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Structural and Process Quality of Danish Preschools: Direct and Indirect Associations With Children's Growth in Language and Preliteracy Skills

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ABSTRACT

Structural quality in childcare centers is considered a precondition for process quality, which in turn is related to children's outcomes. However, the evidence on relations between structural and process quality is mixed. Moreover, despite strong theoretical claims, empirical evidence supporting the indirect relation of structural features through process quality on child outcomes is scarce. The current study contributes to the knowledge by (a) investigating the direct relations of structural teacher and classroom features with growth in children's language and preliteracy skills in a sample of more than 3,000 children, (b) studying the associations of process quality with children's outcomes using the widely used Classroom Assessment Scoring System Pre-K observational measure among more than 400 teachers, and (c) testing indirect effects of structural quality through process quality on growth in children's skills. Process quality was generally directly positively associated with gains in children's language and preliteracy skills, whereas structural quality showed few direct relations. In addition, the average level of children's initial language and preliteracy skills were positively related to gains, as was classrooms' proportion of non-Danish children (indirectly through process quality). The results illustrate the complexities of relations between structural and process quality and children's outcomes and warrant further research.

A host of studies attest to the importance of children's early language and preliteracy skills for their school achievement, reading in particular (National Early Literacy Panel, 2009), which is a strong predictor of later success (Dickinson & Porche, 2011). For instance, children's vocabulary skills at age 2-4 have been shown to be predictive of early reading abilities (Bleses, Makransky, Dale, Højen, & Aktürk Ari, 2016; Dickinson & Porche, 2011; Hart & Risley, 1995; Lee, 2011; National Institute of Child Health and Human Development Early Child Care Research Network [NICHD ECCRN], 2005). The benefits of preschool attendance for children's development, including language, have been well established (Gormley, Gayer, Phillips, & Dawson, 2005; Pianta, Barnett, Burchinal, & Thornburg, 2009), especially when the provided education is of high quality (Melhuish et al., 2015; Zaslow et al., 2010). Two aspects of the quality of preschools have been shown to be related to language outcomes, that is, structural quality and process quality. Structural quality is defined as the so-called regulable, more distal aspects of early childhood education (ECE), such as group size, child-to-teacher ratio, or teachers' qualifications (e.g., Howes et al., 2008), which are regarded as important preconditions of process quality (Cryer, Tietze, Burchinal, Leal, & Palacios, 1999; Philips, Mekos,

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Scarr, McCartney, & Abbott-Shim, 2000; Phillipsen, Burchinal, Howes, & Cryer, 1997; Pianta et al., 2005; Slot, Leseman, Verhagen, & Mulder, 2015). Process quality concerns children's daily experiences while interacting with teachers, peers, and materials and is seen as a proximal determinant of children's outcomes (Howes et al., 2008; Pianta et al., 2005). Although structural features are presupposed to create the conditions under which teachers establish relationships in a way that nurtures children's whole development and allows them to develop their potential, these structural features might also directly influence children's outcomes, or the underlying mechanism might reflect an indirect path in which process quality mediates the relation between structural quality and children's outcomes (see Figure 1). However, empirical evidence to support this mechanism is still scarce. Increasing understanding of indirect and direct effects of quality on child outcomes provides more insights into which investments are needed in order to enhance children's development. The current study aimed to contribute to the knowledge base by (a) investigating the direct relations of structural and process quality with growth in children's language and preliteracy skills and (b) testing indirect paths of structural characteristics through process quality on children's language and preliteracy development. The present study was conducted in Danish preschools, because despite the universal ECE system in Denmark with massive public investment (Esping-Andersen et al., 2012), little is known about its quality, specifically process quality, and how process quality in turn is related to children's preacademic outcomes.

Associations of structural quality with children's language and preliteracy skills

Research into ECE quality often includes structural teacher or classroom features, as these are easy to measure and compare across settings (Bowne, Magnuson, Schindler, Duncan, & Yoshikawa, 2017; Layzer & Goodson, 2006); however, the theoretical underpinning of the importance of these aspects is still limited. Layzer and Goodson (2006) highlighted the importance of teachers' pre- and in-service qualifications for their competencies in supporting individual children's development. Also,

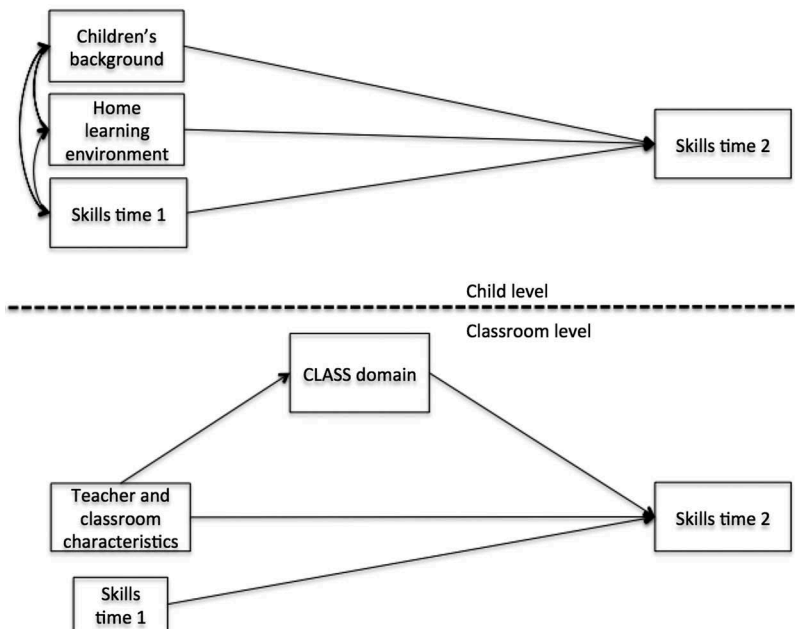


Figure 1. Theoretical multilevel mediation model predicting children's language and preliteracy skills 6 months later. CLASS = Classroom Assessment Scoring System.

Bowne et al. (2017) suggested that aspects such as group size and ratio are related to the workload involved in monitoring and supporting individual children's development.

With regard to the effects of teacher characteristics on child outcomes, the level of preservice and additional in-service training has received by far the most attention. Evidence of the importance of teachers' preservice qualifications is mixed. Some studies revealed that more teacher education was positively related to children's language (Montie, Xiang, & Schweinhart, 2006) and literacy outcomes (Sylva, Melhuish, Sammons, Siraj-Blatchford, & Taggart, 2004). However, another study reported a negative relation between higher teacher qualifications and children's literacy skills (Connor, Son, Hindman, & Morrison, 2005), and other studies showed null associations (Early et al., 2006; Howes et al., 2008; Mashburn et al., 2008). Also, additional training or professional development has been shown to be related to children's language and literacy development, as evidenced in several recent review studies and meta-analyses (e.g., P. Jensen & Rasmussen, 2015; Markussen-Brown et al., 2017).

Concerning group size and child-to-staff ratio, in a large-scale survey study conducted in the United States Blau (1999) found that smaller group size in preschool was related to better vocabulary skills for children across prekindergarten (pre-K) and elementary school and higher reading skills across elementary school from age 5 onward. In addition, studies from Germany and the United States showed that smaller group size in preschool was related to better literacy or vocabulary skills (Ebert et al., 2013; Mashburn et al., 2008). However, other U.S. studies showed that group size and also child-to-staff ratio were unrelated to children's language and literacy skills (Howes et al., 2008; Mashburn, Justice, Downer, & Pianta, 2009; Mashburn et al., 2008). Likewise, an international comparison study revealed null effects (Montie et al., 2006). Classroom composition may affect children's development as well. For instance, a German study demonstrated that preschoolers' vocabulary skills were lower and showed less growth over time in classrooms with a larger share of immigrant children (Ebert et al., 2013). Likewise, other studies from The Netherlands and the United States showed that low-income children attending preschools with a larger share of other less affluent children made less progress in their language (Schechter & Bye, 2007) or literacy (de Haan, Elbers, Hoofs, & Leseman, 2013) development compared to their peers in more socioeconomically mixed preschool classrooms.

To date, empirical evidence from Denmark is scarce. A study by Bauchmüller, Gørtz, and Rasmussen (2014) showed that a favorable child-to-teacher ratio and a higher share of teachers with formal teacher training in preschool positively predicted children's language outcomes in the ninth grade. Gupta and Simonsen (2016) demonstrated that children who attended center-based day care at age 2 scored higher on language skills in ninth grade compared to children who were enrolled in family day care, which the authors explained by the difference in teachers' formal educational qualifications. The vast majority of family day care caregivers completed either vocational training or high school only, whereas teachers in center-based day care (who account for about 60% of the workforce) held a pedagogical degree (Gupta & Simonsen, 2010).

To summarize, evidence of direct relations of structural classroom or teacher characteristics with children's outcomes is limited, particularly for Denmark, and inconclusive. The present study contributes to the research base by investigating the direct associations of a large number of structural teacher and classroom characteristics with children's language and preliteracy outcomes.

Associations of process quality with children's language and preliteracy skills

Interactional classroom processes are considered the primary mechanisms through which children develop and learn (Bronfenbrenner & Morris, 2006). Positive and affectionate relationships with teachers provide children with a secure base and allow them to develop a sense of autonomy and competence (Sroufe, 2000), which is the base for development and learning. Also, teachers' ability to structure the environment, establish and maintain classroom routines, and provide children with developmentally appropriate activities and learning formats promotes children's learning and task

engagement (Emmer & Strough, 2001). Finally, teachers' strategies in using techniques such as scaffolding, providing content-specific and process-oriented feedback, posing questions to stimulate higher order thinking skills, and modeling language use can enhance children's learning opportunities (Davis & Miyake, 2004; Skibbe, Behnke, & Justice, 2004). In line with this social-ecological model, several studies demonstrated effects of preschool process quality on children's language in the United States and Portugal (Burchinal et al., 2008; Burchinal, Vandergrift, Pianta, & Mashburn, 2010; Cadima, Leal, & Burchinal, 2010; Connor et al., 2005; Howes et al., 2008; Keys et al., 2013; Mashburn, 2008; Mashburn et al., 2008) and on literacy outcomes (Abreu-Lima, Leal, Cadima, & Gamelas, 2013; Burchinal et al., 2008, 2010; Cadima et al., 2010; Connor et al., 2005; Curby & Chavez, 2013; Mashburn, 2008; Mashburn et al., 2008), although the effects were generally small in magnitude. Some studies showed that instructional support in particular was related to children's language and literacy development (Burchinal et al., 2010; Howes et al., 2008; Mashburn et al., 2008), which suggests that interactions aimed at engaging children in exchanges that encourage communication and reasoning and providing children with specific and content-related feedback while establishing a rich language environment are especially important for the development of language and literacy skills.

