importance of neighborhoods for child development. Within the neighborhood literature, studies have shown that growing up in a low socioeconomic status (SES) neighborhood is associated with lower levels of cognitive skills and educational attainment, worse mental health outcomes, and higher levels of school dropout for children and adolescents (e.g., Leventhal et al., 2015; Sharkey & Faber, 2014). Although this literature has historically portrayed lower SES communities as monotonically disadvantaged (Wilson, 1987), more recent research suggests that neighborhoods vary considerably in their access to resources (e.g., educational institutions, health care facilities), and sometimes lower SES neighborhoods have more resources than higher SES neighborhoods in the same metropolitan area (Small & McDermott, 2006; Small & Stark, 2005). Less is known about how neighborhood resources may contribute to young children's outcomes above and beyond neighborhood SES, or how these neighborhood

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characteristics might interact to inform children's development. Furthermore, the mechanisms explaining relations between neighborhood characteristics and child development remain poorly understood, particularly in light of a growing body of research linking neighborhood variables to the quality of educational opportunity available to young children (Bassok et al., 2011; Bassok & Galdo, 2016; McCoy et al., 2015; McCoy et al., 2013).

Using a sample of low-income children attending preschools across nine cities in the United States (US), we examine the independent and interactive roles that neighborhood SES and resources play in supporting child development. In particular, we capitalize on the diversity of communities surrounding children's preschools, or their "*preschool neighborhoods*", in our sample to examine the extent to which neighborhood SES is or is not associated with the availability of resources. We then explore the direct and indirect associations between these neighborhood characteristics and preschool-aged children's language/literacy (LL) and executive function (EF) development. Specifically, we focus on preschool classroom process quality as one potential mechanism given its association with both neighborhood SES and child outcomes (Anderson et al., 2014; Bassok & Galdo, 2016; Dupéré et al., 2010; McCoy et al., 2015). In doing so, we build on the institutional resources literature by exploring not only *whether* but also *how* neighborhood resources matter for young low-income children.

Neighborhood SES, Classroom Process Quality, and Early Child Development

The neighborhood literature has repeatedly theorized the ways in which communities influence the children embedded within them (e.g., Leventhal et al., 2015; Sampson, 2008; Sharkey & Faber, 2014). Much of this literature has focused on neighborhood SES, finding that growing up in a lower SES neighborhood is associated with lower reading, math, and social-emotional skills during early childhood (e.g., Aikens & Barbarin, 2008; Leventhal et al., 2015). Moreover, associations between neighborhood SES and the development of school readiness skills have been shown to be most pronounced at the bottom of the SES distribution (Dupéré et al., 2010), suggesting that incremental differences in neighborhood SES could be particularly salient for children in lower income communities.

According to bioecological systems theory, neighborhoods may matter for young children's development via the levels of access to and quality of early educational opportunities—mainly preschools (Bronfenbrenner & Morris, 2006; Leventhal & Brooks-Gunn, 2000). Prior neighborhood research has largely focused on the availability of preschools or structural quality, such as teachers' years of experience, based on characteristics of the neighborhood. For example, neighborhood SES has been shown to have a U-shaped association with preschool availability, where access was highest for children in the lowest and highest SES neighborhoods (Bassok et al., 2011; Fuller & Liang, 1996). A separate study of public preschool programs in Georgia found that children in the lowest SES neighborhoods had the greatest preschool availability and no substantive differences in two measures of structural quality (Bassok & Galdo, 2016). As preschool availability has increased, particularly over the last decade and in urban settings, it is important to consider other sources of inequity in children's early educational experiences. As such, we shift the focus to classroom quality—namely process quality. *Classroom process quality*, often conceptualized as emotional support, classroom organization, and instructional support, is considered the most proximal measure of quality to children's outcomes (Burchinal, 2018). Exposure to higher levels of process quality has been linked to better academic, cognitive, and social-emotional outcomes for children (Downer et al., 2012; Downer et al., 2010; Hamre, 2014; Mashburn et al., 2008). Despite these findings, children in lower SES neighborhoods are more likely to be enrolled in classrooms with lower process quality (Bassok & Galdo, 2016; McCoy et al., 2015), highlighting disparities in access to high-quality experiences for children in lower SES communities and the need to examine interrelations between neighborhood contexts, classroom process quality, and child development.

Two studies have explicitly and simultaneously explored the relations between neighborhood SES, preschool classroom process quality, and child development. One study drawing on a sample of children from a national sample of middle- and high-income families found that classroom emotional support mediated the relation between residential neighborhood SES and children's reading and vocabulary skills in elementary school (Dupéré et al., 2010). A separate study found that the lack of classroom emotional support explained the relation between SES and children's social-emotional skills in a national sample of Head Start participants (McCoy et al., 2015). These studies provide emerging evidence for classroom process quality as a mediating mechanism between neighborhood SES and child outcomes. Additionally, these findings suggest that early differences in classroom process quality attributed to neighborhood SES may be one contributing factor to gaps in school readiness (Reardon, 2011).

The Direct and Indirect Role of Neighborhood Resources

In addition to the salience of neighborhood SES, institutional resource models highlight the importance of neighborhood resources for children (e.g., Jencks & Mayer,

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1990; Leventhal & Brooks-Gunn, 2000). Specifically, *neighborhood resources* refer to physical institutions in the community such as learning, social, and recreational activities (e.g., libraries, museums); child care and schools; medical facilities; services (e.g., barbershops); or vendors of everyday goods (e.g., corner stores; Leventhal & Brooks-Gunn, 2000). For example, the presence of educational resources like libraries may provide parents with the opportunity to offer their children high-quality learning experiences, which may in turn promote children's academic skills. Studies have also found that exposure to many types of neighborhood resources may be beneficial for development. For example, higher levels of neighborhood resources targeting adolescents (e.g., recreational programs, mental health centers) were predictive of positive youth development, such as fewer aggressive behaviors (Anderson et al., 2018; Molnar et al., 2008). Despite these theorized advantages, the sparse literature on institutional resources is largely focused on adolescent development (e.g., Anderson et al., 2018; Molnar et al., 2008) and/or health outcomes (e.g., Pearce et al., 2007; Romero, 2005), with little attention to young children's development or school readiness skills.

