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Advancing research on inclusion and engagement in early childhood education and care (ECEC) with a special focus on children at risk and children with disabilities

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Advancing research on inclusion and engagement in early childhood education and care (ECEC) with a special focus on children at risk and children with disabilities

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Executive Function Skills and Classroom Behaviors of U.S. Prekindergartners With Special Needs

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This study explores the executive function (EF) skills in a sample of 4-year-old children enrolled in inclusive prekindergarten (pre-k) classrooms. We compare the EF skills and important classroom behaviors of children with and without identified special needs as well as a sample of English language learners (ELL) in the same classrooms. Identification of special needs and ELL status were each examined as these factors have previously been shown to be associated with young children's EF skills. Compared to their classroom peers, children with identified special needs not only began the year with lower EF skills but made fewer gains over the school year, a similar pattern was observed for children identified as ELL. Compared to their peers, children with identified special needs were observed as engaging in lower levels of involvement, sequential behaviors, and social learning interactions and higher levels of unoccupied and disruptive behaviors, a pattern that was also found for children's entering EF skills (e.g., lower entering EF scores associated with lower levels of involvement). Lastly, children's classroom behaviors differed across teacher-directed and children-directed learning with level of involvement and social-learning interactions higher during child-directed learning, and sequential behaviors higher in teacher-directed learning, a pattern that held across all groups of children.

Keywords: executive function, classroom behaviors, special needs, English language learners, prekindergarten

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INTRODUCTION

Children with special needs and young children who are English language learners (ELL) in the U.S. are often served in regular prekindergarten (pre-k) settings, with the idea that the classroom environment will aid their development and allow them to participate in naturalistic settings with other children and adults. While children with disabilities could enroll in specialized preschool programs, pre-k classrooms in the public schools and Head Start are often mandated to give at least priority to children with special needs and, in many cases, required to serve a particular percentage of children in each classroom. The types of disabilities included in regular pre-kindergarten classrooms tend to be milder, with the major diagnosis being speech or language delay; developmental delay is the second most common diagnosis (U.S. Department of Education, 2021).

In many states in the U.S., the greatest surge in pre-k enrollment is coming from children of families who are not native English speakers (Hussar et al., 2020). While states in the northwestern U.S. have more experience with children who speak a language other than English and provide appropriate services (such as dual-language speaking teachers), states in the southern part of the country vary widely in such services despite the dramatic increase in enrollment (Horsford and Sampson, 2013).

Pre-kindergarten classrooms under public school auspices are a relatively new development in the U.S. Consequently less is known about how children with special needs or English language learners fare in these classrooms. Transitioning to a formal setting such as a pre-k classroom involves learning to adapt one's individual learning styles to the uniform expectations of the classroom environment—to learn in a large group, to have the learning focus determined by the teacher, to ignore distractions, to be self-directed and involved, to participate with peers, and to comply with the behavioral demands of the classroom. These kinds of skills are related to what is called executive functions or EF. Self-regulation is another comprehensive term for these kinds of skills.

EF skills involve the development of the pre-frontal cortex, an area of the brain that undergoes protracted development, particularly between the ages of 4 and 6 years (Bull et al., 2011). EF skills are comprised of a set of interrelated abilities that include inhibitory control (being able to hold back, not responding immediately and inappropriately), working memory (being able to hold onto something in memory and work with it—such as remembering three things to do before going to lunch and in the right order), and attentional flexibility (being able to redirect attention from one thing to another, particularly if the teacher asks) (Hughes, 2011; Blair, 2016; Zelazo et al., 2016). Because of its lengthy developmental trajectory, EF skills are particularly susceptible to environmental influence (Haft and Hoeft, 2017).

In general, less well-developed EF skills when children enter pre-k or kindergarten are an important predictor of longer-term achievement and behavior (e.g., Fuhs et al., 2014; Schmitt et al., 2017). Nesbitt et al. (2015) found that children's entering EF skills in pre-k were related to levels of involvement, participation in activities requiring sequential steps, participation in social-learning interactions, as well as instances of being unoccupied, disruptive, or in time out. Morgan et al. (2019) found that EF deficits, particularly in working memory, increased the risk for kindergarten children of having repeated academic difficulties. Moreover, studies show that *improvement* in EF skills such as attention and memory are associated with better academic performance in the early elementary school years (Hughes and Ensor, 2010) as well as predicting being more productively engaged in classroom activities (Pagani et al., 2012).

Most studies of EF skills in children with disabilities focus on older children, especially those with attention deficit hyperactivity disorder (ADHD) (Johnson et al., 2015). ADHD, by definition, implies some difficulties with attention, memory, and control. Johnson (2012) accounts for the later emergence of ADHD as a consequence of poorly developed EF skills in early childhood. Studies of EF in younger children focus on such disorders as prematurity, autism, and phenylketonuria and find slower rates of EF development (Hughes, 2011). Examining young children with disabilities who had problems in executive function, a recent Finnish study of inclusive classrooms found that those children spent less time with peers (Kuutti et al., 2021). These findings underscore the importance of EF and self-regulation skills for children with special needs, who are likely to begin pre-k with a disadvantage. One question is whether the experiences of young children with special needs in inclusive classrooms will differ based on their EF skills.

Children from low-income families who are English language learners are also at risk of having more poorly developed EF skills as they enter the more formal learning environment of a pre-k classroom (Wanless et al., 2011). Moreover, these children made less gain in EF skills across the pre-k year than English speaking children from low-income families. Demonstrating that EF skills at kindergarten entry were associated with poorer achievement in kindergarten and third grade for ELL children, Finders et al. (2021) argued strongly for finding ways to improve EF abilities during the pre-k year.

For various reasons, the demands of the classroom may be difficult to meet for children with special needs as well as those who do not know English. Much research has demonstrated that young children identified as having special needs have difficulty functioning in a classroom setting. Studies from various countries confirm this finding. In Portugal, for example, children with disabilities in inclusive preschool classrooms had lower levels of engagement across the day, especially in whole group activities (Coelho et al., 2019). Though not common in preschools in all countries, whole group instruction is increasingly used in some countries where the focus is more on learning basic skills.

Kemp et al. (2013) describe the types of classroom engagement of children with a variety of disabilities. Children had the most difficulty being engaged in group activities but were also less engaged than children without disabilities in free play. The authors assert that both types of activities have the potential to provide learning opportunities for children with disabilities, but that they require skilled scaffolding from teachers to help the children. Markova (2017) found remarkably similar results for ELL children in classroom settings. Children learning English were dramatically more engaged during free play than during teacher-directed activities.

Multiple studies have emphasized the importance of adult scaffolding and assistance for both children who are ELL (e.g., Markova, 2017) and children with special needs. Mills et al. (2014) found that to enable young children with language disabilities to interact effectively with peers, adults must help structure the play situation. Without such adult scaffolding, children with disabilities can be isolated even while in a group situation. Early isolation can lead to later exclusion if children do not develop these early important skills (Koller et al., 2018).

Current Study

This study explores the EF skills in a sample of 4-year-old children all enrolled in regular pre-k classrooms. We compare the EF skills and classroom behaviors of children with and without identified special needs and also explore the EF skills and classroom behaviors of a sample of English language learners

in the same classrooms for comparison. We examine important classroom behaviors (level of involvement, sequential/goal-oriented interactions, social-learning interactions, and off-task behaviors) and the contribution of EF skills to those interactions. Moreover, we explore if children's classroom behaviors vary as a function of whether a learning experience is under the direction of the teacher or the child.