Structural and process quality and indirect relations with children's development

Numerous studies conducted in different countries have investigated the relations between structural characteristics and process quality. The most commonly studied teacher characteristics are teachers' educational qualifications and work experience. A higher preservice training level was shown to be associated with higher levels of process quality in several European countries and the United States (Cryer et al., 1999; Phillipsen et al., 1997; Pianta et al., 2005; Slot, Leseman et al., 2015), particularly if the education included ECE content (Tout, Zaslow, & Berry, 2006). However, the evidence is not completely consistent based on U.S. studies (Early et al., 2006, 2007; Phillips, Gormley, & Lowenstein, 2009) and comparison studies in Europe (Cryer et al., 1999; Slot, Lerkkanen, & Leseman, 2015). Also, in-service training was shown to be beneficial for process quality across Europe and the United States (Fukkink & Lont, 2007; Hamre et al., 2012; Justice, Mashburn, Hamre, & Pianta, 2008; LoCasale-Crouch et al., 2011; Slot, Lerkkanen, et al., 2015; Zaslow et al., 2010) even over and above formal preservice qualifications (Philips et al., 2000) and especially if the training included ECE content (Burchinal, Cryer, Clifford, & Howes, 2002). Similar mixed findings have been reported for teachers' work experience, revealing positive relations (Kuger et al., 2016; LoCasale-Crouch et al., 2007; Phillipsen et al., 1997; Slot, Boom, Verhagen, & Leseman, 2017), negative associations (Connor et al., 2005; Wilcox-Herzog, 2004), or no relations at all (Justice et al., 2008; Phillips et al., 2009; Pianta et al., 2005) with process quality. Two European comparison studies also revealed mixed findings (Cryer et al., 1999; Slot, Lerkkanen, et al., 2015).

Regarding classroom features, several studies showed that smaller child-to-teacher ratios and smaller group sizes were related to higher overall process quality (Barros & Aguiar, 2010; Burchinal et al., 2002; Mashburn et al., 2008; Philips et al., 2000; Phillipsen et al., 1997). However, other studies did not find these associations (Pessanha, Aguiar, & Bairrão, 2007; Phillipsen et al., 1997; Pianta et al., 2005; Slot, Leseman et al., 2015), and a European comparison study showed contradictory results (Cryer et al., 1999). With regard to classroom composition, such as the mean age in the classroom or the effect of classroom ethnic composition on process quality, Mocan and colleagues (1995) found no relations between mean age in the classroom and process quality, but a recent German study by Kuger and colleagues (2016) showed that process quality was higher in classrooms with on average older children. Most research has shown that process quality is lower in classrooms with higher proportions of ethnic minority children, for instance in Germany (Kuger et al., 2016; Lehl, Kuger, & Anders, 2014; Slot, Lerkkanen, et al., 2015) and the United States (LoCasale-Crouch et al., 2007; Tonyan & Howes, 2003). However, another study from the United States showed that

instructional process quality was not related to the number of children with limited English proficiency (Justice et al., 2008).

In sum, there is evidence, although somewhat mixed, of relations between structural and process quality, which in turn is supposed to affect children's development and skills. Despite a strong theoretical assumption that structural teacher and classroom features affect children's development through process quality, the empirical evidence supporting this notion is scarce (Melhuish et al., 2015). To the best of our knowledge, only two studies have investigated mediation effects in ECE and care. A large-scale study of day care carried out by the NICHD ECCRN (2002) investigated two mediation paths using child-to-staff ratio and teachers' qualifications as structural features. The results confirmed indirect paths of teachers' qualifications and child-to-staff ratio through process quality on children's cognitive development, although the effects were small ($\beta = .07$ and $\beta = -.02$, respectively). These indirect effects were smaller than the direct effects of process quality, specifically teachers' emotionally supportive interactions with children, reported in the same study ($\beta = .10$). Furthermore, Connor et al. (2005) also investigated indirect and direct effects of structural and process quality on first graders' vocabulary and reading skills. The findings revealed that higher teacher education only influenced children's vocabulary skills indirectly through teachers' warmth and responsivity, although with a small effect size.

Despite the limited evidence, there is initial support for the indirect relations of structural teacher and classroom features with children's outcomes through process quality. However, the evidence is currently limited to only two factors—teachers' preservice educational qualifications and child-to-staff ratio—and the evidence base for the importance of these particular factors in regard to process quality is inconsistent. Hence, the current study included a wider range of structural teacher characteristics (i.e., pre- and in-service training, age, and work experience) and classroom features (i.e., group size, ratio, and classroom composition in terms of age and cultural background) to investigate possible indirect effects through process quality.

The majority of the research discussed previously refers to the U.S. preschool context, whereas evidence from Europe (and Denmark in particular) is limited. As we discuss, Denmark's ECE system differs from that of the United States in several ways, and thus evidence of the effects of quality on child outcomes can contribute to the current body of knowledge.

The ECE system in Denmark

Denmark provides a universal ECE system with an enrollment rate of 97% of all 3- to 5-year-old children (Danish Ministry of Social Affairs, 2015). Preschools are part of a publicly funded system organized by and under the responsibility of local municipalities that are obliged to ensure the availability of preschools (Gupta & Simonsen, 2010). Municipalities are responsible for the monitoring their educational quality and basic safety and hygiene. The ECE system in Denmark is characterized by a high level of public expenditure compared to other countries (Esping-Andersen et al., 2012) and by comparatively high quality in terms of structural characteristics (Esping-Andersen et al., 2012). For instance, the average child-to-teacher ratio for preschoolers is 7:1, whereas in the United States and Canada the corresponding ratio is 12:1 (Esping-Andersen et al., 2012). However, there is potentially considerable variation across municipalities, as the child-to-teacher ratio is not regulated by the state. Most preschools are organized into classrooms (approximately 20 children on average), but some preschools use activity centers as the main principle of organization. This means that there are different activity centers in which children can play that are not restricted to the classroom setting. Approximately 60% of teachers have a 3.5-year pedagogical bachelor's degree (Dalsgaard, Nøhr, & Tenney Jordan, 2014), and the other 40% are mainly uneducated teaching assistants. Since 2008, it has been possible to obtain a 2.5-year degree as a pedagogical assistant, but it is yet unclear how many teaching assistants have obtained this degree.

There is no national curriculum in Denmark but rather a locally defined curriculum, usually at the institutional level. Since 2004, legislation has been in place obliging day care centers to formulate

so-called learning plans focusing on six broad themes: children's all-around individual development, social competence, language development, body and movement, nature and natural phenomena, and cultural expressions and values (Sylva, Erekly-Stevens, & Aricescu, 2015). This Danish legislation is aimed at a broad concept of learning through free play, creativity, and outdoor activities within a social and inclusive context (Bauchmüller et al., 2014; B. Jensen, 2009). Indeed, a large-scale survey of 1,340 Danish teachers confirmed the strong and common belief that learning occurs in social interactions and in play situations rather than in structured instructional situations, such as circle time or academic activities (Broström, Johansson, Sandberg, & Frøkjær, 2012).

The current study

Despite this universal ECE system with its corresponding large public investment, little is known about the quality of Danish preschool, specifically process quality, and how process quality in turn is related to children's language and preliteracy outcomes. In particular, evidence of the effects of process quality and the hypothesized role of structural teacher and classroom characteristics as determinants of process quality, and thus indirectly as predictors of children's outcomes, remains unclear. Therefore, the current study addressed three research questions: (a) What are the direct effects of structural quality on children's language and preliteracy skills in preschool? (b) What are the effects of process quality on children's skills? (c) Are effects of structural quality on children's outcomes mediated by process quality? In so doing, a comprehensive set of structural teacher characteristics (i.e., pre- and in-service training, age, and work experience) and classroom characteristics (i.e., group size, ratio, and classroom composition in terms of age and cultural background) were included as possible determinants of process quality and children's preliteracy and language skills.

Method

Participants

The current study used data from a randomized controlled trial examining the effectiveness of an intervention focused at enhancing preschool children's language and preliteracy skills (Bleses et al., 2017). A total of 134 preschools containing 352 classrooms were included, which together served a total of 5,359 children ages 3 to 6. Centers were purposively sampled to overrepresent preschools with higher concentrations of children at risk for language and literacy delays based on social disadvantage and non-Danish background. For the purpose of the current study, a subsample was used based on two criteria: (a) Only classrooms for which classroom quality information (i.e., Classroom Assessment Scoring System [CLASS] Pre-K) was available were included, and (b) only children ages 4 years or older were included because the preliteracy assessment was different for 3-year-old children. The intervention study targeted teachers with a bachelor's degree. In case there were no teachers with a bachelor's degree in a center but only teaching assistants (which was the case in some of the small municipalities), the teaching assistants participated instead. A total of 402 teachers, the majority of whom were female (92.0%), from 260 classrooms participated in the current study (sometimes two teachers from the same classroom participated). Comparisons of the current subsample of teachers with the remainder of the teacher sample showed no significant differences in classroom features (i.e., group size, ratio, and classroom composition) or any teacher characteristics (age, in-service education, and work experience) except for teachers' preservice qualifications. Teachers who submitted a video more often held a bachelor's degree in ECE (80%) compared to the remainder of the sample (69%). A total of 3,132 children (53.1% girls) were included in the present study. Children were on average 59.51 months old ($SD = 7.28$, range = 46–81 months), and 89% were monolingual Danish children. A comparison of the children in the current

Table 1. Descriptive information on teachers ($N = 402$) and classrooms.

<i>Variable</i>	<i>N</i>	<i>n</i>	<i>%</i>	<i>M (SD)</i>	<i>Range</i>
In-service training (yes)	342	112	32.7		
Teacher age (years)	339				
<25		1	.3		
25–35		85	25.1		
36–45		107	31.6		
46–55		94	27.7		
>55		52	15.3		
Work experience (years)	342				
<5		61	17.8		
6–10		88	25.7		
11–15		62	18.1		
16–20		33	9.6		
>20		98	28.7		
Child-to-teacher ratio	338				
8 children or fewer		54	16.0		
9–10 children		124	36.7		
11–12 children		112	33.1		
13–14 children		26	7.7		
15 children or more		22	6.5		
Group size	402			21.11 (7.51)	5.00–57.00
Mean age in classroom (months)	346			56.67 (6.91)	42.00–70.20
Fraction non-Danish children	346			0.11 (0.22)	0–1.00

sample and the remainder of the sample showed no differences in initial language and preliteracy skills, mean age, or two out of three parent home learning environment (HLE) measures. The only significant difference was in the parent interaction scale in favor of the remainder of the sample, although the difference was small (Cohen's $d = .06$). Descriptive information on the sample of teachers and classrooms is presented in [Table 1](#).