Neighborhood resources may also indirectly support child development through the classroom environment. Teacher labor markets and classroom quality may vary across neighborhoods with differing levels of resources. For example, one study found that the presence of multiple preschools drove directors' desires for higher standards of quality and created competition among centers to attract the highest quality teachers (Rohacek et al., 2010). The presence of diverse and numerous resources may also lead to higher levels of social capital within neighborhoods, or the norms and actions that arise from social networks (Coleman, 1988; Curley, 2010; Putnam, 1995). For example, schools, religious institutions, barbershops, and other places where people interact with one another may build trust and connectedness between residents, which may foster residents' willingness to seek the common good of the community (i.e., collective efficacy; Galster, 2012; Sampson et al., 1997). This social capital could confer benefits to children's development (Froiland et al., 2014; Leventhal & Brooks-Gunn, 2000), such as through residents' participation in addressing neighborhood issues. In doing so, they can advocate to not only increase access to more resources but also improve the quality of existing institutions, such as preschools (Carpiano, 2006).

Despite this theoretical support, little empirical evidence exists to link the availability of neighborhood resources to classroom process quality or early childhood outcomes. It is possible that this dearth of research is attributed to a historical conceptualization of lower SES communities as resource-poor (Wilson, 1987). In *The Truly Disadvantaged*, Wilson (1987) posited that neighborhood resources were sustained by the presence of economically advantaged community members, and therefore, when more-advantaged members moved out of the neighborhoods, so did the resources. More recent research has pushed back against this assumption, demonstrating that lower SES neighborhoods may in some cases actually have more resources than their higher SES counterparts (Pearce et al., 2007; Small & McDermott, 2006; Small & Stark, 2005), potentially as a result of social services targeting low-income populations (Allard, 2004). Despite the changing characterizations of lower SES settings, little research has considered the relative contributions of neighborhood SES and resources, or the extent to which they may jointly predict child outcomes. In particular, it is unclear whether children and classrooms in lower SES but well-resourced communities would thrive more than children in only lower SES and poorly resourced neighborhoods.

The Present Study

Using a sample of predominantly low-income children living in nine diverse cities across the US, the present study aims (1) to describe the relation between neighborhood SES and resources in our sample; and (2) to explore whether SES and resources may be (a) independently and (b) jointly linked to young children's gains in LL and EF skills via differences in preschool classroom process quality (see Fig. 1). By including neighborhood resources as a predictor, the current study builds on prior research that has traditionally taken a narrow, SES-focused characterization of neighborhoods to explain how neighborhood characteristics relate to child development. This study also examines the mechanisms of how neighborhood characteristics might be related to child development, namely through preschool classroom process quality. By examining both predictors and mediators, this study could support policy and practice levers at different system levels

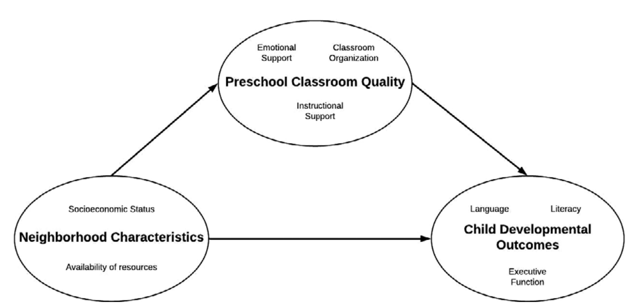

Fig. 1 Conceptual model of relations between neighborhood characteristics, preschool classroom process quality, and child developmental outcomes.

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(e.g., local policies, classroom professional development) to promote children's learning and development.

Method

Sample and Procedure

The present study relied on secondary data from a multi-phase randomized control trial of two professional development programs, the National Center for Research on Early Childhood Education Professional Development Study (NCRECE-PDS), designed to improve preschool teachers' interactions with children (Pianta & Burchinal, 2007–2011). Information regarding the intervention and efficacy results can be found in prior studies (Hamre et al., 2012, Pianta et al., 2017). In the original study, 496 teachers were recruited from various types of preschool programs (e.g., Head Start, public preschool, for-profit, non-profit) in nine cities across the US. Teachers were eligible if (1) they were the lead teacher of the classroom; (2) classroom instruction was delivered primarily in English; and (3) they had access to high-speed internet at the preschool. Children were eligible for the study if they had no IEP at the beginning of the year and spoke English or Spanish. Approximately four children per classroom were randomly selected for direct assessment in the fall and spring. Parents also completed a family questionnaire in the fall. Finally, classroom process quality was coded by trained data collectors using videos that teachers submitted online.

Analytic Sample

We used data from phase two of the parent study, which took place from 2008 to 2009 and was the only phase during which data on both classroom process quality and child outcomes were collected. The full sample during the second phase included 401 teachers and 1,407 children. We further restricted the sample by excluding children (1) who did not complete any post-test assessments in spring ($n = 205$) and (2) whose teachers were missing all classroom quality measures in the spring ($n = 247$). Based on these criteria, we excluded 452 children in total (32%)—leaving a final analytic sample of 955 children and 251 teachers in 159 preschools. In general, the final analytic sample looked similar to the sample of excluded children on neighborhood, classroom, and child characteristics in the fall (see Appendix Table A1). However, a few small differences emerged: teachers were more likely to be in the treatment group and in public school settings, and children were older in the analytic sample than in the excluded sample.

In the final sample, children were 4.19 years old ($SD =$ 0.46) on average and the majority were Black (47%) or Latino/a (35%). The average income-to-needs ratio was 1.11 ($SD = 0.99$), indicating that sample children were living just above the federal poverty line of 1.00. See Table 1 for more sample demographics.

Geocoding

Each preschool was geocoded and mapped onto surrounding census tracts based on the definitions provided by the 2000 Census using ArcGIS v10.5 (ArcGIS, 2017). Census tracts are defined as small geographical subdivisions of a county or equivalent entity that include 1,200 to 8,000 residents (U. S. Census Bureau, 2010). Our analytic sample included 152 census tracts.

Measures

Child Outcomes

Child outcome measures were administered in the fall and spring.

Language/literacy

Four separate measures were used to assess children's LL. The Peabody Picture Vocabulary Test-III (PPVT-III) is a measure of receptive vocabulary ($\alpha = 0.95$; Dunn, 1997) in which children were asked to point to one of four pictures on a card corresponding to the word said aloud by the assessor. The Woodcock-Johnson III Picture Vocabulary Test (WJIII-PVT) is a measure of expressive vocabulary ($\alpha = 0.81$; Woodcock et al., 2001) in which children were asked to name objects depicted in a series of pictures. Children's early literacy was assessed using the Test of Preschool Early Literacy (TOPEL; Lonigan et al., 2007). We focused on two subtests in particular: the Phonological Awareness subtest ($\alpha = 0.86$) which measured children's word elision and blending and the Print Knowledge subtest ($\alpha = 0.93$) which measured children's alphabet knowledge and awareness of written language conventions. Children's raw scores were standardized according to their age for all measures. The four measures were then modeled as a single latent variable using confirmatory factor analyses (CFA) at both time points. Each latent variable demonstrated adequate goodness-of-fit statistics and substantive factor loadings (see Appendix Table A3).