MATERIALS AND METHODS

Participants

Study data come from a large-scale evaluation of a pre-k curriculum (Nesbitt and Farran, 2021). The original study consisted of 1,145 consented children from 80 pre-k classrooms in 57 schools across six school districts from two states in the southern U.S. This study includes a total of 1,103 children (M_{age} = 54.5 months, SD_{age} = 3.6 months) who completed at least one assessment at the onset and end of pre-k and who were present for at least one of the three in-class observations. The primary reason children were excluded was moving from the school district during the course of the study. Each study classroom on average had 13.8 children (SD = 3.4) participating in the study.

Approximately 46% of the children were female; 41% were identified as Caucasian, 26% as African American; 25% as Hispanic/Latinx, and 9% as multiracial or another ethnicity. Within this group, 34% were identified as English Language Learners, meaning their first language and the language spoken at home was not English. Nearly 13% of the children had an Individualized Education Plan (IEP). In the U.S. children are classified as needing an IEP if they have special needs. For young children in these pre-k classrooms, the vast majority of the IEPs will be for language or speech delays; these classrooms served few children with more serious disabilities. All children attended public pre-k programs that prioritized enrollment based on economic need.

Executive Function Assessments

A battery of EF assessments was included in the study. Children were assessed individually in a quiet space near their classrooms in the fall (September, October) and spring (mid-March to mid-May). Although all EF assessments were administered in English, verbal directions were accompanied by demonstrations and practice trials with feedback. Assessments were administered in a fixed order within each session with EF assessments conducted at the beginning of each session (session 1 order = Peg Tapping, Head Toes Knees Shoulders, Copy Design; session 2 order = Dimensional Change Card Sort, Corsi Blocks); however, the order of the two sessions varied based on assessor availability.

Regulation and integration of motor movements (i.e., visual-motor integration) were assessed with the *Copy Design* task (Osborn et al., 1984) in which children are asked to copy eight simple geometric shapes that are increasingly complex. Children had two attempts to draw each design. If an attempt met a defined set of criteria (e.g., should be approximately symmetrical; cannot be rotated) attempts received a score of 1; if it did not, the attempt received a score of 0. Total scores could range from 0 to 16. Interrater reliability for the scoring of the Copy Design was established (κ = 0.79) and the prior test-retest reliability (2-week delay) with pre-k children has been previously demonstrated (r = 0.72; Lipsey et al., 2017).

Working memory was assessed using the backward span from the *Corsi Blocks* task (Corsi, 1972). In this task, children are asked to recall the order in which an examiner points to a series of 3-dimensional blocks fixed to a board in an irregular pattern. Both forward (repeat the pattern exactly as the examiner demonstrated) and backward memory span (reverse the pattern given by the examiner) were assessed. Children had two attempts to complete a pattern. The score was the longest backward pattern a child could correctly repeat. Reliability for a verbal variation of the task (i.e., backward digit span) has been established at r = 0.73 (Lipsey et al., 2017) with children in pre-k.

Children's attention shifting capabilities were assessed using the *Dimensional Change Card Sort* (DCCS; Zelazo, 2006). The task requires children to sort picture cards by features shown on the cards, first by color (red vs. blue color) and then according to shape (star vs. truck). If children were able to make the switch between sorting rules, they were told to sort a set of cards that had either a black border around the card or no border. If the card had a border, children needed to sort cards by color; if the card had no border, they needed to sort by shape. Children received a score of 0 if they did not pass the initial color sort task, a 1 if they passed the color sort but not the shape sort, a 2 if they passed the shape sort, and a 3 if they passed the advanced border version. DCCS test-retest reliability has previously been reported at r = 0.48 (Lipsey et al., 2017) and 0.44 (Müller et al., 2012).

Self-regulation, including the ability to respond in a way that was opposite of an examiner's request, was measured with the *Head-Toes-Knees-Shoulders* task (HTKS; Ponitz et al., 2009). HTKS requires children to respond to two oral prompts, "touch your head" and "touch your toes," then do the opposite in response to those prompts (i.e., touch their heads when the assessor said "touch your toes"). Children were also prompted to touch their knees when instructed to "touch your shoulders" and to touch their shoulders when instructed to "touch your knees." Each trial was scored 0 if the child made an incorrect response, 1 if the child self-corrected an incorrect response, and 2 if the child made a correct response. Task performance was the sum of children's performance on the task's items (range = 0–52). HTKS test-retest and interrater reliability have been established at r = 0.80 (Lipsey et al., 2017) and κ = 0.79 (McClelland et al., 2014), respectively, in pre-k children.

Lastly, children's inhibitory control was measured with the *Peg Tapping* task (Diamond and Taylor, 1996). The task required children to tap a wooden peg once when the examiner taps twice or tap twice when the examiner taps once. Each attempt was scored 0 if incorrect and 1 if correct. A score of −1 was given for the total score if the task was aborted. Final scores ranged from −1 to 16. Peg Tapping test-retest reliability has been children in pre-k at r = 0.80 (Lipsey et al., 2017).

Data are presented for each of these measures separately and also for an equally weighted standardized composite of all five measures (i.e., transforming scores into standardized z-scores and aggregating across the obtained z-scores).

Classroom Behavioral Observations

Daylong observations took place three times during the pre-k year, in the fall, mid-winter, and spring involving the *Child Observation in Preschool* (*COP*; Farran, 2011). All observers achieved interrater reliability with an experienced anchor observer at each time point. The *COP* uses a snapshot behavior-sampling procedure to capture observable child behaviors. Observers progress through a series of 20 rounds of coding, or sweeps, coding each individual child in the classroom before starting another sweep. For each sweep, a classroom member is located, observed, and then, after a count of approximately 3 s, coded across an array of dimensions. When aggregated, the collection of snapshots provides a picture of how members of a classroom spend their time.

Coding was done continuously throughout the entire school day, apart from outdoor recess, meals, and naptime (pre-k classrooms in the U.S. spend the majority of their time indoors and outdoor play sometimes does not occur at all; when it does, it tends to be short). Continuous coding ensures that individuals will be observed across multiple contexts (e.g., large group, centers, transitions). Coding options for each dimension are mutually exclusive. Analytic variables were first computed as the sum of individual scores across the 3 daylong observations (fall, winter, and spring), and then aggregated to the classroom level to provide a picture of classroom practices. Behavioral counts were further computed as proportions of sweeps in which the target behavior occurred out of the total number of sweeps observed, while the variables derived from ratings were computed as averages across all sweeps observed.

The current study focuses on children's behavior. The four behaviors used in this study, children's level of involvement, participation in sequential learning, participation in social learning interactions, and disengagement were all summarized as they co-occurred with learning activities.

Children's level of involvement was coded based on a 5-point scale ranging from 1 (low; off task, not attending to instruction) to 5 (high; intense focus, serious pursuit of an activity, cannot be distracted from task) involvement. Level of involvement was only coded if a child was engaged in a learning activity; thus, for this study, level of involvement was quantified as a child's average level of involvement during learning activities. "Learning activities" were broadly defined as basically any time the child was not unoccupied or disruptive or engaged in waiting for activities to begin. Across the three observations, interrater reliability for involvement in learning was Cohen's $\kappa = 0.69$.

Second, we examined children's participation in sequential learning behaviors, defined as behaviors that involved a sequence of steps or organization. Sequential behaviors could include children examining a book while turning the pages or working on a puzzle or craft project. Across the three observations, interrater reliability for sequential learning behaviors was Cohen's $\kappa = 0.85$.

Third, we characterized children's participation in social learning interactions. Social-learning interactions were defined as instances in which children (with or without the teacher) were working together in the context of a learning activity (which could include playing together during free play). Across the three observations, interrater reliability for social learning interactions was Cohen's $\kappa = 0.86$.