Procedures

As part of their participation in the larger study, teachers were asked to submit videos of three daily recurring activities and routines (i.e., mealtime, shared book reading, and a language activity of the teachers' choice) before and after the intervention. The activities were to include up to five children selected by the teacher. For our purposes, baseline data were used. Trained observers coded all three videos with the CLASS Pre-K, and CLASS dimension scores were averaged across these three videos (i.e., resulting in one dimension score per teacher) for further analyses. Teachers assessed children's language and preliteracy outcomes twice with 6 months in between (i.e., pre- and postintervention) using a standardized instrument as part of national screening program (Language Assessment (LA); Bleses, Vach, Jørgensen, & Worm, 2010). Information on children's HLE and structural teacher and classroom characteristics was collected at baseline, prior to the intervention.

Classroom measures

CLASS Pre-K

Classroom quality was evaluated using the CLASS Pre-K, which distinguishes 10 different quality dimensions grouped into three overarching domains (Pianta, La Paro, & Hamre, 2008). The CLASS framework is grounded in observational studies conducted in more than 4,000 early childhood and elementary school classrooms and evaluates the quality of classroom processes along three broad domains—Emotional Support, Classroom Organization, and Instructional Support (Hamre et al., 2013)—which have been supported in other countries outside the United States as well (Leyva et al., 2015; Pakarinen et al., 2010; Von Suchodoletz, Fäsche, Gunzenhauser, & Hamre, 2014).

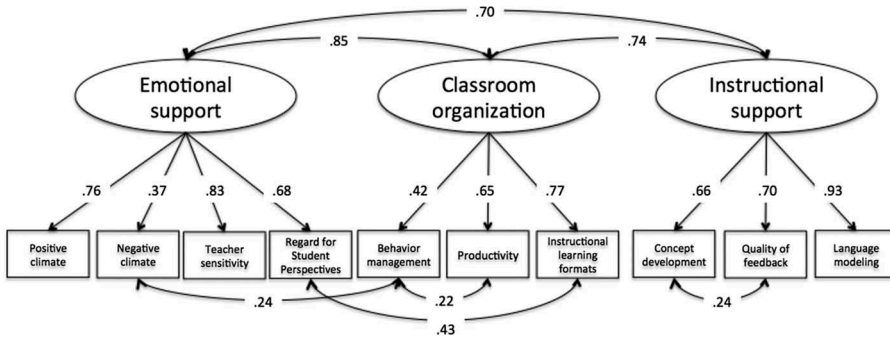


Figure 2. Factor structure of the Classroom Assessment Scoring System Pre-K in Danish Preschools.

The first domain, Emotional Support, comprises four dimensions: Positive Climate reflects the warmth, enjoyment, and respect shown in teacher–child interactions; Negative Climate captures the degree of negativity expressed by teachers and children (scores are reversed); Teacher Sensitivity reflects the degree of awareness of and responsiveness to children’s individual and learning needs; and Regard for Student Perspectives refers to the extent to which teachers elicit and take children’s ideas into account when organizing activities, providing them with choice and encouraging their independence. The second domain, Classroom Organization, has three dimensions: Behavior Management captures the strategies teachers use to promote positive behavior and redirect misbehavior; Productivity refers to the effective use of time; and Instructional Learning Formats reflects the different strategies and materials teachers use to encourage children’s engagement in activities. Finally, the third domain, Instructional Support, includes three dimensions: Concept Development refers to the strategies and activities teachers use to promote children’s thinking skills and cognition; Quality of Feedback assesses the degree to which teachers’ feedback is content specific and process oriented, aimed at enhancing children’s learning and understanding, and expands their involvement; and Language Modeling refers to the degree and quality of teachers’ language stimulation and facilitation techniques. Classroom quality was rated on a 7-point scale ranging from 1 or 2 (*classroom is low on that dimension*), to 3–5 (*classroom is in the midrange*), to 6 or 7 (*classroom is high on that dimension*).

All observers were trained by a licensed CLASS trainer and, following the standard procedure as recommended by the authors, passed a reliability test with a preset criterion of at least 80% agreement within 1 scale point. A total of 10% of the videos were randomly selected and double-coded, revealing good interrater reliability of 91.2% within 1 scale point.

Confirmatory factor analysis initially showed poor model fit, $\chi^2(32) = 230.750$, $p < .001$, root mean square error of approximation (RMSEA) = .111, comparative fit index (CFI) = .876, Tucker–Lewis index (TLI) = .825, standardized root-mean-square residual (SRMR) = .067 (Sample size is $N = 502$ for both analysis). We improved model fit by allowing some of the error variances to correlate based on the modification indices provided by Mplus and the correlational pattern between the dimensions. This resulted in a significantly improved model with satisfactory model fit, $\Delta\chi^2(4) = 103.413$, $p < .001$, RMSEA = .084, CFI = .938, TLI = .900, SRMR = .057. The final model is presented in Figure 2. The internal consistency of the domains was sufficient, with Cronbach’s alphas of .73 for Emotional Support, .64 for Classroom Organization, and .83 for Instructional Support. Average domain scores were calculated for teachers and used in the analyses.

Structural teacher and classroom characteristics

Teachers completed an online questionnaire to collect basic demographic information, and managers reported on the structural characteristics of the classroom. For teacher characteristics three dichotomous variables were included: teacher gender (1 = female); teacher education level

(1 = bachelor's degree in ECE); and whether the teacher had attended in-service training (1 = yes), which in the current study involved a nationwide course specifically targeted at enhancing children's language and preliteracy skills by training teachers in using strategies such as scaffolding, providing feedback, and language modeling (not part of the present intervention study). In addition, teacher age and work experience were included. Teacher age was measured on a 5-point scale with the following categories: 1 = 25 years or younger, 2 = 23–35 years, 3 = 36–45 years, 4 = 46–55 years, and 5 = 55 years or older. Work experience was measured on a 5-point scale with categories of 1 = 5 years or less, 2 = 6–10 years, 3 = 11–15 years, 4 = 16–20 years, and 5 = 20 years or more. Concerning classroom characteristics, four variables were included. The group size in the classroom and the child-to-teacher ratio in the classroom were provided by the leader of the preschool center. The child-to-teacher ratio was measured on a 5-point scale with categories of 1 = 8 or fewer children, 2 = 9–10 children, 3 = 11–12 children, 4 = 13–14 children, and 5 = 15 children or more. Finally, the mean age of children in the classroom measured in months and the proportion of non-Danish children in the classroom measured on a scale ranging from 0 to 1 were included.

Child measures

Language and preliteracy skills

Children's language and preliteracy skills in Danish were assessed on two occasions, with 6 months in between, using the published assessment instrument Language Assessment 3–6 that was adapted for the current study (Language Assessment (LA); Bleses et al., 2010). A total of six subscales were administered using direct assessment via picture identification or picture elicitation tasks (with the exception of the Communication task, which is a teacher report): Rhyme Detection (maximum score = 17), Deletion (maximum score = 20), Letter Identification (maximum score = 12), Vocabulary (expressive; maximum score = 40), Comprehension (of words and complex sentences; maximum score = 27), and Communication (a questionnaire with communicative strategies; maximum score = 76). Internal consistency coefficients (Cronbach's alphas) for the subscales were between .75 and .91, correlations between subscales ranged from .25 to .70, and validity has been shown to be sufficient (Bleses et al., 2017).

For the current study two composite scores were constructed: (a) a preliteracy composite, based on the average of the standardized scores of the Rhyme Detection, Deletion, and Letter Identification subscales (Cronbach's $\alpha = .58$ for Wave 1 and .65 for Wave 2); and (b) a language composite, based on the average of the standardized scores of the Vocabulary, Comprehension, and Communication subscales (Cronbach's $\alpha = .69$ for Wave 1 and .72 for Wave 2). The standardized scores were based on age- and gender-specific norms (Bleses et al., 2017). Therefore, gender and age were not used as additional covariates in the analyses.

Children's background information

Information on whether children were non-Danish was provided by the teachers participating in the study (1 = non-Danish). Although measures of family socioeconomic background, such as maternal education level, are often included as control variables, these measures are considered more distal aspects of the environment that reflect differences in children's language experiences in the home and relatedly affect children's language abilities (Hoff, 2006). Moreover, actual language experiences in the home (specifically maternal speech input) have been shown to fully explain differences in children's vocabulary development related to socioeconomic status (Hoff, 2003) and were a better predictor of children's outcomes than socioeconomic status (Hart & Risley, 1995). Therefore, in the current study we chose to use a more direct measure of the HLE to account for differences in family background. Information from the parent questionnaire was used to control for children's family background using three subscales to assess the quality of parent–child interactions (seven items), the frequency of reading (three items), and home literacy support (four items). Internal consistency coefficients (Cronbach's alphas) ranged from .65 to .81.

Missing data

There were missing data for several variables in the data set. For the HLE missing data on the subscales ranged from 25% to 26%. This information was missing more often for non-Danish children (50%) compared to Danish children (22%). Concerning teachers' background information, missing data ranged from 6% (for preservice education level) to 15% (for teacher age and gender). Missingness in classroom-level variables ranged from 0% (for group size) to 19% (for children's mean age in the classroom and the proportion of non-Danish children in the classroom). As recommended, we dealt with missing data using full information maximum likelihood estimation in Mplus (Enders, 2010), in which the standard errors for the parameter estimates are computed using the complete observed information matrix (Muthén & Muthén, 1998–2012).