Executive Function

Children's EF, namely inhibitory control, was assessed using the Pencil Tap test ($\alpha = 0.93$; Blair & Razza, 2007). In this task, children were asked to tap a pencil once when the assessor tapped twice and vice versa.

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Table 1 Descriptive statistics of analytic sample

Variable	*N*	% Missing	Mean	*SD*	Min	Max
Neighborhood-level variables (*N* = 152)						
Neighborhood SES						
Employment rate	152	0%	51.81	13.50	0.04	79.73
Adult educational attainment	152	0%	75.13	13.60	40.70	99.20
Household income	151	1%	37,837	21,188	7,966	140,909
Types of neighborhood resources	152	0%	7.05	2.52	0.00	13.00
Sum score of neighborhood resources	152	0%	17.97	7.46	0.00	36.00
Population density (individuals per square mile)	152	0%	6,865	9,348	68	50,340
Census tract area (in square miles)	152	0%	1.12	1.90	0.54	12.32
Classroom-level variables (*N* = 251)						
% in treatment condition	251	0%	61%			
% in Head Start settings	233	7%	56%			
% in public school settings	241	4%	39%			
Emotional support	251	0%	5.31	0.55	3.25	6.35
Instructional support	251	0%	2.60	0.65	1.17	4.52
Classroom organization	251	0%	5.33	0.58	3.00	6.67
Child-level variables (*N* = 955)						
Age	955	0%	4.19	0.46	2.65	5.10
% Female	955	0%	48%			
% Black	955	0%	51%			
% White	955	0%	17%			
% Hispanic	955	0%	34%			
Income-to-needs ratio	875	8%	1.11	0.99	0.06	5.05
Maternal years of education	936	2%	12.70	2.03	8.00	20.00
Fall						
Language/literacy (factor score)	955	0%	0.00	0.83	−3.12	2.40
Executive function (% correct)	816	15%	47.69	32.70	0	100
Spring						
Language/literacy (factor score)	955	0%	0.00	0.78	−2.86	2.48
Executive function (% correct)	948	1%	64.15	32.60	0	100

Children's performance on this task was based on the proportion of correct responses.

Classroom Process Quality

Classroom process quality was assessed using the Classroom Assessment Scoring System™ (CLASS; Pianta et al., 2008) during the spring. The CLASS is an observational tool used to assess teacher–child interactions in a set of dimensions across three domains: emotional support (i.e., positive and negative climate, teacher sensitivity, regard for student perspectives), instructional support (i.e., concept development, quality of feedback, language modeling), and classroom organization (i.e., behavior management, productivity, instructional learning formats). Raters assessed classrooms on each dimension using a 7-point scale, with higher scores indicating better quality. In the present study, the internal consistencies of CLASS domains were high, with alphas ranging from 0.84 to 0.91. Past work with the NCRECE dataset found that interrater reliability across 20% of CLASS observations was 0.83 (Williford et al., 2013). The present study operationalized classroom process quality as observed averages at the domain level.

Neighborhood Characteristics

The two neighborhood variables, *SES* and *resources*, were based on schools' census tracts. We chose to use census tracts due to (1) their abundant use in prior neighborhood literature (see Leventhal & Brooks-Gunn, 2000; Sharkey & Faber, 2014), (2) their incorporation of natural boundaries that separate neighborhoods from one another (e.g., rivers, highways), and (3) similarities between actual census tract size and residents' perceptions of neighborhood size (Coulton et al., 2001).

Neighborhood SES

Neighborhood SES indicators were drawn from the 2005–2009 American Community Survey (U. S. Census Bureau, 2009) and included the following sociodemographic factors: adult educational attainment (i.e., proportion of the adult population with at least a high school diploma), employment rate (i.e., proportion of the adult population employed), and median household income. Collectively, these indicators demonstrated high internal consistency ($\alpha = 0.77$). Consistent with prior studies (Anderson et al., 2014; Dupéré et al., 2010), we modeled

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neighborhood SES using a latent variable generated through CFA (see Appendix Table A3 for model fit).

Neighborhood Resources

Indicators representing neighborhood resources were drawn from the 2007 Esri Business Data from Infogroup (Esri Business Data, 2007), which included geocoded data of businesses classified according to the North American Industry Classification Code. The following 13 resources were included due to their hypothesized direct (e.g., doctors' offices, libraries) and indirect (e.g., corner stores and barbershops that may increase collective efficacy) relevance for child development: libraries, day care centers, schools, higher education institutions, doctors, dentists, pharmacies, hospitals, community centers, barbershops, grocery stores, corner stores, or religious institutions. For every school census tract, we generated counts of businesses for each resource. Prior studies (Curley, 2010; Molnar et al., 2008) constructed the resource variable as a sum score based on the presence of the individual resources (0 = not present; 1 = present) in each census tract. Our resource variable builds on this conceptualization and also accounts for resource frequency by coding each resource from 0 to 3, such that it could have a score of 0 for no resources, 1 for 1 resource, 2 for 2 resources, and 3 for 3 + resources. We then summed across all 13 resource indicators (possible range = 0 to 39). Together, these indicators demonstrated high internal consistency ($\alpha = 0.76$).

Covariates

In order to minimize the risk of confounding in mediation analyses, we included the following covariates collected in the fall of the preschool year. Specifically, children's fall outcome scores were included to account for unobserved time-invariant characteristics that may be related to neighborhood, classroom, and child characteristics (e.g., the number of years children were enrolled in preschool; NICHD & Duncan, 2003). As such, our results can be interpreted as the extent to which neighborhood characteristics and classroom process quality were associated with changes in children's outcomes across the school year. We also included the following set of covariates that have been used in prior NCRECE-PDS studies (Pianta et al., 2017; Sabol et al., 2018): child-level characteristics (i.e., age, sex, race/ethnicity, mother's years of education, household income-to-needs ratio) and classroom-level characteristics (i.e., treatment status of the teacher, Head Start status, public school status). Finally, we included neighborhood-level population density and census tract area to account for differences in neighborhood density or size, which may be particularly relevant for contextualizing our analyses summing neighborhood resources (see Appendix Table A2 for variance across and within sample cities).

Analytic Plan

To address Aim 1, we used structural equation modeling (SEM) to explore correlations between the latent neighborhood SES variable and the sum score of resources. To address Aim 2, we also used SEM to examine the direct and indirect relations between neighborhood characteristics, preschool classroom process quality, and children's outcomes. We first tested a model (i.e., Aim 2a) where we included the two neighborhood variables (a latent variable for SES and an observed resource variable) as predictors and the three observed classroom process quality domains as mediators. For outcomes, children's spring language/literacy (LL) scores were included as a single latent construct and executive function (EF) as an observed variable. We then tested the same model as above, but with the addition of an interaction between the two neighborhood variables predicting all classroom process quality and child outcomes (i.e., Aim 2b). In the Aim 2 models, child-, classroom-, and neighborhood-level covariates were included to account for potential sources of bias. Specifically, classroom- and neighborhood-level covariates were included to predict classroom process quality, and all covariates were included to predict child outcomes.