We used three codes from the COP protocol to quantify children's disengagement from these activities. Unoccupied was coded when a child was not attending to a learning-related activity though one was available. Disruptive was coded when children were observed either acting in a manner that drew other classroom members' attention off task, or deliberately misusing or destroying materials. Time out was coded when children were isolated by the teacher from the rest of the class because of behavior. The three codes were compiled to create an unoccupied– disruptive variable. The codes that contributed to the unoccupied–disruptive variable were captured through two categories of type task, which had interrater reliability of Cohen's κ 0.85 and 0.89.

In addition "context" scores were calculated by summing the percent children were observed in teacher-directed activities (whole and small group instruction), child-directed activities (centers or free-play) and the percentage of the observations children were in transitions.

Missing Data

Aggregating across the multiple assessments and observations, complete data were available for 96% of the sample (n = 1,053). The presence of missing data was not significantly associated with any variable included in the study. To avoid bias associated with listwise deletion (Enders, 2010), full information maximum likelihood estimation (i.e., the ML estimator was implemented) was used with the final sample of 1,103 children in Mplus 8.6 (Muthén and Muthén, 1998–2021).

Analytic Approach

All analyses were conducted with group-mean centered variables for classroom behaviors and Spring EF scores (see Raudenbush and Bryk, 2002) and uncentered Fall/entering EF skills. This approach was taken to control for the variation between pre-k classrooms that could affect children's classroom behaviors (e.g., differing pedagogical approaches of teachers) and EF gains, allowing us to compare the classroom behaviors of children with and without identified special needs as well as children identified as ELL within the same classrooms. Approximately 48, 50, 43, and 15% of the variances in the level of involvement, sequential behaviors, social learning interactions, and unoccupied–disruptive were accounted for by between classroom differences, respectively. EF skills were not group-mean centered as they were assessed at the onset of the school year; however, standard errors were adjusted using the complex command in Mplus to further account for the nesting of children within classrooms. Tests of statistical significance controlled for gender and age. Tests of Spring EF also controlled for Fall EF.

To examine group differences based on IEP and ELL status, a dichotomous independent variable for group status was included to predict targeted dependent outcomes (EF scores or classroom behaviors). Children identified by their teachers as ELL or children identified as having an IEP were the reference group for all analyses. Tests of association between the EF skills and classroom behaviors were run separately for each independent

variable of children's entering EF skills and each dependent variable of classroom behaviors.

RESULTS

Presented in **Table 1** are the Fall and Spring EF skill scores for children in two groups. First, those children who were English Language Learners (ELL) scores are compared to those children who were English speakers. The second panel of **Table 1** presents the EF scores for children with a diagnosed special need (an IEP) compared to those children who did not have an IEP.

At the start of pre-k, children classified as ELL had lower EF scores on all measures except *Copy Design*. Interestingly, the *Copy Design* task is the least dependent on language. Children are shown a geometric figure and they are required to copy it exactly. The instructions do not require English in order for children to know what to do. On *Copy Design* children who were ELL actually scored significantly higher than native English speakers. It is hard to disentangle the effects of English instructions from the actual EF skills for this group of children. EF scores for children with an IEP were significantly lower on each EF measure and on the composite.

Examination of residual gains in EF over the pre-k year (spring scores controlling for fall scores) indicated that for Corsi Blocks, DCCS, and HTKS, children not classified as ELL made larger gains compared to their ELL peers while the reverse was observed for Copy Design. In other words, for these measures, the initial differences in EF skills widened over the school year. A similar effect was seen regarding IEP status, with children without an IEP making larger EF gains for every measure except DCCS as well as for the composite.

Table 2 presents a summary of the four classroom behaviors observed across the year for the two contrasting groups of children. Children with an ELL status were significantly rated as more highly involved than English-speaking children, engaged in more sequential type activities, and also significantly more likely to be involved in social interactions. ELL children were significantly less likely to be unoccupied-disruptive.

On the other hand, children who had an IEP had very different classroom behavior patterns than those children without an IEP. They were rated as less involved overall. They were less likely to be doing sequential tasks, less likely to be in social interactions, and more likely to be unoccupied and/or disruptive. The sizes of the effects are large enough to be meaningful and of concern.

Table 3 presents the correlations between entering EF skills and these four classroom behaviors, collapsed across ELL and IEP status. As can be seen, the strongest relations between entering EF skills and classroom behaviors involve children being unoccupied and/or disruptive. Level of involvement is also strongly related to children's entering EF skills, while social interactions were the least predicted by EF.

To further explore if the relations between entering EF skills and children's classroom behaviors varied by ELL and IEP status, moderation analyses were conducted. Specifically, the analysis tested whether the association between the EF standardized composite variable and each of the four classroom behaviors was moderated by ELL or IEP status. Regarding ELL status, there was no significant moderation for any of the four behaviors ($ps > 0.285$) suggesting that the relation between entering EF skills and classroom behaviors was similar for children identified as ELL

TABLE 1 | Prekindergarten fall and spring executive function skills by ELL status, and IEP status.

ELL status						
	ELL		**Not ELL**		**Tests of group differences (Cohen's *D* ES)**	
Variable	**Fall *M* (*SD*)**	**Spring *M* (*SD*)**	**Fall *M* (*SD*)**	**Spring *M* (*SD*)**	**Fall**	**Pre-K gain**
Corsi Blocks, backward	1.06 (1.09)	1.43 (1.31)	1.17 (1.15)	1.62 (1.34)	−0.10	−0.15**
Copy design	1.22 (1.67)	5.70 (2.82)	0.92 (1.44)	4.44 (2.68)	0.20**	0.36**
DCCS	1.11 (0.43)	1.51 (0.55)	1.38 (0.62)	1.73 (0.58)	−0.48**	−0.26**
HTKS	5.91 (10.03)	17.52 (16.62)	11.65 (13.74)	23.94 (16.96)	−0.46**	−0.19**
Peg tapping	2.07 (5.08)	7.86 (6.34)	5.27 (5.83)	10.03 (0.34)	−0.57**	−0.16
Standardized composite	−0.18 (0.54)	−0.11 (0.68)	0.09 (0.66)	0.06 (0.65)	−0.44**	0.02
IEP status						
	IEP		**No IEP**		**Tests of group differences (Cohen's *D* ES)**	
Variable	**Fall *M* (*SD*)**	**Spring *M* (*SD*)**	**Fall *M* (*SD*)**	**Spring *M* (*SD*)**	**Fall**	**Pre-K gain**
Corsi Blocks, backward	0.88 (1.13)	1.22 (1.36)	1.17 (1.13)	1.60 (1.32)	−0.26**	−0.24**
Copy design	0.73 (1.44)	3.95 (2.78)	1.06 (1.54)	5.00 (2.77)	−0.21*	−0.20*
DCCS	1.16 (0.61)	1.56 (0.63)	1.31 (0.57)	1.67 (0.57)	−0.26**	−0.10
HTKS	7.65 (12.32)	17.53 (17.67)	10.04 (12.97)	22.34 (16.95)	−0.19*	−0.22**
Peg tapping	3.06 (5.62)	7.48 (6.23)	4.37 (5.79)	9.54 (5.68)	−0.23**	−0.25**
Standardized composite	−0.20 (0.67)	−0.26 (0.77)	0.03 (0.63)	0.04 (0.66)	−0.36**	−0.49**

Children identified by their teachers as English Language Learners (ELL) or having an active Individualized Education Plan (IEP) are the reference group [negative standardized mean difference effect sizes (ES) indicate lower scores for the reference group]. Estimates of Fall group difference (significance and ES) control for gender and age. Estimates of the PreK Gain are residual gains controlling for Fall scores. DCCS, Dimensional Change Card Sort; HTKS, Head Toes Knees Shoulders.
***$p < 0.01$, *$p < 0.05$.*

TABLE 2 | Children's classroom behaviors by ELL and IEP status.