Analysis strategy

First a baseline model was estimated for children's language and literacy skills at Waves 1 and 2 to estimate the amount of shared variance due to the nested structure of the data. Intraclass correlation coefficients were .33 and .35 for Waves 1 and 2, respectively, for children's language skills and .18 and .24, respectively, for children's literacy skills, showing substantial variance in children's skills related to the nesting within teachers.¹ To investigate the direct and indirect associations of structural and process quality with children's outcomes we estimated a multilevel path model in Mplus while controlling for children's skills at Time 1, family background (i.e., home language and three aspects of the HLE: quality of parent-child interactions, parent reading, and home literacy support), intervention group, and nesting within teachers. Each CLASS domain was modeled separately for each of the child outcomes, including all structural teacher and classroom characteristics, resulting in six multilevel path models.² We tested mediation effects using the model indirect command in Mplus to test indirect and direct effects of the structural features simultaneously. The model fit of the multilevel path models was evaluated with several fit indicators: the chi-square test of goodness of fit, CFI, TLI, RMSEA, and SRMR at both the child and classroom level, with CFI and TLI >.95, RMSEA <.05, and SRMR_{within} and SRMR_{between} <.05 indicating good fit and <.08 indicating acceptable fit. Standardized regression coefficients were used as measures of the effect size, with β <.10 indicating a small effect, a beta of around .30 a medium-size effect, and β >.50 a large effect (Kline, 2005).

Results

Descriptive information on the CLASS Pre-K is presented in Table 2, and correlations between structural teacher and classroom features and the CLASS domains are presented in Table 3. Teachers in Danish preschools showed medium to high levels of Emotional Support and Classroom Organization, whereas scores for Instructional Support were much lower. The results showed the strongest associations of both pre- and in-service training with the CLASS domains. Holding a bachelor's degree in ECE was related to higher observed process quality in Emotional Support and Classroom Organization but not to Instructional Support. Teachers who had attended in-service training showed higher levels of Classroom Organization and Instructional Support. Having a higher proportion of non-Danish children in the classroom was related to lower quality in all three CLASS domains, with the strongest association for Classroom Organization. None of the other teacher characteristics (teacher age or work experience) or classroom features (i.e., group size ratio or mean age of the children in the classroom) were significantly related to observed process quality. Several correlations emerged between different structural features. For instance, positive associations appeared between higher proportions of non-Danish children in the classroom and teacher education and a more favorable child-to-staff ratio.

Table 2. Descriptive information on the Classroom Assessment Scoring System Pre-K ($N = 402$).

<i>Dimension</i>	<i>M</i>	<i>SD</i>	<i>Range</i>
Positive Climate	6.22	0.53	3.50–7.00
Negative Climate	1.08	0.19	1.00–2.00
Teacher Sensitivity	5.74	0.63	3.50–7.00
Regard for Student Perspectives	4.49	0.78	2.00–6.50
Behavior Management	6.40	0.48	4.70–7.00
Productivity	6.25	0.52	4.33–7.00
Instructional Learning Formats	4.42	0.77	2.00–6.00
Concept Development	1.81	0.59	1.00–5.50
Quality of Feedback	2.41	0.66	1.00–4.67
Language Modeling	3.13	0.65	1.50–5.33
Emotional Support	5.85	0.42	4.38–6.88
Classroom Organization	5.69	0.47	3.83–6.67
Instructional Support	2.45	0.55	1.17–4.83

Table 3. Correlations between structural teacher and classroom features and CLASS domains ($N = 402$).

<i>Variable</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>8</i>	<i>9</i>	<i>10</i>	<i>11</i>
1. Teacher age	—	-.06	.79**	.07	.02	.05	.04	-.01	-.01	.06	-.07
2. BA in ECE		—	-.10	.19**	-.10	-.01	.03	.11*	.14**	.16**	.06
3. Work experience			—	.04	-.01	-.03	.05	-.03	-.03	.09	-.09
4. In-service training				—	.05	.05	-.05	-.00	.13*	.16**	.18**
5. Group size					—	.04	-.04	-.05	-.05	-.07	-.04
6. Child-to-teacher ratio						—	-.01	-.13*	-.03	.03	-.07
7. Mean age in classroom							—	-.04	.02	-.01	.06
8. Percent non-Danish children								—	-.19**	-.23**	-.13**
9. Emotional Support									—	.71**	.57**
10. Classroom Organization										—	.55**
11. Instructional Support											—

Note. CLASS = Classroom Assessment Scoring System; BA = bachelor's degree; ECE = early childhood education.

* $p < .05$. ** $p < .01$.

With regard to the first research question, the structural features and observed quality of interactions were related to children's language and preliteracy skills at Time 2 when we controlled for children's skills at Time 1 and family background (see Table 4). Concerning the structural teacher and classroom characteristics, the findings revealed that teacher age was positively related to growth in children's language skills, with a small effect size. Furthermore, the average skill level of children in the classroom at Time 1 was the strongest predictor of gains in skills 6 months later at Time 2. A higher average of children's language and preliteracy skills in the classroom was related to more average gains, which suggests an effect of classroom composition. Model 1 presents the results for Emotional Support, which showed good model fit and revealed positive relations with growth in children's language and preliteracy skills, $\chi^2(18) = 30.034$, $p = .037$, RMSEA = .015, CFI = .995, TLI = .978, SRMR_{within} = .007, SRMR_{between} = .051 (Sample size is $N = 3032$ children for all three models). Model 2 reports the results for Classroom Organization, which was positively related to gains in language and preliteracy skills, $\chi^2(18) = 29.998$, $p = .038$, RMSEA = .015, CFI = .995, TLI = .978, SRMR_{within} = .007, SRMR_{between} = .050. Finally, Model 3 demonstrates the findings for Instructional Support, which was only associated with growth in children's language skills, $\chi^2(18) = 40.600$, $p = .0302$, RMSEA = .020, CFI = .991, TLI = .959, SRMR_{within} = .007, SRMR_{between} = .058.

To summarize, structural features, except teacher age, showed no significant direct relations with children's language and preliteracy skills, whereas all CLASS domains revealed small associations with children's growth.

Next indirect relations of structural teacher and classroom features through process quality were tested. Only a few indirect associations reached statistical significance (see Figure 3). The findings

Table 4. Direct relations between structural teacher and classroom features and observed quality and growth in children's language and preliteracy skills based on a multilevel path model (N = 3,132 children and N = 402 teachers).

Variable	Preschoolers' Language Skills									Preschoolers' Preliteracy Skills								
	Model 1			Model 2			Model 3			Model 1			Model 2			Model 3		
	B	SE	β	B	SE	β	B	SE	β	B	SE	β	B	SE	β	B	SE	β
Child level																		
Time 1 skills	.65	.01	.71***	.65	.01	.71***	.65	.01	.71***	.50	.01	.59***	.50	.01	.59***	.50	.01	.59***
Non-Danish	-.30	.04	-.14***	-.29	.04	-.14***	-.30	.04	-.14***	-.14	.04	-.07***	-.14	.04	-.07***	-.14	.04	-.07***
Parent-child interaction	.00	.00	.01	.00	.00	.01	.00	.00	.01	.00	.00	.00	.00	.00	.00	.00	.00	.00
Parent reading	.01	.00	.03 [†]	.01	.00	.03 [†]	.01	.00	.03 [†]	.01	.01	.05**	.01	.00	.05**	.01	.00	.05**
Literacy support	.01	.00	.04**	.01	.00	.04**	.01	.00	.04**	.01	.00	.06**	.01	.00	.06**	.01	.00	.06**
R ²	.65***			.65***			.65***			.41***			.41***			.41***		
Classroom level																		
Time 1 skills	.70	.05	.73***	.70	.05	.73***	.69	.05	.71***	.69	.07	.65***	.69	.07	.65***	.68	.08	.64***
Teacher age	.05	.02	.14*	.05	.02	.15*	.05	.02	.15*	.02	.02	.08	.03	.02	.09	.02	.02	.09
BA in ECE	.01	.04	.01	.01	.04	.01	.00	.04	.00	-.03	.04	-.05	-.03	.04	-.04	-.04	.04	-.06
Work experience	-.01	.01	-.04	-.01	.01	-.06	-.01	.01	-.03	.01	.01	.06	.01	.01	.03	.01	.01	.06
In-service training	.01	.03	.01	.01	.03	.01	.01	.03	.02	-.01	.03	-.02	-.01	.03	-.01	-.01	.03	-.01
Group size	.02	.02	.04	.02	.02	.04	.02	.02	.04	.01	.02	.03	.01	.02	.03	.01	.02	.03
Ratio	.00	.01	.01	-.00	.01	-.01	.00	.01	.00	.00	.01	.01	-.00	.01	-.00	.00	.01	.01
Mean age in classroom	-.02	.02	-.04	-.02	.02	-.03	-.02	.02	-.04	.01	.03	.03	.01	.02	.03	.01	.02	.02
Percent non-Danish	.01	.05	.01	.02	.05	.02	.02	.05	.02	.08	.06	.08	.09	.06	.09	.09	.06	.10 [†]
Condition	.08	.04	.09*	.07	.04	.07 [†]	.08	.04	.09*	.22	.04	.26***	.21	.04	.25***	.22	.04	.26***
Emotional Support	.11	.04	.14**				.08	.04	.12*	.08	.04	.12*						
R ²	.57***			.57***			.57***			.53***			.53***			.52***		
Classroom Organization				.08	.03		.08	.03		.08	.03		.08	.03	.13*			
R ²				.57***						.54***								
Instructional Support							.06	.03	.10*				.05	.03				.10 [†]
R ²							.56***						.52***					

Note. BA = bachelor's degree; ECE = early childhood education.