All analyses were conducted in Mplus 8.1 (Muthén & Muthén, 1998–2017) and employed a maximum likelihood estimator with robust standard errors, which calculates standard errors using a sandwich estimator and accounts for observations' non-independence and non-normality. In order to account for the nesting of children in classrooms in neighborhoods, we clustered standard errors at the classroom level across all Aim 2 analyses. Full information maximum likelihood was used to account for missing continuous covariates, whereas multiple imputation by chained equations was used to account for missing dichotomous covariates in Aim 2 analyses. See Table 1 for information on missing data. Adequate model fit was indicated by the root mean squared error of approximation (RMSEA) $\leqq 0.08$, Comparative Fit Index (CFI) $\geqq 0.90$, and standardized root mean square residual (SRMR) $\leqq 0.08$ (Hu & Bentler, 1999; Kline, 2016).

Results

Descriptive statistics of neighborhood characteristics, classroom process quality, and child outcomes are presented in Table 1. The 152 neighborhoods in our analytic sample were of lower SES than the average US census tract. For example, the average median household income of sample neighborhoods was \$37,836 ($SD = 21{,}188$) compared to the median national household income of \$50,599 in 2009 (U.S. Census Bureau, 2011). Sample neighborhoods varied from having zero to all 13 resources present. Out of a possible 39, the average sample neighborhood had 18 resources present ($M = 17.97$, $SD = 7.46$, range = 0 to 36). Moreover, consistent with prior studies using the CLASS (Downer et al., 2012; Hamre et al., 2014), classrooms in our sample tended to be rated higher on emotional support ($M = 5.31$, $SD = 0.55$) and classroom organization ($M = 5.32$, $SD = 0.58$) than on instructional support ($M = 2.60$, $SD = 0.65$). Finally, children who performed well on LL measures were more likely to do well on the EF measure ($r = 0.39$, $p < .001$).

Correlations between Neighborhood SES and Resources

Results of our Aim 1 analyses revealed a positive but weak and non-significant correlation between neighborhood SES and resources ($r = 0.13$, $p = .20$), suggesting there was heterogeneity in the two neighborhood characteristics. As demonstrated in Fig. 2, 55% of neighborhoods were either above or below the sample average on both neighborhood characteristics. The other 45% of the sample was comprised of neighborhoods that were above the sample average on one characteristic but below average on the other. Specifically, nearly one-quarter (22%) of neighborhoods were below average on SES but above average on resources.

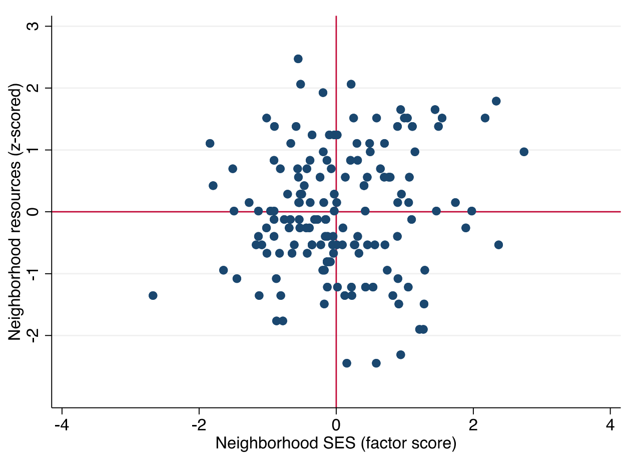

Fig. 2 Scatterplot of standardized (z-scored) neighborhood resources and neighborhood SES. *Note*. Each blue dot represents a preschool neighborhood ($N = 152$) and its observed values on each neighborhood characteristic. The two red lines split the neighborhoods into quadrants (i.e., above sample average neighborhood SES, above sample average neighborhood resources). 32% of the sample is below average on both neighborhood characteristics, whereas 24% of the sample is above average on both, 23% of the sample is above average on SES and below average on resources, and 22% of the sample is below average on SES and above average on resources.

Relations between Neighborhood Characteristics, Classroom Quality, and Child Outcomes

Results of SEM analyses for Aim 2a are presented in Fig. 3. The primary model yielded the following fit statistics: RMSEA = 0.07, CFI = 0.77, SRMR = 0.07. Although the RMSEA and SRMR demonstrated adequate model fit, the CFI was not adequate. However, Kenny (2020) stipulates that if the RMSEA for the null model is less than.158, an incremental measure of fit (i.e., CFI) may not be very informative. The RMSEA for the null model was calculated to be.13 (see Appendix B for more information and calculations). Thus, this goodness-of-fit standard was relaxed.

In terms of direct paths, neighborhood SES positively predicted gains in children's LL skills, $b = 0.90$, $SE = 0.52$, $p = .08$, $\beta = 0.05$, and negatively predicted gains in EF, $b = -0.05$, $SE = 0.02$, $p = .01$, $\beta = -0.11$. Neighborhood SES was positively predictive of classroom instructional support, $b = 0.14$, $SE = 0.06$, $p = .02$, $\beta = 0.16$, but not classroom organization or emotional support. The presence of neighborhood resources was not predictive of children's gains in either LL or EF. Like neighborhood SES, resources only positively predicted instructional support, $b = 0.01$, $SE = 0.01$, $p = .04$, $\beta = 0.12$. Finally, higher levels of classroom instructional support were related to gains in both child outcomes, LL: $b = 1.51$, $SE = 0.62$, $p = .02$, $\beta = 0.07$; EF: $b = 0.05$, $SE = 0.02$, $p = .03$, $\beta = 0.10$. All other direct paths between classroom process quality and child outcomes were non-significant.

Table 2 presents the indirect path coefficients from our model. Of the 12 indirect pathways tested, three marginally significant paths—all via classroom instructional support—emerged from our analyses. Specifically, we observed indirect pathways via instructional support from neighborhood SES to LL, $b = 0.21$, $SE = 0.11$, $p = .07$, $\beta = 0.01$, and EF, $b = 0.01$, $SE = 0.00$, $p = .10$, $\beta = 0.02$. Finally, instructional support also partially explained the association between neighborhood resources and children's LL skills, $b = 0.02$, $SE = 0.01$, $p = .09$, $\beta = 0.01$.