ELL status			
Variable	**ELL*M* (*SD*)**	**Not ELL*M* (*SD*)**	**Cohen's D ES**
Level of involvement (Rating)	2.46 (0.24)	2.36 (0.27)	0.40**
Sequential behaviors	0.27 (0.09)	0.24 (0.09)	0.30**
Social learning interactions	0.11 (0.07)	0.10 (0.06)	0.04
Unoccupied/ Disruptive	0.03 (0.04)	0.05 (0.05)	−0.34**
IEP status			
Variable	**IEP*M* (*SD*)**	**No IEP*M* (*SD*)**	**Cohen's D ES**
Level of involvement (Rating)	2.30 (0.29)	2.41 (0.26)	−0.40**
Sequential behaviors	0.22 (0.08)	0.26 (0.09)	−0.47**
Social learning interactions	0.09 (0.06)	0.11 (0.06)	−0.33**
Unoccupied/ Disruptive	0.06 (0.07)	0.04 (0.04)	0.42**

Children identified by their teachers as English Language Learners (ELL) or having an active Individualized Education Plan (IEP) are the reference group [negative standardized mean difference effect sizes (ES) indicate lower scores for the reference group]. Level of Involvement Likert ratings range from 1 (low involvement) to 5 (high involvement). Descriptives for other learning-related behaviors are the proportion of observed sweeps characterized by the given behavior. Estimates of group differences (significance and ES) control for gender and age.
***$p < 0.01$.*

TABLE 3 | Associations between entering executive function skills and children's classroom behaviors.

Variable	**Level of involvement**	**Sequential behaviors**	**Social learning interactions**	**Unoccupied/ Disruptive**
Corsi Blocks, backward	0.13**	0.08**	0.12**	−0.14**
Copy design	0.11**	0.11**	−0.01	−0.14**
DCCS	0.10**	0.07**	0.08**	−0.13**
HTKS	0.12**	0.09**	0.10**	−0.09**
Peg tapping	0.12**	0.12**	0.07**	−0.11**
Standardized composite	0.18**	0.14**	0.11**	−0.19**

DCCS, Dimensional Change Card Sort; HTKS, Head Toes Knees Shoulders. Tests of significance controlled for gender and age.
***$p < 0.01$, *$p < 0.05$.*

and their non-ELL peers ($\beta_{involve} = 0.02$, $SE_{involve} = 0.03$; $\beta_{sequ} = -0.02$, $SE_{sequ} = 0.04$; $\beta_{social} = -0.03$, $SE_{social} = 0.03$; $\beta_{unocc} < 0.01$, $SE_{unocc} = 0.03$). Similarly, tests of moderation by IEP status were not significant ($ps > 0.175$) suggesting that the relation between entering EF and classroom behaviors was similar for children with an IEP and their classroom peers ($\beta_{involve} = 0.03$, $SE_{involve} = 0.04$; $\beta_{sequ} = 0.02$, $SE_{sequ} = 0.03$; $\beta_{social} < -0.01$, $SE_{social} = 0.02$; $\beta_{unocc} = -0.05$, $SE_{unocc} = 0.03$). The implication of these findings is that EF skills operate similarly in children irrespective of their designation as English language learners or as having special needs.

We also examined contextual effects on behavior and whether those effects differed for different groups of children. Overall, children were observed engaging in teacher-directed settings (whole group and small group) for 43% (*SD* = 15%) of sweeps and child-directed settings (centers and small group centers) for 31% (*SD* = 16%) of sweeps. Children were observed in non-instructional transitions for 18% (*SD* = 10%) of sweeps.

Table 4 reports the findings from examining whether children's classroom behaviors differed across learning settings (teacher-directed compared to children-directed learning), including if the pattern was moderated by ELL and IEP status. Significant main effects (collapsed across ELL and IEP status) were observed for level of involvement, sequential behaviors, and social-learning interactions, but not for unoccupied/disruptive behaviors. Children's involvement and their social learning interactions were greater in child-directed learning contexts compared to teacher-directed activities, while sequential behaviors mean were higher for teacher-directed instruction.

Tests of moderation indicated that differences in classroom behaviors by classroom learning setting were similar regardless of ELL or IEP status for level of involvement ($\beta_{ELL} < -0.01$, $SE_{ELL} = 0.03$; $\beta_{IEP} = 0.04$, $SE_{IEP} = 0.04$), sequential behaviors ($\beta_{ELL} = 0.01$, $SE_{ELL} = 0.01$; $\beta_{IEP} < -0.01$, $SE_{IEP} = 0.02$), and unoccupied/disruptive behaviors ($\beta_{ELL} < -0.01$, $SE_{ELL} < 0.01$; $\beta_{IEP} = -0.01$, $SE_{IEP} = 0.01$). However, there were significant interactions ($ps < 0.01$) for social-learning behaviors ($\beta_{IEP} = -0.03$, $SE_{IEP} = 0.01$; $\beta_{IEP} = -0.06$, $SE_{IEP} = 0.02$). While across ELL and IEP status, children were more likely to engage in social-learning in child-directed experiences compared to teacher-directed, the magnitude of the differences was larger for children not identified as ELL compared to their ELL-peers and for children without an active IEP compared to their peers with an IEP. Typically developing children were more likely to engage with their peers during child-directed experiences than both of the other designated groups of children.

DISCUSSION

In this paper, we have presented data on the entering EF skills of children who are English language learners and children who have a diagnosed special need or disability and thus an Individualized Education Plan. All children were members of a full-school-day pre-k program serving children from low-income families and housed in elementary schools. All the classrooms were taught by a licensed teacher and an aide; the focus was supposed to be on learning skills to be better prepared for entering and being successful in kindergarten.

We found, as others have, that both ELL children and children with an IEP enter the formal pre-k learning environment with significantly lower EF skills than their typically developing, English-speaking peers. For children who are classified as ELL, poor English language skills likely contributed to their lower EF performance. The children scored highest and most similar to their English-speaking peers on the one EF measure that

TABLE 4 | Children's classroom behaviors by learning setting and ELL and IEP status.

Variable	Teacher-directed	Child-directed	Cohen's D ES
Full sample			
Level of involvement (Rating)	2.63 (0.17)	2.89 (0.35)	−0.91**
Sequential behaviors	0.36 (0.15)	0.20 (0.15)	1.10**
Social learning interactions	0.08 (0.08)	0.18 (0.17)	−0.78**
Unoccupied/Disruptive	0.06 (0.07)	0.06 (0.08)	−0.04
ELL			
Level of involvement (Rating)	2.66 (0.32)	2.9 (0.31)	−0.79**
Sequential behaviors	0.36 (0.15)	0.20 (0.15)	1.09**
Social learning interactions	0.08 (0.09)	0.17 (0.15)	−0.73**
Unoccupied/Disruptive	0.05 (0.07)	0.06 (0.07)	−0.02
Non-ELL			
Level of involvement (Rating)	2.61 (0.34)	2.87 (0.37)	−0.71**
Sequential behaviors	0.36 (0.15)	0.19 (0.16)	1.12**
Social learning interactions	0.08 (0.08)	0.20 (0.18)	−0.85**
Unoccupied/Disruptive	0.06 (0.08)	0.06 (0.08)	−0.03
Active IEP			
Level of involvement (Rating)	2.58 (0.34)	2.85 (0.4)	−0.73**
Sequential behaviors	0.35 (0.15)	0.18 (0.13)	1.18**
Social learning interactions	0.07 (0.17)	0.15 (0.15)	−0.47**
Unoccupied/Disruptive	0.07 (0.08)	0.07 (0.09)	0.02
No IEP			
Level of involvement (Rating)	2.68 (0.33)	2.92 (0.38)	−0.66**
Sequential behaviors	0.38 (0.15)	0.21 (0.14)	1.13**
Social learning interactions	0.08 (0.08)	0.21 (0.08)	−1.64**
Unoccupied/Disruptive	0.05 (0.07)	0.06 (0.1)	−0.05

The teacher-directed setting is the reference group (negative standardized mean difference effect sizes (ES) indicate lower scores for the reference group). Level of Involvement Likert ratings range from 1 (low involvement) to 5 (high involvement). Descriptives for other variables are the proportion of observed sweeps characterized by that code. Estimates of group differences (significance and ES) control for gender and age.
$^{**}p < 0.01$.

was not language-dependent (*Copy Design*). However, being immersed in an English-speaking classroom for the pre-k year was not associated with strong gains on the other EF measures; the gains of ELL children were significantly less than those of other children. Similarly, children with an IEP scored lower than other children initially and again at the end of pre-k, making significantly less gain on these measures.