[†]p < .10, *p < .05, **p < .01, ***p < .001

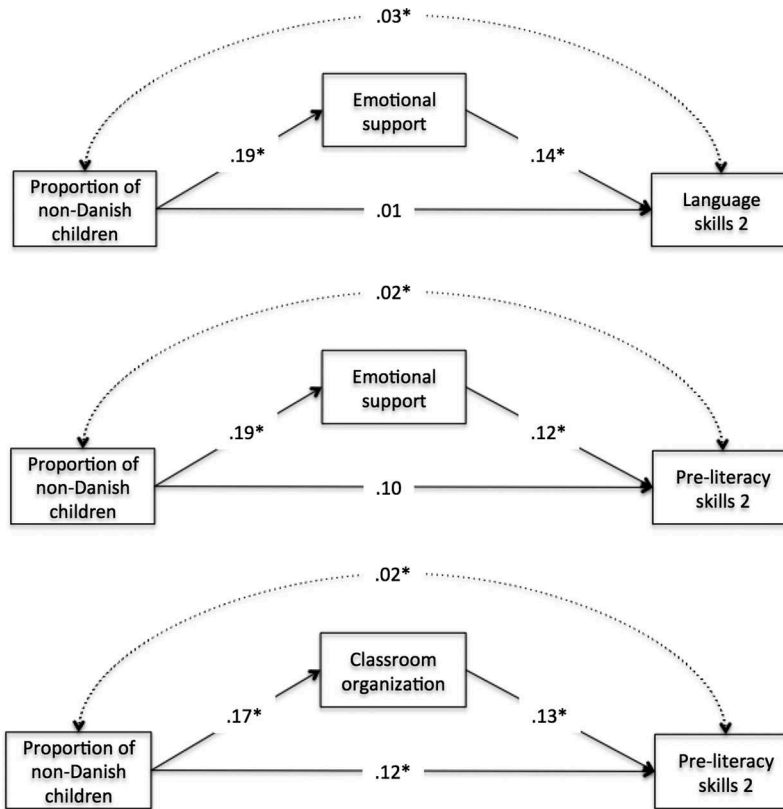


Figure 3. Multilevel models depicting direct (solid line) and indirect (dashed line) effects on children's language and preliteracy skills 6 months later (controlling for children's background and skills at Time 1).

showed a nonsignificant direct association between the proportion of non-Danish children in the classroom and children's growth in language skills but revealed a significant direct relation between the proportion of non-Danish children in the classroom and children's language ($B = .03$, $p = .02$, $\beta = .02$; see the top panel of Figure 3). The proportion of non-Danish children was positively related to Emotional Support, which in turn was positively associated with children's language skills at Time 2. A similar pattern appeared for children's preliteracy skills, with a nonsignificant relation of the proportion of non-Danish children in the classroom and an indirect relation through Emotional Support ($B = .02$, $p = .05$, $\beta = .02$; see the middle panel of Figure 3). The proportion of non-Danish children in the classroom was positively related to Emotional Support, which in turn was associated with growth in children's preliteracy skills. The proportion of non-Danish children in the classroom showed significant direct and indirect associations through Classroom Organization on children's preliteracy skills ($B = .02$, $p = .05$, $\beta = .02$; see the bottom panel of Figure 3). All indirect effects were considered small.

Discussion

There is wide consensus on the importance of language and preliteracy for children's subsequent school achievement (Dickinson & Porche, 2011; Hart & Risley, 1995; Lee, 2011; NICHD ECCRN, 2005; National Early Literacy Panel, 2009). Higher preschool quality has been shown to be related to children's developmental gains (Melhuish et al., 2015; Zaslow et al., 2010). Structural teacher and classroom characteristics are generally hypothesized to create the preconditions for process quality,

which in turn is associated with children's developmental and educational outcomes. However, empirical evidence supporting this mediational path is scarce (Melhuish et al., 2015). The current study adds to the body of evidence by (a) investigating the direct relations between structural quality and preschoolers' language and preliteracy skills, (b) evaluating the direct associations of process quality with children's skills, and finally (c) testing for indirect effects of structural features through process quality. The results showed few direct associations of structural teacher and classroom features with growth in children's skills, although there were small relations of process quality, and Emotional Support and Classroom Organization in particular. One pattern of indirect associations of structural features through process quality emerged, providing some initial evidence of the hypothesized link between structural and process quality in predicting child outcomes.

The results of the current study showed that only a few structural features were related to children's outcomes, which is in line with the mixed and inconsistent evidence base from mainly U.S. studies and one comparison study in 10 countries (e.g., Early et al., 2006; Howes et al., 2008; Mashburn et al., 2008, 2009; Montie et al., 2006). Only one Danish study demonstrated effects of child-to-staff ratio and teachers' preservice qualifications on children's language in Grade 9 (Bauchmüller et al., 2014), but the variation in these characteristics was higher than in the current study, which might explain the different findings. For instance, the child-to-staff ratio was on average more favorable in Bauchmüller's et al. (2014) study, but the distribution of scores was much larger, ranging from 1 to 14 children per teacher. Likewise, in that study on average less than half of the teachers held a pedagogical degree compared to 80% in the current sample. A more restricted range of variance does not imply that these characteristics are not important but implies that the remainder of the variation in quality might not have added value in terms of child outcomes, perhaps suggesting a threshold effect. Another factor concerns the average skills of children in the classroom, which showed the strongest relation with gains in skills over the course of 6 months, suggesting a classroom composition effect. Indeed, some studies have shown that peers can also affect children's gains in language skills (e.g., Justice, Petcher, Schatschneider, & Mashburn, 2011; Mashburn et al., 2009).

Process quality was associated with growth in both language and preliteracy skills, corroborating previous research (Abreu-Lima et al., 2013; Burchinal et al., 2008; Cadima et al., 2010; Curby & Chavez, 2013; Keys et al., 2013; Mashburn, 2008). Previous studies have highlighted the importance of instructional support (Burchinal et al., 2010; Howes et al., 2008; Mashburn et al., 2008), but the current findings in fact showed that it was the weakest predictor of children's language and preliteracy outcomes. This can most likely be explained by the fact that instructional quality was on average low with limited variation. There is increasing evidence that certain thresholds of quality are needed in order to affect children's outcomes (Burchinal et al., 2016). A meta-analysis revealed a threshold of 2.75 for Instructional Support that resulted in stronger effects on children's language and literacy skills. The mean score for Instructional Support in our study was lower than that, which might explain the lack of stronger effects. The low instructional support seems to reflect the stronger social-emotional orientation and pedagogy in Denmark. Danish preschools provide ample time for free play, which is highly valued in Denmark, but focus little on supporting children's preacademic skills. The latter is also reflected in the limited emphasis on instructional practices in the content of the teacher education programs (Krog, Månsson, & Bleses, 2007).

Although there were hardly any effects of structural features on children's language and preliteracy outcomes, there were significant indirect effects. In classrooms where children made more progress in language and to a lesser extent preliteracy skills, this could be explained in part by positive indirect effects of the proportion of non-Danish children in the classroom through process quality (i.e., Emotional Support and Classroom Organization), although the effects were small. This means that in classrooms with a larger proportion of non-Danish children teachers showed higher levels of Emotional Support and Classroom Organization, which resulted in more progress over 6 months. This might seem counterintuitive given the negative correlations between the proportion of non-Danish children and process quality. At the same time, the correlations

showed more favorable structural conditions, with more highly educated teachers and lower ratios for more diverse classrooms. It may have been a confounding of several factors that resulted in this indirect effect, which may point to moderation effects. Future studies could explore this further in a more diverse sample that would allow for a balanced comparison of monolingual and bilingual children (the current sample had 11% non-Danish children in the average classroom). Another explanation for the seemingly contradictory findings might be that overall classroom quality affects children differently. Abundant studies have demonstrated differential effects of classroom quality (Broekhuizen, Van Aken, Dubas, Mulder, & Leseman, 2015; Rimm-Kaufmann, Curby, Grimm, Nathanson, & Brock, 2009; Vitiello, Moas, Henderson, Greenfield, & Munis, 2012). As part of the current study, an in-depth study looked at individual children's relations with the teacher, with peers, and within tasks (i.e., using the Individualized Classroom Assessment Scoring System Pre-K; Downer, Booren, Lima, Luckner, & Pianta, 2010). The results revealed that non-Danish children scored slightly higher on teacher interactions compared to Danish children, and the reverse pattern appeared for peer interactions (Slot & Bleses, 2018). It is interesting that the findings also showed that the shared classroom variance was higher for the domain peer interactions compared to the domain teacher interactions, which supports the notion of differential effects within a classroom. Future studies could explore this further by using an overall classroom measure and an additional measure for individual children.

Despite the universal ECE system in Denmark with high public expenditure, substantial variation still occurred in both structural and process quality. An important question arises of how to improve process quality, as this appeared to be the strongest predictor of children's development. The correlational pattern between structural features and process quality provides some starting points. Teacher pre- and in-service training showed significant relations with most CLASS domains. Teachers with a bachelor's degree with ECE content showed higher levels of emotional support and better classroom organization strategies, in line with previous studies (Cryer et al., 1999; Phillipsen et al., 1997; Pianta et al., 2005; Slot, Leseman et al., 2015; Tout et al., 2006). A bachelor's degree was not related to better instructional practices, though. A possible explanation for this is related to the content of Danish teacher training programs. To date, there has been a limited focus on instructional learning and supporting children's preacademic skills (Krog et al., 2007), which might explain the lack of a relation with instructional support. However, having attended additional in-service training was related to higher process quality in all domains, which is in line with increasing evidence pointing to the added value of in-service compared to preservice training (Fukkink & Lont, 2007; Hamre et al., 2012; LoCasale-Crouch et al., 2011; Slot, Lerkkanen, et al., 2015; Zaslow et al., 2010). A higher share of non-Danish children in the classroom appeared to be negatively related to process quality, which is in line with previous findings from other countries (Early et al., 2010; Kuger et al., 2016; Lehrl et al., 2014; Slot, Lerkkanen, et al., 2015; Tonyan & Howes, 2003) and suggests that working in a group with a lot of second language learners is challenging for teachers. The current findings suggest that investing in better preservice training and more additional training on the job is important in view of improving process quality, although the magnitude of the relations was rather small. Together with the null associations for most of the other structural features, this might point to two things. First, the current set of structural features was not sufficient to capture the relevant variation. There is emerging evidence that organizational characteristics such as the organizational climate or team cohesion or team collaboration are important determinants of process quality (Bloom & Bella, 2005; Bloom & Sheerer, 1992; Slot, Cadima, Salminen, Pastori, & Lerkkanen, 2016; Sylva et al., 2004) with even stronger associations than for the usual classroom features (Dennis & O'Connor, 2013). Second, the relationships between structural and process quality might be more complex, as different structural teacher characteristics might interact and jointly predict process quality. A recent European study that conducted secondary data analyses on several European data sets showed few consistent relations between structural and process quality but rather revealed

interaction effects of teacher, classroom, and system characteristics (Slot, Lerkkanen, et al., 2015). For example, the provision of more professional development activities in a center appeared to compensate for a less favorable child-to-staff ratio. Hence, future studies should incorporate a broader set of structural features, including features at the organizational level as well, and investigate these more complex interaction effects to further disentangle the potential contribution of structural features to process quality.