Finally, we modified our model to examine whether exposure to high levels of both SES and resources were directly and indirectly relevant for gains in child outcomes. Two of the five interactions tested were statistically significant (see Fig. 4a,b). First, levels of classroom instructional support were highest when neighborhoods were both high SES and well-resourced ($b = 0.02$, $SE = 0.01$, $p = .004$, $\beta = 0.13$). Second, the relation between neighborhood SES and child EF skills was moderated by the level of neighborhood resources ($b = -0.003$, $SE = 0.002$, $p = .07$, $\beta = -0.03$). In other words, children

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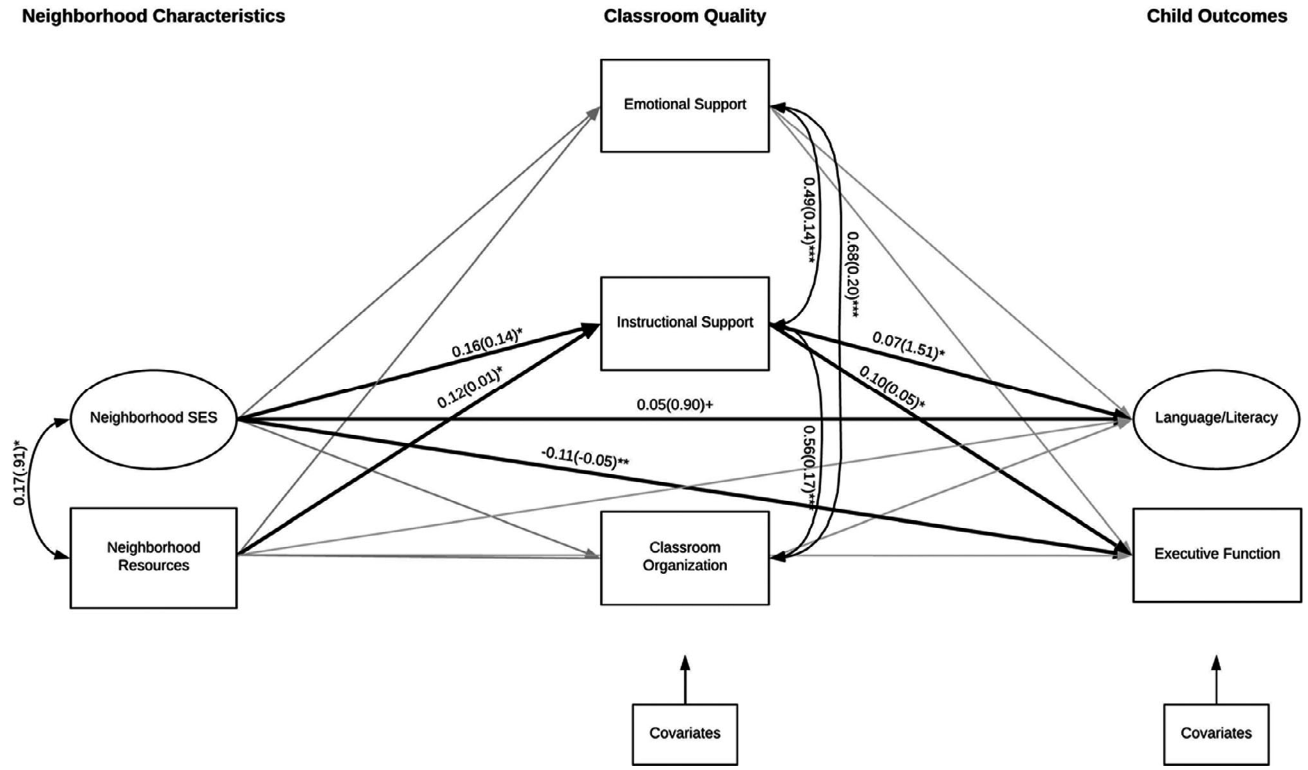

Fig. 3 Path analyses of the final mediation model (N = 955 children). *Note*. Model accounts for non-independence of observations at the classroom-level; Model fit statistics are RMSEA = 0.07, CFI = 0.77, SRMR = 0.07; Gray lines indicate non-significant paths, whereas black lines indicate significant paths; Unstandardized coefficients (inside parentheses) and standardized coefficients (outside parentheses) are presented for coefficients with p-values <.10; Stars indicate statistical significance of the unstandardized path coefficients: + $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$; Covariates were included to predict classroom process quality and children's outcomes; Model does not present the variance terms of exogenous variables or the variance of the error terms of the endogenous variables; Complete model results are presented in Table C.1.

demonstrated the largest gains in EF in lower SES but relatively well-resourced contexts. Other paths showed no evidence for moderation.

Sensitivity Analyses

We also conducted a series of sensitivity analyses to test the robustness of our results. First, we clustered standard errors at the neighborhood level. Second, we examined the sensitivity of our findings to alternative conceptualizations of neighborhood resources by modeling resources as (1) a sum score based on the presence of the 13 resources (i.e., range = 0 to 13) drawing on prior studies' approaches (Curley, 2010; Molnar et al., 2008) and (2) a latent variable using the 13 resources as indicators. We found no meaningful substantive differences in these analyses (contact first author for full results). Third, we examined whether our results differed based on treatment or control group status. A chi-square difference test was conducted between a model in which all parameters were constrained to be equal across groups and a model in which path coefficients between the primary variables were freely estimated between groups. The chi-square difference test indicated that the fully constrained model had better fit than the model with paths unconstrained, $\Delta\chi^2(16) = 26.68$, $p = .04$, suggesting that there was no difference in these associations based on treatment group status.

Discussion

The present study aimed to (1) describe associations between SES and resources among urban preschool neighborhoods; and (2) examine whether neighborhood SES and resources may be independently and jointly linked to young children's gains in developmental outcomes via differences in preschool classroom process quality. Our results showed heterogeneity in neighborhood resources across varying neighborhood SES contexts, thereby suggesting a lack of monotonicity among sample neighborhoods. We also found that levels of classroom instructional support may partially account for the relations between both neighborhood characteristics and preschool children's development. Specifically, one

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Table 2 Indirect path coefficients from final model ($N = 955$)