The continued poor performance of both groups of children (ELL and those with disabilities) should be of concern. It appears that the EF skills of inhibitory control, working memory, and attention shifting may be critical for children to engage and meaningfully gain from formal learning environments. Pagani et al. (2012), Morgan et al. (2019), and Finders et al. (2021) similarly demonstrate the importance of entering EF skills for kindergarten achievement as well as learning beyond kindergarten. Of importance is the issue of whether these skills can be improved through intervention or enhanced pre-k classroom environments before kindergarten.

We observed all children three times across the year, examining the important classroom interactive behaviors of the level of involvement, engagement in sequential/goal-oriented activities, and participation in social learning interactions (associative and cooperative interactions) as well as off-task behaviors. For these behaviors children who were English language learners distinguished themselves from children with disabilities. ELL children participated in the classroom significantly more than children who were English speaking. They were rated as more involved, participated in the more demanding sequential learning tasks, and were more often interacting with peers but were seldom observed unoccupied. In great contrast, children with a diagnosed disability were rated as the least involved of all the children. They did not engage in demanding learning tasks or with their peers as often. Moreover, they were the most likely to be observed unoccupied or disruptive.

It is important to remember that despite these group differences, our data suggest that the EF skills children have already developed when they enter the pre-k classroom will predict each of the four classroom behaviors, regardless of IEP and ELL status.

It seems to be especially difficult for children with lower EF skills to occupy themselves productively in the classroom. Similarly, when these children are engaged with learning opportunities lower EF skills are associated with lower levels of involvement. This could be because of the children's being more distractible or it could be because of a less well-developed attention span. These findings are particularly important for children with special needs because they are coming into the classroom with poorer skills in all the executive function skills we measured. Children's specific diagnoses, in this case primarily language delay, may not convey the other developmental difficulties they have that could prevent them from benefitting from the classroom experience. Poorer skills in attention, working memory, and inhibitory control appear to be associated

with children being less participatory with peers and teachers in social interactions. These children did not engage with the kinds of sequential materials that could help expand their attention and working memory skills, and they seem to have difficulty becoming highly involved in classroom activities. Consequently, the lack of these quality interactions does not bode well for the children's future development.

While the present study extends our current understanding of how EF skills impact the experiences of children in early care and education settings by examining relations across children who are English language learners and children who have been diagnosed with special needs, there are important study limitations. First, as all measures of EF skills were administered in English, it is hard to disentangle the effects of providing directions in English from the EF skills. To better understand the EF skills of ELLs future research must consider the delivery of assessments in a child's home language. The study is also limited by an inability to examine if findings vary across the category of a child's diagnosed special need. Unfortunately, study schools only indicated the presence of an IEP, not the reason for the plan. Future research is needed to better understand the development and classroom experiences of children based on their unique neurodevelopmental needs.

Notwithstanding these limitations, it seems clear that teachers may not be prepared for children who need this much help in finding involving things to do in the classroom or know how to create activities that will stimulate and hold children's attention. In a relevant study of family interactions and the longitudinal development of EF skills, Hughes and Ensor (2009) found that the most facilitative adult behaviors for the development of EF involved scaffolding, meaning asking open-ended questions, and providing praise, encouragement, and elaborations during structured activities. These would appear to be the kinds of behaviors teachers could employ during child-directed activities when they have more opportunities to interact individually with children. However, an Australian study concluded that while there were many opportunities for children to learn, particularly during free-play and center routines, opportunities will not result in changed developmental trajectories unless the childcare and education workforce are able to implement instructional strategies that have been proven to be successful for this population (Kemp et al., 2013; Watson et al., 2016). In their Portuguese study, Coelho et al. (2019) concluded that teachers were not taking advantage of the full potential of free play and centers as opportunities for children with disabilities to interact and learn.

How teachers are to learn these skills, however, is an important question that has a significant impact on the design of teacher training programs and in-service professional learning. Teachers may not receive the necessary preparation for providing the kind of individualized attention children with disabilities need in the classroom setting, particularly as they are coming into the classroom with less well-developed EF and self-regulatory skills. The same holds true for those classified as ELL, particularly in states where this population is relatively new. It is necessary to evaluate the certification requirements of early education teachers to confirm that pre-k teachers are trained in developmentally appropriate practices to support the individual and social-cultural needs of their students. Moreover, ongoing professional learning must be provided to teachers that aligns with expanding knowledge of the science of how children learn. As the U.S. increases funding for pre-k classrooms and these settings become common for children who are learning English and those with mild disabilities, much more attention is needed on how to make these settings facilitative of the development of skills like those related to EF. There is good evidence these skills are critical for long-term school success.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Human Research Protections Program, Vanderbilt University. Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin.

AUTHOR CONTRIBUTIONS

Both authors listed have made a substantial, direct, and intellectual contribution to the work, and approved it for publication.

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Building inclusive preschool classrooms: How desirable and feasible is a set of strategies that facilitate teacher-child relationships?

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Positive teacher-child relationships promote children's engagement, as children feel more secure to explore and participate in free or oriented activities. For children with disabilities, a context wherein they can receive the support to maintain a positive engagement in different activities is even more relevant. A scarcity of research exists on how to promote ECEC quality, namely, how to facilitate teacher-child interactions in inclusive environments. This study aims to evaluate preschool teachers' opinions about the *desirability* and *feasibility* of a set of empirically validated strategies to improve teacher-child interactions in ECEC classrooms, for the group and children with disabilities. The participants were 89 Portuguese preschool teachers. Based on a non-systematic literature review, a questionnaire composed of 22 strategies to facilitate teacher-child interactions (in 4 dimensions: emotionally responsive interactions, classroom management, attend to children's perspectives, and scaffolding learning) was developed. Along with the questionnaire, a set of socio-demographic variables was also collected. ECEC teachers scored significantly higher in the *desirability* subscale compared with the *feasibility* subscale in all dimensions and at both the *child* and the *group* level. This gap between teachers' perceived *desirability* and *feasibility* provides important insights regarding the dimensions which are important to reinforce in ECEC teachers' education and professional development. The mean difference between the *desirability* and *feasibility* subscales registered a higher effect size at the *child*'s level than at the *group's* level, confirming that the inclusion of children with disabilities in preschool settings remains a challenge. Moreover, the effect size was small to moderate in the *Emotionally Responsive Interactions* dimension for both *child* and *group* levels. These results are aligned with previous studies stating that among different self-identified dimensions for improvement, emotional support is the less evoked by ECEC teachers. Across all dimensions, the main reason teachers give for difficulty in *feasibility,* both at the *group* and *child's* level, is lack of *knowledge*. Overall, understanding the reasons teachers attribute to

the difference between the strategies' *desirability* and *feasibility* informs the assessment of teacher education needs and might be operationalized as a new observation instrument.