Implications and future research

Taken together, the current results underline the beneficial effects of high process quality and provide some insights into how to further improve this quality. In line with previous research, the added value of both preservice training and additional practice-based in-service training was demonstrated in the current study. In particular, preservice education programs can be strengthened in the way they prepare teachers in their instructional practices to support children's development, as this is currently lacking in the Danish teacher program. Also, these results call for the need to implement permanent in-service training opportunities, especially for teachers who are already part of the workforce. A recent meta-analysis of the effects of language- and literacy-focused professional development on aspects of process quality, structural quality, and educator knowledge as primary outcomes indicated that the use of a variety of different professional development components—in particular the use of coaching and mentorship, the provision of courses, and working with a curriculum—had a medium effect on process quality (Markussen-Brown et al., 2017). In addition, the negative association between higher proportions of non-Danish children in the classroom and process quality requires attention, especially given the positive mediation effect we found. Although this negative association is not unexpected, as it is quite common in other countries (Kuger et al., 2016; Lehl et al., 2014; Slot, Lerkkanen, et al., 2015), it is worrisome. In Denmark the nonindigenous population is very diverse, with the largest share of immigrant children coming from Turkey, Lebanon, Pakistan, Iraq, and Somalia (Danmarks Statistik, 2014). A study in Flanders, Belgium, which has similar heterogeneous groups in ECE, revealed that teachers feel ill prepared to deal with immigrant children and their families, mostly because of language difficulties and differing cultural values (Michel & Kuiken, 2014; Van Gorp & Moons, 2014). Recently, Europe has had to deal with increasing immigration of refugees mainly from Syria and Afghanistan (Ministry of Immigration, Integration and Housing, 2016), of which Denmark had an above-average number, which poses even more challenges for professionals working with children and their families. Therefore, it seems timely to better prepare teachers in how to support this new group of children entering preschools and their families. One way could be through professional development, which can be an effective means of enhancing cultural awareness and supporting multilingualism (e.g., Michel & Kuiken, 2014; van Gorp & Moons, 2014).

The current study suffers from a number of limitations. First, there were missing data on almost all of the variables. Missing data for children's HLE were on average 25%, but they were missing more often for non-Danish families. This selective response may have affected the representativeness and thus the generalizability of the findings. Note, however, that information on ethnic background was complete for all children, as this was based on teacher information rather than parental reports, which allowed for a more accurate estimation of the missing information when full information maximum likelihood estimation was used in the analyses. Further missingness concerned some of the teacher characteristics. Second, the classroom observations were based on videos of selected activities, which might not necessarily have reflected everyday classroom quality, as was previously pointed out. Therefore, it is recommended that future studies include a wider range of activities that are representative of the Danish curriculum. Also, in the current study centers were purposively oversampled to include preschools with higher concentrations of at-risk children, which thus limits the generalizability of the findings to all preschools in Denmark. Another limitation concerns the fact that some of the variables (i.e., child-to-staff ratio, teacher work experience and age) were

measured on an ordinal scale, limiting the precision and variability. However, the literature supports the use of ordinal variables as continuous variables if there are at least four categories and if the distribution is considered to be reasonably normal (Bentler & Chou, 1987; Byrne, 2012), which appeared to be the case for the current variables. Finally, the teachers in the current sample were nested within classrooms, which resulted in a three-level structure of children nested within teachers nested within classrooms. These dependencies were not fully addressed in the current analyses because of the already complex nature of multilevel mediation analyses (Preacher, Zang, & Zyphur, 2010), which would have made interpretation of the results harder. The current study chose to focus the level of analysis on the teachers, as the majority of the information (most structural features and the CLASS data) was measured at this level, which resulted in a loss of potentially relevant information aggregated to the classroom level. Future studies could address this issue by including only one teacher per classroom.

Despite the limitations, the current study adds to the body of knowledge as it demonstrates the direct associations (or lack thereof) of both structural and process quality with children's outcomes, which allows for the identification of which quality aspects matter the most in affecting child outcomes. Moreover, the present study is among the first to investigate mediation effects of structural teacher and classroom features through process quality on child outcomes. The results underline the importance of both pre- and in-service training for higher process quality. When examined simultaneously, the classroom composition in terms of children's language and preliteracy skills and process quality were the strongest direct predictors of child outcomes. Process quality also mediated between the proportion of non-Danish children and children's language and preliteracy skills, although the size of the association was small. The findings illustrate the complexities of relations between structural and process quality and children's outcomes and warrant further research.

Notes

1. The intraclass correlation coefficients at the classroom level were quite similar but slightly lower compared to the teacher-level intraclass correlation coefficients (.28 and .32 for language and .17 and .23 for preliteracy skills), which indicates that most variance was located at the teacher level rather than the classroom level. Given the fact that the CLASS data were collected at the teacher level rather than the classroom level, and the other structural features were also mostly located at the teacher level (e.g., teacher pre- and in-service qualifications, age, and work experience), it was decided that the teacher level was the most appropriate for the current analyses.
2. A model with all three domains entered simultaneously was tested to check the robustness and demonstrated a similar pattern of results compared to the independent models.

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References

- Abreu-Lima, I. M. P., Leal, T. B., Cadima, J., & Gamelas, A. M. (2013). Predicting child outcomes from preschool quality in Portugal. *European Journal of Psychology of Education*, 28, 399–420. doi:10.1007/s10212-012-0120-y
- Barros, S., & Aguiar, C. (2010). Assessing the quality of Portuguese child care programs for toddlers. *Early Childhood Research Quarterly*, 25, 527–535. doi:10.1016/j.ecresq.2009.12.003
- Bauchmüller, R., Gørtz, M., & Rasmussen, A. W. (2014). Long-run benefits from universal high-quality preschooling. *Early Childhood Research Quarterly*, 29, 457–470. doi:10.1016/j.ecresq.2014.05.009
- Bentler, P. M., & Chou, C.-P. (1987). Practical issues in structural modeling. *Sociological Methods & Research*, 16, 78–117. doi:10.1177/0049124187016001004
- Blau, D. M. (1999). The effect of child care characteristics on child development. *Journal of Human Resources*, 34, 786–822. doi:10.2307/146417

- Bleses, D., Højen, A., Justice, L. M., Dale, P. S., Dybdal, L., Piasta, S. B., . . . Haghish, E. F. (2017). The effectiveness of a large-scale language and preliteracy intervention: The SPELL randomized controlled trial in Denmark. *Child Development*. Advance online publication. doi:10.1111/cdev.12859
- Bleses, D., Makransky, G., Dale, P. S., Højen, A., & Aktürk Ari, B. (2016). Early productive vocabulary predicts academic achievement 10 years later. *Applied Psycholinguistics*, 37, 1461–1476. doi:10.1017/S0142716416000060
- Bleses, D., Vach, W., Jørgensen, R. N., & Worm, T. (2010). The internal validity and acceptability of the Danish SI-3: A language screening instrument for 3-year-olds. *Journal of Speech, Language and Hearing Research*, 53, 490–507. doi:10.1044/1092-4388(2009/08-0132)
- Bloom, P. J., & Bella, J. (2005). Investment in leadership training: The payoff for early childhood education. *Young Children*, 60, 32–40.
- Bloom, P. J., & Sheerer, M. (1992). The effect of leadership training on child care program quality. *Early Childhood Research Quarterly*, 7, 579–594. doi:10.1016/0885-2006(92)90112-C
- Bowne, J. B., Magnuson, K. A., Schindler, H. S., Duncan, G. J., & Yoshikawa, H. (2017). A meta-analysis of class sizes and ratios in early childhood education programs: Are thresholds of quality associated with greater impacts on cognitive, achievement and socioemotional outcomes? *Educational Evaluation and Policy Analysis*, 10, 1–22. doi:10.3102/0162373716689489
- Broekhuizen, M. L., Slot, P. L., Dubas, J. S., & Van Aken, M. A. G. (2017). Teacher's emotional and behavioral support and preschoolers' self-regulation: Relations with social and emotional skills during play. *Early Education & Development*, 28, 135–153. doi:10.1080/10409289.2016.1206458
- Broekhuizen, M. L., Van Aken, M. A. G., Dubas, J. S., Mulder, H., & Leseman, P. P. M. (2015). Individual differences in effects of child care quality: The role of child affective self-regulation and gender. *Infant Behavior and Development*, 40, 216–230. doi:10.1016/j.infbeh.2015.06.009
- Bronfenbrenner, U., & Morris, P. A. (2006). The bioecological model of human development. In R. M. Lerner (Ed.), *Handbook of child psychology: Vol. 1. Theoretical models of human development* (6th ed., pp. 793–828). Hoboken, NJ: Wiley.
- Broström, S., Johansson, I., Sandberg, A., & Frøkjær, T. (2012). Preschool teachers' view on learning in preschool in Sweden and Denmark. *European Early Childhood Education Research Journal*, 22, 590–603. doi:10.1080/1350293X.2012.746199
- Burchinal, M., Vandergrift, N., Pianta, R., & Mashburn, A. (2010). Threshold analysis of association between child care quality and child outcomes for low-income children in pre-kindergarten programs. *Early Childhood Research Quarterly*, 25, 166–176. doi:10.1016/j.ecresq.2009.10.004
- Burchinal, M., Zaslow, M., & Tarullo, L. (2016). *Quality thresholds, features, and dosage in early care and education: secondary data analyses of child outcomes*. Wiley.
- Burchinal, M. R., Cryer, D., Clifford, R. M., & Howes, C. (2002). Caregiver training and classroom quality in child care centers. *Applied Developmental Science*, 6, 2–11. doi:10.1207/S1532480XADS0601_01
- Burchinal, M. R., Howes, C., Pianta, R., Bryant, D., Early, D., Clifford, R., & Barbarin, O. (2008). Predicting child outcomes at the end of kindergarten from the quality of pre-kindergarten teacher-child interactions and instruction. *Applied Developmental Science*, 12, 140–153. doi:10.1080/10888690802199418
- Byrne, B. M. (2012). *Handbook of structural equation modeling*. New York, NY: Guilford Press.
- Cadima, J., Leal, T., & Burchinal, M. (2010). The quality of teacher-student interactions: Associations with first graders' academic and behavioral outcomes. *Journal of School Psychology*, 48, 457–482. doi:10.1016/j.jsp.2010.09.001
- Connor, C. M., Son, S.-H., Hindman, A. H., & Morrison, F. J. (2005). Teacher qualifications, classroom practices, family characteristics, and preschool experience: Complex effects on first graders' vocabulary and early reading outcomes. *Journal of School Psychology*, 43, 343–375. doi:10.1016/j.jsp.2005.06.001
- Cryer, D., Tietze, W., Burchinal, M., Leal, T., & Palacios, J. (1999). Predicting process quality from structural quality in preschool programs: A cross-country comparison. *Early Childhood Research Quarterly*, 14, 339–361. doi:10.1016/S0885-2006(99)00017-4
- Curby, T. W., & Chavez, C. (2013). Examining CLASS dimensions as predictors of pre-K children's development of language, literacy, and mathematics. *Dialog*, 16, 1–17.
- Dalsgaard, C., Nøhr, K., & Jordan, A. L. T. (2014). Personale og børn i kommunernes dagtilbud: en undersøgelse af perioden 2007–2012 [Staff and children in municipal day care services: a survey of the period 2007–2012]: KORA. Danish Ministry for Social Affairs. (2015). *Tal og statistik om dagtilbud* [Numbers and statistics about daycares]. Retrieved from <https://uvm.dk/da/Dagtilbud/Love-og-regler/Statistik>
- Danmarks Statistik. (2014). *Indvandrere i Danmark 2014* [Immigrants in Denmark 2014]. Retrieved from www.dst.dk/publ/indvandrer Reidk
- Davis, E. A., & Miyake, N. (2004). Explorations of scaffolding in complex classroom systems. *Journal of the Learning Sciences*, 13, 265–272. doi:10.1207/s15327809jls1303_1
- De Haan, A., Elbers, E., Hoofs, H., & Leseman, P. P. M. (2013). Targeted versus mixed preschools and kindergartens: Effects of class composition and teacher-managed activities on disadvantaged children's emergent academic skills. *School Effectiveness and School Improvement*, 24, 177–194. doi:10.1080/09243453.2012.749792