	B (*SE*)	β
Neighborhood SES → Language/literacy		
Total indirect paths	0.22* (0.11)	0.01
Neighborhood SES → Emotional Support → Language/literacy	0.00 (0.02)	0.00
Neighborhood SES → Instructional Support → Language/literacy	0.21~ (0.11)	0.01
Neighborhood SES → Classroom Organization → Language/literacy	0.02 (0.04)	0.00
Neighborhood Resources → Language/Literacy		
Total indirect paths	0.01 (0.01)	0.01
Neighborhood Resources → Emotional Support → Language/literacy	0.00 (0.00)	0.00
Neighborhood Resources → Instructional Support → Language/literacy	0.02~ (0.01)	0.01
Neighborhood Resources → Classroom Organization → Language/literacy	0.00 (0.01)	0.00
Neighborhood SES → Executive Function		
Total indirect paths	0.01~ (0.00)	0.02
Neighborhood SES → Emotional Support → Executive Function	0.00 (0.00)	0.00
Neighborhood SES → Instructional Support → Executive Function	0.01~ (0.00)	0.02
Neighborhood SES → Classroom Organization → Executive Function	0.00 (0.00)	0.00
Neighborhood resources → Executive Function		
Total indirect paths	0.00 (0.00)	0.01
Neighborhood Resources → Emotional Support → Executive Function	0.00 (0.00)	0.00
Neighborhood Resources → Instructional Support → Executive Function	0.00 (0.00)	0.01
Neighborhood Resources → Classroom Organization → Executive Function	0.00 (0.00)	0.00

Standard errors (SE) in parentheses; Stars indicate statistical significance of unstandardized coefficients: ~ $p < .10$, *$p < .05$.

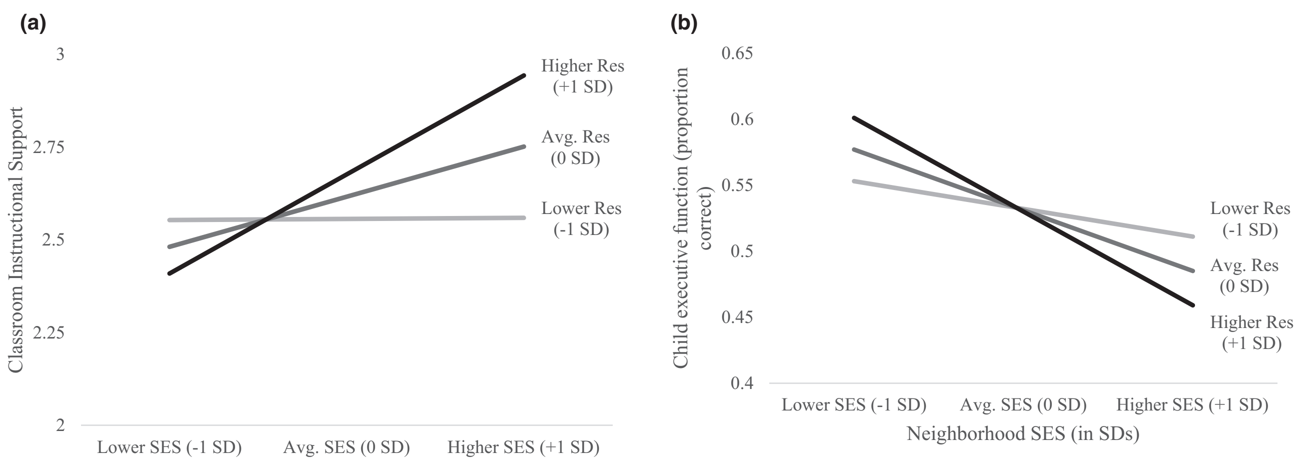

Fig. 4 (a and b). Predicting (a) classroom instructional support and (b) gains in child executive function skills as a function of the interaction between neighborhood SES and neighborhood resources. Each line represents a different level of neighborhood resources among neighborhoods in the sample (lower resources = −1 SD, average levels of resources = 0 SD, higher resources = +1 SD). A neighborhood that is well-resourced (+1 SD) and higher SES (+1 SD) would be in the top right quadrant of Fig. 2.

contribution of this study is our finding that after controlling for neighborhood SES, neighborhood resources were indirectly and positively related to gains in children's LL skills through higher levels of preschool classroom instructional support. Finally, our interaction analyses revealed that preschool classroom instructional support was highest in neighborhoods that were above average in both SES and resources, suggesting the benefits that may be transmitted to children attending preschool in doubly advantaged neighborhoods.

Results of the present study revealed that the number of resources available varied across neighborhoods, providing evidence against a "one size fits all" image of relatively low-SES communities. Although resource-poor, low-SES neighborhoods were present in our sample, there were also many low-SES neighborhoods that were relatively resource-abundant. This finding aligns with more recent research on neighborhood resources demonstrating that the lack of resources in lower SES neighborhoods is far less common than previously observed (Small & McDermott, 2006; Small & Stark, 2005). Indeed, the weak relation between neighborhood SES and resources may be attributed to the role of government intervention at the federal, state, or local levels in increasing access to neighborhood resources in low-income neighborhoods. For example, the federal government has intentionally placed safety net hospitals in primarily low-income neighborhoods to promote access to health care (Hussein et al., 2016). These efforts were noticed in our sample neighborhoods where the mean number of hospitals was similar across neighborhoods of different SES levels. Collectively, this finding calls into question current models of neighborhood research that largely focus on unitary neighborhood constructs, such as neighborhood SES, rather than considering a more holistic, multi-dimensional approach to characterizing communities.

Our results revealed several direct associations between neighborhood characteristics and children's outcomes. First, consistent with prior literature (Aikens & Barbarin, 2008; Anderson et al., 2019), we found direct relations between neighborhood SES and gains in children's LL skills. Surprisingly, we also found that higher levels of neighborhood SES were associated with reduced gains in child EF. Although prior research has found that children from higher SES communities demonstrate higher levels of EF than their peers from lower SES contexts (Roy et al., 2014), our study focuses on *gains*, rather than levels of EF. Importantly, children attending preschool in lower SES neighborhoods had lower fall EF scores on average relative to their peers in higher SES neighborhoods, suggesting that they also had more "room to grow" in these skills. Future studies should explore associations between neighborhood SES and EF with a more diverse sample of neighborhood contexts and with a broader set of EF measures to both replicate and explain these negative associations. Research is also needed to better understand the mechanisms that may explain these residual direct associations.

In addition to the direct pathways, our results also revealed that instructional support was the only dimension of classroom process quality to partially explain the positive association between both neighborhood characteristics and child gains. Consistent with prior studies exploring the role of neighborhood SES (Dupéré et al., 2010; McCoy et al., 2015), our study found that children in higher SES neighborhoods experienced greater preschool classroom process quality relative to their peers in lower SES neighborhoods. This quality was, in turn, predictive of greater gains in child outcomes over one academic year.

The present study also builds on the institutional resources literature by demonstrating the importance of neighborhood resources for child development. More notably, the presence of neighborhood resources was associated with gains in children's LL via classroom instructional support, even after accounting for levels of neighborhood SES and child SES. To our knowledge, this study is the first to empirically test associations between neighborhoods resources, classroom process quality, and early childhood development. It is possible that market-based mechanisms were at play, such that neighborhoods with more preschools induced competition among preschools, thereby improving instructional quality. Alternatively, the presence of these resources may reflect the social capital and overall investment of residents and local organizations who care about the common good of those embedded within the community—such as ensuring that the youngest residents (i.e., children) have access to high-quality learning settings. Future studies should continue to explore the mechanisms underlying these relations to understand how to support children's development both within and outside classrooms.