KEYWORDS

teacher-child relationship, high-quality early education setting, children at risk, disability, engagement, inclusion, preschool classroom

Introduction

In the past two decades, the focus of early childhood education and care (ECEC) has increasingly been placed on child's belongingness, engagement and learning, as major outcomes of an inclusive school (Castro et al., 2017; Coelho et al., 2019), where all children find the appropriate support that enable them to fully participate in natural environments (EASNIE, 2017). Research has shown that high-quality ECEC settings contribute for children to be more engaged in activities and interactions (Aydogan, 2012; Arthur-Kelly et al., 2013; Hau et al., 2020), leading to more effective learning and development (McCabe and Altamura, 2011; Pianta et al., 2020a). In this regard, one of the most important dimensions of ECEC quality are teacher-child relationships, characterized by responsiveness, sensitivity, warmth, emotional tone, and emotional support. Teacher-child relationships are associated with a wide array of developmental outcomes in several domains, such as social, emotional, and cognitive, in the early years and beyond (e.g., McCormick et al., 2013; Hamre et al., 2014; EASNIE, 2017; Blewitt et al., 2020a,b; Nguyen et al., 2020), as well as children's engagement both in preschool (Raspa et al., 2001; Aydoğan et al., 2015; Sjöman et al., 2016; Coelho et al., 2019), and in childcare (Barros, 2007; Aguiar and McWilliam, 2013; Pinto et al., 2019a), and particularly, the engagement of children with disabilities (de Kruif et al., 2000; Almqvist, 2006). In fact, some studies highlighted the crucial role of teacher's interactions and behaviors in promoting the engagement of children with disabilities, as these children often need more support to get and maintain active and positive engagement in different activities in inclusive educational settings (Mahoney and Wheeden, 1999; McWilliam et al., 2003; Grande and Pinto, 2009). However, a scarcity of research exists on how to promote ECEC quality, namely, how to facilitate teacher-child interactions in inclusive environments, to draw meaningful implications for ECEC teachers training and education (e.g., Hu and Szente, 2010; Vieira-Rodrigues and Sanches-Ferreira, 2017), particularly focusing on the strategies/tools teachers can use to provide support in inclusive education. Moreover, instruments assessing ECEC quality tend to focus on the direct assessment of teacher-child interactions, mainly through observation (e.g., Classroom Assessment Scoring System, for parsimony, CLASS; Pianta et al., 2008), failing to address teacher's knowledge and needs regarding the implementation of specific strategies in daily pedagogical practices (i.e., whether or not they are desirable and feasible to implement, meaning their desirability and feasibility, regarding the group and the child). In this study, we will address this literature gap between teachers' desirability regarding a set of strategies and the perceived challenges regarding the implementation of these same strategies, by developing a new assessment instrument and grid of observation to collect teachers' opinions about the desirability and feasibility of a set of empirically validated strategies to be used in preschool classrooms at the group or child level.

Literature review

Teacher-child interactions and child developmental outcomes

High-quality early educational settings have been consistently associated with positive child outcomes (Burchinal, 2018; Felfe and Lalive, 2018; Clark et al., 2020; Nguyen et al., 2020; Osher et al., 2020). These effects have been found across domains and skills, such as social-emotional development and social competence (Rucinski et al., 2018; Saral and Acar, 2021); self-regulation, prosocial behavior, and peer interaction (Cadima et al., 2016; Acar et al., 2022); behavioral regulation and physiological regulation (Acar et al., 2018); behavioral adjustment, inhibitory control, school readiness, and learning behavior (Acar et al., 2022); language development and pre-academic skills in literacy and math (Slot et al., 2018; Pakarinen et al., 2021); executive functions, cognitive development, school engagement, and motivation (Heatly and Votruba-Drzal, 2019; Önder et al., 2020); children's self-perception, internalizing problems, and mental health outcomes (Zatto and Hoglund, 2019; Blewitt et al., 2020a,b; for a meta-analysis see Perlman et al., 2016; Brunsek et al., 2017; Egert et al., 2018).

Positive outcomes have been found for young children across samples of varying risk level, including those with and without disabilities, and across different socio-economic backgrounds, including those from low and middle-income countries (Rhoad-Drogalis et al., 2018; Chen and Wolf, 2021;

Goldberg and Iruka, 2022). Studies around the world (e.g., Europe, China, Brazil, Chile, Colombia, Ghana, Greece, Latin America and the Caribbean, Kenya, Turkey, and the United States) have reported these associations using both cross-sectional and longitudinal study designs (e.g., Lazzari et al., 2013; Yoshikawa et al., 2015; Gregoriadis et al., 2016; Kagan et al., 2016; Mungai et al., 2017; Soliday Hong and Udommana, 2018; Acar et al., 2019; Bernal et al., 2019; Ponguta et al., 2019; Rosa and Menezes, 2019; Wolf et al., 2019; Liu et al., 2020; Wang et al., 2020; Önder et al., 2020; Hu et al., 2021; Yang et al., 2021; Bartholo et al., 2022). Positive associations between ECEC quality and children's learning and development have also been found across developmental stages and educational settings, including childcare centers and kindergartens (Liu et al., 2020). In Portugal, the same pattern of results has been found, both in childcare center settings and preschool (e.g., Pessanha et al., 2007, 2017; Barros and Aguiar, 2010; Barros et al., 2016, 2018; Pinto et al., 2019a; Guedes et al., 2020; Coelho et al., 2021, 2022; Cadima et al., 2022; Fuertes et al., 2022) and for both children at-risk and children with no known risk associated (e.g., Cadima et al., 2018; Aguiar et al., 2019; Pinto et al., 2019b).

Therefore, in early educational settings, it is important to study the *preschool classroom quality*, particularly, the classroom *structural quality,* which refer to regulable characteristics (e.g., teacher-to-child ratio, group size, years of experience, and teacher education levels), and the classroom *process quality,* which relates to children's daily experiences in the classroom context, including their interactions with teachers and peers and their engagement in school activities (e.g., teacher-child interactions), features that promote learning and development for all, in inclusive settings (Phillips and Howes, 1987). *Process quality*, and particularly teacher-child interactions, are especially relevant given its direct association with a wide range of child outcomes. According to the bioecological model of human development (Bronfenbrenner and Morris, 2006), human development is fueled in part by the interrelationships among characteristics of people, the contexts they are situated in, and the processes that take place within those contexts. Children's classroom behaviors are better understood as a dynamic attribute of the teacher–child system, rather than as a characteristic of the children themselves, i.e., it is an outcome of a dynamic interplay between characteristics at different levels including the intrapersonal, interpersonal, and contextual level. From an ecological systems perspective, development occurs as a function of the continuous interaction between the child's characteristics and the close context—the so-called *proximal processes of development*. *Proximal processes* are the engines that drive development. When we consider this model in an educational setting, teacher-child relationships are the driving force, the *main ongoing proximal processes* that drive children's development in early childhood classrooms. Children learn through frequent and continuous interactions with teachers, peers, and all the elements of their social and physical environments. This view highlights the importance of teachers' support and challenge in determining children's active and positive involvement with classroom tasks (Davis, 2003); children will likely display greater engagement when their teacher is attuned and responsive to children's cues and interests and matches the level of scaffolding to the children's needs.