- Dennis, S. E., & O'Connor, E. (2013). Reexamining quality in early childhood education: Exploring the relationship between the organizational climate and the classroom process quality. *Journal of Research in Childhood Education*, 27, 74–92. doi:10.1080/02568543.2012.739589
- Dickinson, D. K., & Porche, M. V. (2011). Relation between language experiences in preschool classrooms and children's kindergarten and fourth-grade language and reading abilities. *Child Development*, 82, 870–886. doi:10.1111/cdev.2011.82.issue-3
- Downer, J. T., Booren, L. M., Lima, O. K., Luckner, A. E., & Pianta, R. C. (2010). The Individualized Classroom Assessment Scoring System (inCLASS): Preliminary reliability and validity of a system for observing preschoolers' competence in classroom interactions. *Early Childhood Research Quarterly*, 25, 1–16. doi:10.1016/j.ecresq.2009.08.004
- Early, D., Maxwell, K. L., Burchinal, M., Alva, S., Bender, R. H., Bryant, D., ... Zill, N. (2007). Teacher's education, classroom quality, and young children's academic skills: Results from seven studies of preschool programs. *Child Development*, 78, 558–580. doi:10.1111/j.1467-8624.2007.01014.x
- Early, D. M., Bryant, D. M., Pianta, R. C., Clifford, R. M., Burchinal, M. R., Ritchie, S., ... Barbarin, O. (2006). Are teachers' education, major, and credentials related to classroom quality and children's academic gains in pre-kindergarten? *Early Childhood Research Quarterly*, 21, 174–195. doi:10.1016/j.ecresq.2006.04.004
- Early, D. M., Iruka, I. U., Ritchie, S., Barbarin, O. A., Winn, D.-M., & Pianta, R. C. (2010). How do kindergarteners spend their time? Gender, ethnicity, and income as predictors of experiences of experiences in pre-kindergarten classrooms. *Early Childhood Research Quarterly*, 25, 177–193. doi:10.1016/j.ecresq.2009.10.003
- Ebert, S., Lockl, K., Weinert, S., Anders, Y., Kluczniok, K., & Rossbach, H.-G. (2013). Internal and external influences on vocabulary development in preschool children. *School Effectiveness and School Improvement*, 24, 138–154. doi:10.1080/09243453.2012.749791
- Emmer, E. T., & Strough, L. (2001). Classroom management: A critical part of educational psychology, with implications for teacher education. *Educational Psychologist*, 36, 103–112. doi:10.1207/S15326985EP3602_5
- Enders, C. K. (2010). *Applied missing data analysis*. New York, NY: Guilford Press.
- Esping-Andersen, G., Garfinkel, I., Han, W.-J., Magnuson, K., Wagner, S., & Waldfogel, J. (2012). Child care and school performance in Denmark and the United States. *Children and Youth Services Review*, 34, 576–589. doi:10.1016/j.childyouth.2011.10.010
- Fukkink, R. G., & Lont, A. (2007). Does training matter? A meta-analysis and review of caregiver training studies. *Early Childhood Research Quarterly*, 22, 294–311. doi:10.1016/j.ecresq.2007.04.005
- Gormley, W. T., Gayer, T., Phillips, D., & Dawson, B. (2005). The effects of universal pre-K on cognitive development. *Developmental Psychology*, 41, 872–884. doi:10.1037/0012-1649.41.6.872
- Gupta, N., & Simonsen, M. (2010). Non-cognitive child outcomes and universal high quality child care. *Journal of Public Economics*, 94, 30–43. doi:10.1016/j.jpubeco.2009.10.001
- Gupta, N. D., & Simonsen, M. (2016). Academic performance and type of early childhood care. *Economics of Education Review*, 53, 217–229. doi:10.1016/j.econedurev.2016.03.013
- Hamre, B., Pianta, R., Downer, J., DeCoster, J., Mashburn, A. J., Jones, S. M., ... Hamagami, A. (2013). Teaching through interactions: Testing a developmental framework of teacher effectiveness in over 4,000 classrooms. *Elementary School Journal*, 113, 461–487. doi:10.1086/669616
- Hamre, B. K., Pianta, R. C., Burchinal, M., Field, S., LoCasale-Crouch, J., Downer, J. T., & Scott-Little, C. (2012). A course on effective teacher-child interactions: Effects on teacher beliefs, knowledge, and observed practice. *American Educational Research Journal*, 49, 88–123. doi:10.3102/0002831211434596
- Hart, B., & Risley, T. R. (1995). *Meaningful differences in the everyday experiences of young American children*. Baltimore, MD: Brookes.
- Hoff, E. (2003). The specificity of environmental influence: Socioeconomic status affects early vocabulary development via maternal speech. *Child Development*, 74, 1368–1378. doi:10.1111/1467-8624.00612
- Hoff, E. (2006). How social contexts support and shape language development. *Developmental Review*, 26, 55–88. doi:10.1016/j.dr.2005.11.002
- Howes, C., Burchinal, M., Pianta, R. C., Bryant, D., Early, D., Clifford, R., & Barbarin, O. (2008). Ready to learn? Children's pre-academic achievement in pre-kindergarten programs. *Early Childhood Research Quarterly*, 23, 27–50. doi:10.1016/j.ecresq.2007.05.002
- Jensen, B. (2009). A Nordic approach to early childhood education (ECE) and socially endangered children. *European Early Childhood Education Research Journal*, 17, 7–21. doi:10.1080/13502930802688980
- Jensen, P., & Rasmussen, A. W. (2015). Professional development and its impact on children in early childhood education and care: A meta-analysis based on European studies. Aarhus, Denmark: Curriculum and Quality Analysis and Impact Review of European Early Childhood Education and Care.
- Justice, L. M., Mashburn, A. J., Hamre, B. K., & Pianta, R. C. (2008). Quality of language and literacy instruction in preschool classrooms serving at-risk pupils. *Early Childhood Research Quarterly*, 23, 51–68. doi:10.1016/j.ecresq.2007.09.004

- Justice, L. M., Petcher, Y., Schatschneider, C., & Mashburn, A. (2011). Peer effects in preschool classrooms: Is children's language growth associated with their classmates' skills? *Child Development*, 82, 1768–1777. doi:10.1111/j.1467-8624.2011.01665.x
- Keys, T. D., Farkas, G., Burchinal, M. R., Duncan, G. J., Vandell, D. L., Li, W., . . . Howes, C. (2013). Preschool center quality and school readiness: Quality effects and variation by demographic and child characteristics. *Child Development*, 84, 1171–1190. doi:10.1111/cdev.12048
- Kline, R. B. (2005). *Principles and practice of structural equation modeling* (2nd ed.). New York, NY: Guilford Press.
- Krog, T., Månsson, H., & Bleses, D. (2007). Sprogtilegnelse på pædagog- og læreruddannelserne: Undersøgelse af danskundervisernes kompetencer inden for børns sprogtilegnelse [Language acquisition in the preschool and teacher education: Examination of the teaching in Children's Language acquisition]. *Viden Om Læsning*, 2, 33–39.
- Kuger, S., Kluczniok, K., Kaplan, D., & Rossbach, H.-G. (2016). Stability and patterns of classroom quality in German early childhood education and care. *School Effectiveness and School Improvement*, 27, 418–440. doi:10.1080/09243453.2015.1112815
- Layzer, J. I., & Goodson, B. D. (2006). The “quality” of early care and education settings: Definitional and measurement issues. *Evaluation Review*, 30(5), 556–576. doi:10.1177/0193841X06291524
- Lee, J. (2011). Size matters: Early vocabulary as a predictor of language and literacy competence. *Applied Psycholinguistics*, 32, 69–92. doi:10.1017/S0142716410000299
- Lehrl, S., Kuger, S., & Anders, Y. (2014). Soziale disparitäten beim zugang zu kindergartenqualität und differenzielle konsequenzen für die vorschulische mathematische entwicklung [Social disparities in access to preschool quality and differential consequences on the development of early numeracy skills]. *Unterrichtswissenschaft*, 42, 132–151.
- Leyva, D., Weiland, C., Barata, M., Yoshikawa, H., Snow, C., Treviño, E., & Rolla, A. (2015). Teacher–child interactions in Chile and their associations with prekindergarten outcomes. *Child Development*, 86, 781–799. doi:10.1111/cdev.12342
- LoCasale-Crouch, J., Konold, T., Pianta, R. C., Howes, C., Burchinal, M., Bryant, D., . . . Barbarin, O. (2007). Observed classroom quality profiles in state-funded pre-kindergarten programs and associations with teacher, program, and classroom characteristics. *Early Childhood Research Quarterly*, 22, 3–17. doi:10.1016/j.ecresq.2006.05.001
- LoCasale-Crouch, J., Kraft-Sayre, M., Pianta, R. C., Hamre, B. K., Downer, J. T., Leach, A., . . . Scott-Little, C. (2011). Implementing an early childhood professional development course across 10 sites and 15 sections: Lessons learned. *NHSA Dialog*, 14, 275–292. doi:10.1080/15240754.2011.617527
- Markussen-Brown, J., Juhl, C. B., Piasta, S. B., Bleses, D., Højen, A., & Justice, L. M. (2017). The effects of language- and literacy-focused professional development on early educators and children: A best-evidence meta-analysis. *Early Childhood Research Quarterly*, 38, 97–115. doi:10.1016/j.ecresq.2016.07.002
- Mashburn, A. J. (2008). Quality of social and physical environments in preschools and children's development of academic, language, and literacy skills. *Applied Developmental Science*, 12, 113–127. doi:10.1080/10888690802199392
- Mashburn, A. J., Justice, L. M., Downer, J. T., & Pianta, R. C. (2009). Peer effects on children's language achievement during pre-kindergarten. *Child Development*, 80, 686–702. doi:10.1111/j.1467-8624.2009.01291.x
- Mashburn, A. J., Pianta, R. C., Hamre, B. K., Downer, J. T., Barbarin, O. A., Bryant, D., & Howes, C. (2008). Measures of classroom quality in prekindergarten and children's development of academic, language, and social skills. *Child Development*, 79, 732–749. doi:10.1111/j.1467-8624.2008.01154.x
- Melhuish, E., Ereky-Stevens, K., Petrogiannis, K., Aricescu, A., Penderi, E., Rentzou, K., . . . Leseman, P. P. M. (2015). *A review of research on the effects of early childhood education and care (ECE) on child development*. Oxford, UK: Curriculum and Quality Analysis and Impact Review of European Early Childhood Education and Care.
- Michel, M. C., & Kuiken, F. (2014). Language at preschool in Europe: Early years professionals in the spotlight. *European Journal of Applied Linguistics*, 2, 1–26. doi:10.1515/eujal-2014-0005
- Ministry of Immigration, Integration and Housing. (2016). *Tal på udlændingeområdet pr. 30.04.2016* [Statistics on immigration 30.04.2016]. Retrieved from https://www.nyidanmark.dk/nr/rdonlyres/e3c50ea0-bd36-4ddd-9c8d-7aaf44def12/0/seneste_tal_udlaendingeomraadet.pdf
- Mocan, N., Burchinal, M., Morris, J. R., & Helburn, S. W. (1995). Models of quality in early childhood care and education. In S. W. Helburn (Ed.), *Cost, quality and child outcomes in child care centers: Technical report* (pp. 279–295). Denver, CO: Department of Economics.
- Montie, J. E., Xiang, Z., & Schweinhart, L. J. (2006). Preschool experience in 10 countries: Cognitive and language performance at age 7. *Early Childhood Research Quarterly*, 21, 313–331. doi:10.1016/j.ecresq.2006.07.007
- Muthén, L. K., & Muthén, B. O. (1998–2012). *Mplus user's guide* (7th ed.). Los Angeles, CA: Authors.
- National Early Literacy Panel. (2009). *Developing early literacy: Report of the National Early Literacy Panel*. Jessup, MD: National Institute for Literacy.
- National Institute of Child Health and Human Development Early Child Care Research Network. (2002). Early child care and children's development prior to school entry: Results from the NICHD Study of Early Child Care. *American Educational Research Journal*, 39, 133–164. doi:10.3102/00028312039001133