Finally, two interactions between neighborhood SES and resources emerged in our findings. First, differences in instructional support based on neighborhood resources emerged only in higher SES (i.e., one SD above the sample average) communities. In particular, instructional support was low in poor neighborhoods, regardless of the level of resources available in those contexts. In higher SES neighborhoods, however, instructional support was substantially higher in the context of high levels of resources, whereas it was similar to that of lower SES communities when resources were low. As such, children in our study attending preschool in the highest SES and most resource-abundant sample neighborhoods gained the most via the higher levels of instructional support experienced. This finding could be explained by the cumulative advantage hypothesis, which suggests that sources of advantage build on top of each other to accrue benefits to children (Ceci & Papierno, 2005). Whereas this hypothesis is often applied in the context of individual characteristics (e.g., household SES), the present study suggests that theories of cumulative advantage may also hold for classrooms and neighborhoods. Moreover, this interaction suggests that paying attention to and targeting multiple dimensions of communities may have additive benefits relative to those focused on only one of these characteristics.

The second interaction revealed that gains in EF were similarly small for children attending preschool in low-resource neighborhoods, regardless of SES level. In the context of higher-resource neighborhoods, however, neighborhood SES seemed to make a difference. In particular, gains in EF were largest for children attending preschool in lower SES but higher-resource communities, and smallest for children in higher SES, higher-resource contexts. As mentioned previously, the negative associations between neighborhood SES and child gains in EF skills were surprising and warrant additional research. It is possible that children attending preschool in lower SES

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neighborhoods have the most room to grow in their EF development, but also that exposure to a high-resource neighborhood may provide affordances that support children's EF development.

Although this study has several notable strengths, it also has a number of limitations. First, it is possible that family-level selection processes may predict living in specific neighborhoods that are correlated with preschool quality. The present study is based on correlational data on neighborhood characteristics, classroom process quality, and children's outcomes. We accounted for a number of covariates, including fall child outcomes, but it is possible that the interpretation of our results may be biased due to selection bias or reverse causality. Future research should consider the possibility of selection bias at multiple levels of analysis (e.g., by using experimental or quasi-experimental designs that allow for causal conclusions) and the timing of variables (e.g., by examining these variables using longitudinal data). Second, the present study is focused on interrelations between children's microsystems and does not consider broader macro-level factors (e.g., state- or city-level factors like funding, political context) that may account for variation in these associations. Future studies should incorporate these factors to gain a more comprehensive understanding of the ecosystem of early child development. Third, our study focuses on children's preschool neighborhoods only. Although children often attend preschools near their homes (Chaudry et al., 2011; Raikes et al., 2012), we do not have access to children's residential addresses and cannot confirm this in our sample. Future research leveraging information on both residential and preschool neighborhoods is needed to consider the various contexts in which children are immersed and how each independently and jointly contributes to development. Fourth, our neighborhood resource measure is limited in scope and depth. Despite the fact that we captured a number of types of institutions, our data source limited us to information solely on the presence or absence of specific categories of businesses. As such we were unable to account for other child-friendly resources (e.g., neighborhood parks), the frequency of use or the quality of resources, or residents' access to resources outside of the census tract. Future studies should consider these other dimensions of resources, as well as other characterizations of neighborhood boundaries. Finally, the generalizability of our study is limited based on the fact that preschools in our study were located almost exclusively in urban areas. Prior studies have shown how both neighborhood SES and resource availability may vary by geography (Allard, 2004; Holliday & Dwyer, 2009). As such, further research is needed to confirm the degree to which these processes operate similarly based on urbanicity.

Conclusions

Past research has primarily focused on neighborhood SES as a core predictor of child development and has largely failed to consider the mechanisms underlying these associations. By taking a more comprehensive approach toward capturing neighborhood characteristics, the present study illuminates considerable heterogeneity in the resources available in communities serving low-SES preschoolers. Moreover, these findings suggest that both neighborhood SES and resources may individually promote child development through levels of classroom process quality, and that these associations are magnified in communities high in both SES and resources. In light of these findings, there is a need for policymakers and practitioners to pay attention to multiple neighborhood characteristics simultaneously. Specifically, when considering how to target preschool- or classroom-based interventions, these findings suggest that classrooms in neighborhoods that are low on only one characteristic may need more support than one that is high on both characteristics. Targeting the multiple contexts in which children are embedded may be an effective approach toward ensuring that all children have high-quality early learning experiences that promote their development and well-being in both the short- and long-term.

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Conflict of Interest

The authors declare that they have no financial or other conflict of interest relevant to this article.

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Appendix A

Additional descriptive statistics

Table A1 Descriptive statistics of full vs. analytic vs. excluded samples

	Full sample			Analytic sample			Excluded sample			Diff. btw. analytic and excluded samples
	N	*M*	*SD*	*N*	*M*	*SD*	*N*	*M*	*SD*	
Neighborhood characteristics										
Socioeconomic status	209	−0.00	0.89	152	−0.01	0.91	57	0.02	0.85	
Resources (sum score)	209	17.31	7.40	152	17.71	7.36	57	16.25	7.44	
Population Density (individuals per square mile)	209	7330	9895	152	6865	9348	57	8566	11221	
Census tract area (in square miles)	209	1.06	1.95	152	1.12	1.90	57	0.86	2.04	
Classroom characteristics										
% in treatment condition	401	51%		251	61%		150	35%		***
% in Head Start settings	289	57%		233	56%		56	64%		
% in public school settings	300	37%		239	39%		61	27%		~
Child characteristics										
Age	1,407	4.17	0.47	955	4.19	0.46	452	4.12	0.48	**
% Girls	1,407	49%		955	48%		452	52%		
% Black	1,382	47%		945	47%		437	48%		
% White	1,382	11%		945	12%		437	10%		
% Hispanic	1,382	34%		945	35%		437	32%		
Income-to-needs ratio	1,277	1.09	1.01	875	1.11	0.99	402	1.06	1.05	
Maternal years of education	1,370	12.73	2.04	936	12.70	2.03	434	12.81	2.07	

PA, Print Awareness; PH, Phonological Knowledge; PPVT, Peabody Picture Vocabulary test; TOPEL, Test of Preschool Early Literacy; WJPV, Woodcock-Johnson Picture Vocabulary test.