Teacher-child relationships refer to the cumulative and ongoing interpersonal connections that develop over time between teachers and individual children in their classroom, the *"daily back-and-forth exchanges that teachers and children have with one another throughout each day, including those that are social and instructional in nature"* (Hamre et al., 2012, p. 89). Though behavioral indicators of such relationships could be assessed through repeated observations over extended periods of time, teacher–child relationships are typically measured by means of teacher report, often using the Student Teacher Relationship Scale (STRS; Pianta and Steinberg, 1992). As such, teacher–child relationships reported in the literature most often reflect the teacher's perception of the relationship. There has been an accumulation of evidence indicating that high-quality teacher-child relationships, characterized by supportive and sensitive teacher–child interactions, are beneficial to children's social and academic development, with positive outcomes at different functioning levels (e.g., behavior, cognitive, affective/social-emotional, and school readiness/success) (e.g., Sabol and Pianta, 2012; Hamre, 2014; for a meta-analysis see Perlman et al., 2016; Perlman et al., 2017). Based on the attachment theory (Bowlby, 1969), teacher–child interactions support children's engagement, at least in part, indirectly; warm and positive interactions with teachers promote children's feelings of security—a sense of trust, comfort, or equilibrium—to explore the classroom environment (Birch and Ladd, 1997; Williford et al., 2016). According to the emotional security hypothesis (Davies and Cummings, 1994; Davies and Martin, 2013), in moments of stress (e.g., frustration with a task, difficult interactions with peers) children rely on their teachers for support, to preserve and attain security (Little and Kobak, 2003; Thijs et al., 2008). The stability and predictability of sensitive and responsive interactions is theorized to reassure a child that the teacher is available, thus advancing a child's feelings of security. As early childhood classrooms place cognitive and social demands that may elicit stress on children (e.g., Watamura et al., 2003), preschool teachers are salient resources to support all children's stress regulation (e.g., Badanes et al., 2012; Hatfield et al., 2013) and help them reengage with classroom tasks/activities. This support system is especially important for children with disabilities.

Considering the importance of *process quality* in ECEC settings, some dimensions related particularly to teacher-child interactions, have been commonly used in previous studies, and were an important framework for the current study, namely:

emotional support, classroom organization, and instructional support (Pianta et al., 2008).

Emotional support

Briefly, an emotionally supportive environment is characterized by high levels of teacher sensitivity and regard for children's perspectives and a positive emotional climate with low levels of negativity between teachers and children (Pianta et al., 2008). Markers of an emotionally supportive classroom are teacher behaviors indicating that he or she is in tune with children's needs and responsive to their cues, developmentally appropriate opportunities for children to make decisions and show leadership, and a warm and accepting classroom environment. Support in the classroom, particularly during early childhood, is recognized as a mechanism for fostering not just social but also academic success in elementary grades. Indeed, children who feel safe with and valued by the teacher are likely to be mentally ready to handle academic information, whereas children who are worried or feel uneasy in the classroom may be preoccupied and unable to take in new information. This domain also includes the constructs of individualized dyadic interactions, management of activities in the child-group, and regard for children's perspectives. Typically, regarding emotional support, teacher–child relationships are viewed as consisting of two dimensions: closeness and conflict. Closeness represents high levels of warmth, positive affect, and approachability between teacher and child (Pianta et al., 1995, 1999) whereas conflict represents negativity and lack of rapport (Ladd and Burgess, 2001). Supportive, warm, responsive, and sensitive teacher–child interactions and relationships are critical for children's academic and social development (Sabol and Pianta, 2012; Hamre, 2014). Previous studies show that effective teacher–child relationships develop through reiterated interactions characterized by shared affect and emotional engagement, teachers' sensitivity and responsiveness, and low conflict (Pianta et al., 2003). For instance, research using the CLASS indicates that when teachers offer warm, supportive, and responsive interactions, children develop stronger social and emotional skills (e.g., Johnson et al., 2013).

Instructional support

Instructional support is characterized by scaffolding, questioning, and feedback exchanges between teachers and children. A classroom with high instructional support has rich and detailed interactions between children and teachers that are linked to and extend academic content. In this domain, the constructs of planning activity settings and scaffolding learning are also highlighted. There is evidence that instructional support promotes children's academic performance (Pianta et al., 2002; Perry et al., 2007) and can buffer elementary school-age children against low achievement if they are at risk because of low socioeconomic status or poor attention (Hamre and Pianta, 2005).

Classroom organization

Classroom organization is the dimension of teacher-child interactions through which teachers organize behavior, time, and attention (Emmer and Stough, 2001). Teachers using more effective behavior management strategies (Evertson et al., 1983; Arnold et al., 1998; Evertson and Harris, 1999; Emmer and Stough, 2001), having more organized and routine management structures (Bohn et al., 2004; Cameron et al., 2005), and implementing strategies that make children active participants in classroom activities (Vygotsky and Cole, 1978; Rogoff, 1990; Bruner, 1996; Stott and Bowman, 1996) have less oppositional behavior, higher levels of engagement in learning, and ultimately, children who learn more. This domain also includes behavior management (rules, consistency), social cooperation (peers' interactions), and conflict resolution.

Although we know, as the literature reviewed here shows, that ECEC quality is important for the developmental outcomes of children (with or without disabilities), *what does the research say about the global and process quality of classrooms?*

Research results related to global ECEC quality for young children in inclusive and non-inclusive programs are inconsistent (Bruder and Brand, 1995; La Paro et al., 1998; Buysse et al., 1999; Hestenes et al., 2007; Pelatti et al., 2016), which has been a cause of concern for parents, educators, and policymakers.

Some studies have found that inclusive and segregated programs were similar in quality, with levels of quality moderately high in both types of settings (La Paro et al., 1998). Despite a relative lack of specialized training in teaching children with disabilities and relatively high child-teacher ratios, in inclusive classrooms, teacher behaviors and levels of attention to children were similar to teachers working in segregated early childhood special education classrooms (Hundert et al., 1998). In addition, children with disabilities in inclusive and segregated classrooms showed similar levels of participation in small and large group activities and low rates of solitary play and antisocial behavior. La Paro et al. (1998) also reported that the same percentage of inclusive and non-inclusive classrooms met the criteria for developmentally appropriate practices, with 14 (48 percent) of the self-contained programs scoring 5 or above (developmentally appropriate) and 15 (52 percent) of the inclusive classrooms scoring 5 or above on the Early Childhood Environment Rating Scale (ECERS; widely used to indicate programs that are developmentally appropriate). However, due to the small sample size, the results of this study need to be interpreted with caution.

Other studies have highlighted differences when comparing inclusive and segregated settings (Sontag, 1997; Kishida and Kemp, 2009). In general, segregated classrooms had the following features: more homogeneous grouping, more

specialized teachers, smaller class sizes, and higher adult-child ratio than inclusive programs. Mahoney et al. (1992) suggested that there might be important differences in the types of teacher behaviors that are inherent in ECEC and early childhood special education classrooms. Typically, inclusive programs have a theoretical and philosophical background that encourages teachers to promote child-initiated activities and abstain from being highly directive with children. In contrast, segregated programs are often based on the belief that children need direction and guidance to acquire desired developmental skills.

Some research comparing the quality of preschool inclusive and non-inclusive classrooms has found inclusive classrooms to be of higher quality (Bruder and Brand, 1995; Buysse et al., 1999; Hestenes et al., 2007). Buysse et al. (1999) found that 62 inclusive programs scored better on a global quality measure than did non-inclusive programs. Bruder and Brand (1995) had similar results for their study in which they compared inclusive programs for toddlers with non-inclusive programs: inclusive programs observed were of higher quality than non-inclusive programs. Hestenes et al. (2007) reported that not only was the overall quality of inclusive preschool classrooms higher but that inclusive preschool classrooms were higher on both an activities/materials factor-based scale and a language/interaction factor-based scale of the Early Childhood Environment Rating Scale-Revised (ECERS-R). Teachers in the inclusive classrooms also had significantly higher levels of education and more coursework in special education (compared with teachers in non-inclusive classrooms). Teachers in inclusive classrooms were rated higher on their interactions with preschoolers, based on scores on the Teacher-Child Interaction Scale (TCIS). Results also indicated that no differences existed in classroom quality based on the level of severity of children with disabilities who were enrolled (Hestenes et al., 2007).