- National Institute of Child Health and Human Development Early Child Care Research Network. (2005). Pathways to reading: The role of oral language in the transition to reading. *Developmental Psychology*, 41, 428–442. doi:10.1037/0012-1649.41.2.428
- Pakarinen, E., Lerkanen, M.-K., Poikkeus, A.-M., Kiuru, N., Siekkinen, M., Rasku-Puttonen, H., & Nurmi, J.-E. (2010). A validation of the Classroom Assessment Scoring System in Finnish kindergartens. *Early Education & Development*, 21, 95–124. doi:10.1080/10409280902858764
- Pessanha, M., Aguiar, C., & Bairrão, J. (2007). Influence of structural features on Portuguese toddler child care quality. *Early Childhood Research Quarterly*, 22, 204–214. doi:10.1016/j.ecresq.2007.02.003
- Phillips, D., Mekos, D., Scarr, S., McCartney, K., & Abbott-Shim, M. (2000). Within and beyond the classroom door: assessing quality in child care centers. *Early Childhood Research Quarterly*, 15, 475–496. doi:10.1016/S0885-2006(01)00077-1
- Phillips, D. A., Gormley, W. T., & Lowenstein, A. E. (2009). Inside the pre-kindergarten door: Classroom climate and instructional time allocation in Tulsa's pre-K programs. *Early Childhood Research Quarterly*, 24, 213–228. doi:10.1016/j.ecresq.2009.05.002
- Phillipsen, L. C., Burchinal, M. R., Howes, C., & Cryer, D. (1997). The prediction of process quality from structural features of child care. *Early Childhood Research Quarterly*, 12, 281–303. doi:10.1016/S0885-2006(97)90004-1
- Pianta, R., Howes, C., Burchinal, M., Bryant, D., Clifford, R., Early, D., ... Barbarin, O. (2005). Features of pre-kindergarten programs, classrooms, and teachers: Do they predict observed classroom quality and child-teacher interactions? *Applied Developmental Science*, 9, 144–159. doi:10.1207/s1532480xads0903_2
- Pianta, R. C., Barnett, W. S., Burchinal, M., & Thornburg, K. R. (2009). The effects of preschool education: What we know, how public policy is or is not aligned with the evidence base and what we need to know. *Psychological Science in the Public Interest*, 10, 49–88. doi:10.1177/1529100610381908
- Pianta, R. C., La Paro, K. M., & Hamre, B. K. (2008). *Classroom Assessment Scoring System Pre-K manual*. Baltimore, MD: Brookes.
- Preacher, K. J., Zang, Z., & Zyphur, M. J. (2010). A general multilevel SEM framework for assessing multilevel mediation. *Psychological Methods*, 15, 209–233. doi:10.1037/a0020141
- Rimm-Kaufman, S. E., Curby, T. W., Grimm, K. J., Nathanson, L., & Brock, L. L. (2009). The contribution of children's self-regulation and classroom quality to children's adaptive behaviors in the kindergarten classrooms. *Developmental Psychology*, 45, 958–972. doi:10.1037/a0015861
- Schechter, C., & Bye, B. (2007). Preliminary evidence for the impact of mixed-income preschools on low-income children's language growth. *Early Childhood Research Quarterly*, 22, 137–146. doi:10.1016/j.ecresq.2006.11.005
- Skibbe, L., Behnke, M., & Justice, L. M. (2004). Parental scaffolding of children's phonological awareness skills: Interactions between mothers and their preschoolers with language difficulties. *Communication Disorders Quarterly*, 25, 189–203. doi:10.1177/15257401040250040401
- Slot, P. L., & Bleses, D. (2018). Individual children's interactions with teachers, peers, and tasks: the applicability of the inclass pre-k in danish preschools. *Learning and Individual Differences*, 61, 68-76. doi:10.1016/j.lindif.2017.11.003
- Slot, P. L., Boom, J., Verhagen, J., & Leseman, P. P. M. (2017). Measurement properties of the CLASS Toddler in ECEC in The Netherlands. *Journal of Applied Developmental Psychology*, 48, 79–91. doi:10.1016/j.appdev.2016.11.008
- Slot, P. L., Cadima, J., Salminen, J. E., Pastori, G., & Lerkanen, M.-K. (2016). *Multiple case study in seven European countries regarding culture-sensitive classroom quality assessment*. Jyväskylä, Finland: Curriculum and Quality Analysis and Impact Review of European Early Childhood Education and Care.
- Slot, P. L., Lerkanen, M.-K., & Leseman, P. P. M. (2015). *The relations between structural quality and process quality in European early childhood education and care provisions: Secondary data analyses of large scale studies in five countries*. Utrecht, The Netherlands: Curriculum and Quality Analysis and Impact Review of European Early Childhood Education and Care.
- Slot, P. L., Leseman, P. P. M., Verhagen, J., & Mulder, H. (2015). Associations between structural quality aspects and process quality in Dutch early childhood education and care settings. *Early Childhood Research Quarterly*, 33, 64–76. doi:10.1016/j.ecresq.2015.06.001
- Sroufe, L. A. (2000). Early relationships and the development of children. *Infant Mental Health Journal*, 21, 67–74. doi:10.1002/(ISSN)1097-0355
- Sylva, K., Ereky-Stevens, K., & Aricescu, A.-M. (2015). *Overview of European ECE curricula and curriculum template*. Oxford, UK: Curriculum and Quality Analysis and Impact Review of European Early Childhood Education and Care.
- Sylva, K., Melhuish, E., Sammons, P., Siraj-Blatchford, I., & Taggart, B. (2004). *The effective provision of pre-school education (EPPE) project: Final report: A longitudinal study funded by the DfES 1997-2004*. London, UK: Institute of Education, University of London/Department for Education and Skills/Sure Start.
- Tonyan, H. A., & Howes, C. (2003). Exploring patterns in time children spend in a variety of child care activities: Associations with environmental quality, ethnicity, and gender. *Early Childhood Research Quarterly*, 18, 121–142. doi:10.1016/S0885-2006(03)00006-1
- Tout, K., Zaslow, M., & Berry, D. (2006). Quality and qualifications: Links between professional development and quality in early care and education settings. *Critical Issues in Early Childhood Professional Development*, 1, 77–110.

- Van Gorp, K., & Moons, C. (2014). Creating rich language environments for more than one language: A work in progress in Flemish childcare. *European Journal of Applied Linguistics*, 2, 53–78. doi:10.1515/eujal-2014-0007
- Vitiello, V. E., Moas, O., Henderson, H. A., Greenfield, D. B., & Munis, P. M. (2012). Goodness of fit between children and classrooms: Effects of child temperament and preschool classroom quality on achievement trajectories. *Early Education & Development*, 23, 302–322. doi:10.1080/10409289.2011.526415
- Von Suchodoletz, A., Fäsche, A., Gunzenhauser, C., & Hamre, B. K. (2014). A typical morning in preschool: Observations of teacher-child interactions in German preschools. *Early Childhood Research Quarterly*, 29, 509–519. doi:10.1016/j.ecresq.2014.05.010
- Whitehurst, G. J., & Lonigan, C. J. (1998). Child development and emergent literacy. *Child Development*, 69, 848–872. doi:10.1111/j.1467-8624.1998.tb06247.x
- Wilcox-Herzog, A. (2004). Actions speak louder than words: How experience and education relate to teachers' behaviors. *Journal of Early Childhood Teacher Education*, 25, 11–18. doi:10.1080/1090102040250104
- Zaslow, M., Anderson, R., Redd, Z., Wessel, J., Tarullo, L., & Burchinal, M. (2010). *Quality, dosage, thresholds, and features in early childhood settings: A review of the literature* (OPRE 2011-5). Retrieved from http://www.acf.hhs.gov/sites/default/files/opre/quality_review_0.pdf