A two-sample t-test was used to test differences between the analytic and excluded samples for continuous variables, whereas a chi-squared test was used to test differences for dichotomous variables.

~$p < .10$, * $p < .05$, **$p < .01$, ***$p < .001$.

Table A2 Descriptive statistics of neighborhood-level covariates across and within sample cities'

	Population density (individuals per square mile)		Census tract area (in square miles)	
City	Mean	*SD*	Mean	*SD*
Chicago, IL ($n = 34$)	9,104	4,327	0.32	0.55
Charlotte-Mecklenburg, NC ($n = 24$)	1,069	694	2.68	2.81
New York City, NY ($n = 22$)	24,050	12,876	0.07	0.02
Dayton, OH ($n = 20$)	1,350	821	2.14	2.84
Hartford, CT ($n = 16$)	4,249	2,392	0.44	0.51
Columbus, OH ($n = 14$)	2,184	1,323	0.89	0.66
Stockton, CA ($n = 9$)	2,595	796	0.89	0.47
Providence, RI ($n = 9$)	2,466	1,660	1.16	0.96
Memphis, TN ($n = 4$)	1,774	224	3.15	3.29
Total ($N = 152$ neighborhoods based on Census tract)	6,865	9,348	1.12	1.90

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Table A3 Model fit and factor loadings for the latent variables for language/literacy at fall and spring and neighborhood SES

Construct/Indicator	Standardized (Unstandardized) factor loading	Internal Consistency (alpha)
Language/literacy (fall) →		
PPVT	0.87 (1.00)***	0.79
WJPV	0.83 (0.93)***	
TOPEL—PA	0.69 (0.70)***	
TOPEL—PK	0.55 (0.53)***	
Language/literacy (spring) →		
PPVT	0.88 (1.00)***	0.80
WJPV	0.83 (0.79)***	
TOPEL—PA	0.65 (0.71)***	
TOPEL—PK	0.51 (0.52)***	
Neighborhood SES →		
Employment rate	0.80*** (1.00)	0.77
Adult educational attainment (HS diploma+)	0.77*** (0.97)	
Household income	0.81*** (1.04)	
Covariance between neighborhood SES and neighborhood resources	0.13 (0.10)	

PA, Phonological Awareness; PK, Print Knowledge; PPVT, Peabody Picture Vocabulary Test; TOPEL, Test of Preschool Early Literacy; WJPV, Woodcock-Johnson III Picture Vocabulary Test.
The results for the latent variable for neighborhood SES are based on a measurement model that correlates the latent variable for neighborhood SES with the sum score of neighborhood resources because neighborhood SES was perfectly identified on its own. Model fit statistics are RMSEA = 0.12, CFI = 0.98, SRMR = 0.03 for fall LL; RMSEA = 0.07, CFI = 0.99, SRMR = 0.02 for spring LL; and RMSEA = 0.11, CFI = 0.99, and SRMR = 0.03 for the neighborhood SES measurement model.
Stars indicate statistical significance of unstandardized coefficients: *$p < .05$, **$p < .01$, ***$p < .001$.

Table A4 Correlation matrix of analytic variables ($N = 955$)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) Neighborhood SES	1						
(2) Neighborhood resources	0.16***	1					
(3) Classroom—Emotional support	0.10**	0.09**	1				
(4) Classroom—Instructional support	0.21**	0.15***	0.52***	1			
(5) Classroom—Classroom organization	0.02	0.07*	0.67***	0.55***	1		
(6) Child—Language/literacy	0.11**	0.10**	0.11***	0.13***	0.03	1	
(7) Child—Executive function	0.00	0.02	0.04	0.09**	0.05	0.39***	1

*$p < .05$, **$p < .01$, ***$p < .001$.

Appendix B

RMSEA Calculation for the Null Model of the Non-imputed Final Mediation Model

$$\mathrm{RMSEA} = \frac{\sqrt{X^2 - df}}{\sqrt{df(N-1)}}$$

$$\mathrm{RMSEA} = \frac{\sqrt{5414.37 - 300}}{\sqrt{300(955-1)}} = 0.134$$

Note. Based on the mathematical properties of calculating RMSEA and CFI, a low model RMSEA and a null model RMSEA of less than 0.158 will yield a CFI that is less than .90. The RMSEA for the null model could not be computed based on the imputed structural model. The values used in these calculations are from the same model using non-imputed covariates.

Appendix C

Comprehensive model results

Table C1 Direct paths of final analytic model (N = 955 children)

Direct paths	*b*	*SE*	*p*	β
Emotional support ←				
Neighborhood SES	0.02	0.05	.43	0.03
Neighborhood resources	0.01	0.01	.20	0.08
Instructional support ←				
Neighborhood SES	0.14	0.06	.02	0.16
Neighborhood resources	0.01	0.01	.04	0.12
Classroom organization ←				
Neighborhood SES	−0.03	0.05	.64	−0.03
Neighborhood resources	0.01	0.01	.25	0.07
Language/Literacy ←				
Neighborhood SES	0.90	0.52	.08	0.05
Neighborhood resources	0.04	0.04	.28	0.02
Emotional support	−0.17	0.72	.81	−0.01
Instructional support	1.51	0.62	.02	0.07
Classroom organization	−0.59	0.78	.46	−0.02
Fall language/literacy	0.97	0.04	<.001	1.04
Executive Function ←				
Neighborhood SES	−0.05	0.02	.01	−0.11
Neighborhood resources	0.00	0.00	.67	−0.01
Emotional support	−0.01	0.02	.74	−0.02
Instructional support	0.05	0.02	.03	0.10
Classroom organization	−0.03	0.02	.23	−0.05
Fall executive function	0.36	0.04	<.001	0.36

Model accounts for non-independence of observations at the classroom-level; child-, classroom-, and neighborhood-level covariates were included to predict classroom process quality and child variables; covariances between neighborhood-level characteristics (i.e., SES, resources, population density) and classroom process quality measures were also included.

Table C2 Main effects of and interactions between neighborhood SES and resources predicting preschool classroom process quality and child gains in developmental outcomes

	Emotional Support			Instructional Support			Classroom Organization			Language/Literacy			Executive Function		
	b	*SE*	*p*	*b*	*SE*	*p*	*b*	*SE*	*p*	*b*	*SE*	*p*	*b*	*SE*	*p*
SES	0.04	0.05	.46	0.14	0.05	.01	−0.03	0.05	.61	0.89	0.53	.09	−0.05	0.02	.01
Resources	0.01	0.01	.29	0.01	0.01	.11	0.01	0.01	.33	0.04	0.04	.31	0.00	0.00	.94
SES X Res.	0.01	0.01	.25	0.02	0.01	.00	0.01	0.01	.47	0.00	0.34	.99	−0.00	0.00	.07

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