In some studies, inclusive classrooms have been described as an optimal context for teachers to promote social skills and peer interactions, because these environments provide opportunities for children to learn by observing and imitating typically developing peers and also to learn from teacher-lead direct intervention (e.g., Bronson et al., 1997; Sontag, 1997; Terpstra and Tamura, 2008). Research has confirmed that children with mild disabilities exhibited higher levels of peer interaction in inclusive groups, when compared with segregated groups (Kishida and Kemp, 2009). Children with disabilities in inclusive settings have also been observed to be more independent and less controlled by teachers (Bronson et al., 1997; Kishida and Kemp., 2009). They were also less often engaged in unoccupied play, and exhibited fewer inappropriate or self-abusive behaviors than children in segregated programs (Erwin, 1993).

Similarly, in ECEC for children younger than 3 the results are also inconsistent. Although there is evidence suggesting that inclusive settings may be of higher quality than non-inclusive settings, other studies report no differences across settings. For instance, while Hestenes et al. (2009) found that infant and toddler classrooms that include children with diagnosed disabilities were significantly higher in quality than classrooms that did not include children with disabilities and the enrollment of children with disabilities did not diminish the overall classroom quality below the level of what is considered to be developmentally appropriate (a score of 5 on the 7-point scale); in Portugal, previous research focusing on the associations between global classroom quality and the social acceptance of children with disabilities in inclusive ECEC settings found no evidence of such associations (e.g., Aguiar et al., 2010).

Because of inconsistent findings, further examination is needed to determine whether there are differences between inclusive and segregated programs in both teacher behaviors and peer interactions by children with disabilities. It would be interesting to conduct research on how the classrooms including children with disabilities differed with regard to teacher behaviors. Do teachers with more special education coursework interact with children in a manner that encourages involvement and acceptance of children with disabilities? It also would be important to examine the relationship between teacher-child ratios and appropriate engagement with children for teachers who have more education. It seems that continuing to educate the ECEC staff regarding the importance of inclusive environments, appropriate interactions with children with and without disabilities, and knowledge of best practice would increase the number of children with disabilities served in high-quality inclusive environments.

Teacher-child interactions may be particularly important for children at risk. These relationships are particularly salient resources for children who, for various reasons (e.g., with disabilities, low achievement or display of externalizing behavior problems), are likely to experience the classroom setting as socially or academically challenging (Hamre and Pianta, 2005; Baker et al., 2008; Castro-Kemp and Samuels, 2022). For children with disabilities and children at-risk (e.g., from disadvantaged backgrounds), high-quality inclusive environments potentially act as a buffer mechanism for negative life experiences and risk factors, serving as a protective (compensatory) mechanism to promote child engagement and resiliency within the classroom environment (Hall et al., 2009; Frawley, 2014; Melhuish et al., 2015). For example, Buyse et al. (2008) found positive effects of emotionally supportive interactions for children at risk of establishing less close and more conflictual relationships with teachers because of their internalizing and externalizing behavior. Similarly, moderation effects of emotional support were found for prosocial behaviors of children with caregivers with depressive symptoms (Johnson et al., 2013). Furthermore, children from poor families seem to improve their social skills and adjusted behavior when experiencing high levels of emotional support (Burchinal et al., 2010). Interestingly, moderate-to-low emotional support

does not seem to predict social competence but positively predicts behavior problems (Burchinal et al., 2010). Focusing on indicators of children's social acceptance within the peer group, Mikami et al. (2012) reported low social preference stability for children attending classrooms with higher levels of emotional support, which may translate into increased opportunities for children with initial lower social preference. However, children with high levels of externalizing behavior showed decreases in social preference throughout the school year, regardless of the level of emotional support provided by teachers. Collectively, these findings support the expectation that teacher-child interactions may also play an important role in fostering the social development of a particular type of disadvantaged children, that is, children with disabilities.

However, research suggests that promoting high-quality interactions in educational settings is a challenge for teachers, and that this challenge can be even higher in inclusive settings, as teachers need to be responsive to a wider span of children's needs (Downer et al., 2010; Logan et al., 2011; Chung and Carter, 2013; Pelatti et al., 2016; Goble and Pianta, 2017; Cadima et al., 2018; Hu et al., 2018; Cash et al., 2019; Langeloo et al., 2019). For teachers in inclusive classrooms, the challenge of high-quality interactions is even greater as they strive to be responsive to the needs of all children with and without disabilities. In fact, inclusion needs to be balanced to provide rich opportunities for participating and being engaged in the same activities as other children and at the same time receive needed support. For example, Soukakou (2012) found that teachers in inclusive classrooms seldom used high-quality feedback. The types of interactions and conversations that are conducted with children with and without disabilities influence all facets of children's development, including their ensuing interactions with peers. Measurement of teacher–child interactions seems particularly important in understanding this dimension of process quality across settings. Researchers in the field are called upon to study this important aspect of inclusion (Odom, 2000).

Some studies suggest that some dimensions of quality of teacher–child interactions in inclusive classrooms tend to be higher than in non-inclusive environments (Hestenes et al., 2008; Grisham-Brown et al., 2010; Pelatti et al., 2016). For instance, Pelatti et al. (2016) found that inclusive preschool classrooms tend to show higher levels of teacher emotional support; however, non-inclusive classrooms showed significantly higher levels of teacher instructional support.

In classrooms that include children with disabilities, teachers' interaction patterns appear to be somewhat different from their interactions with typically developing children. Teachers are generally observed to be more directive and less child centered (not supportive of child-initiated activities) in their interactions with children with disabilities (Goodman et al., 1992). Results of another study found that teachers who were highly responsive and moderately directive in their behavior were more successful in engaging children with disabilities in meaningful activities in the classroom (Mahoney and Wheeden, 1999). Teachers' differing styles of interaction patterns with children with disabilities has been an issue of debate in the field.

Furthermore, several studies have revealed that teachers use more directives with children with disabilities than with typically developing children (Stipek and Sanborn, 1985; Quay, 1991; File, 1994; Chow and Kasari, 1999; Hestenes et al., 2004). File's research (1994) indicated that teachers in inclusive preschool classrooms were more directive (e.g., asking closed questions) of the cognitive experiences of children with disabilities than of the cognitive experiences of typically developing children. Also, teachers were more likely to support cognitive play than social play behaviors. Indeed, support of social play (play with peers) was relatively infrequent (only 2%). Furthermore, Quay (1991) reported that teachers were more negative toward children with disabilities than toward typically developing children.

Studies of inclusive classrooms have suggested that teachers may be more involved with children with disabilities than with other children (Brophy and Hancock, 1985; Hundert et al., 1993; Chow and Kasari, 1999), although their involvement is mixed in terms of its appropriateness. For example, Chow and Kasari (1999) found that at the beginning of the school year in inclusive classrooms, teachers initiated more negative and task-related interactions with children with disabilities than with their typical peers. However, at the end of the school year, teacher interactions with the children with disabilities were similar to those with the typically developing children. Research has also indicated that teacher presence is predictive of more interactions between preschool children with and without disabilities in inclusive classrooms (Hestenes and Carroll, 2000). The teacher's role and involvement with young children is clearly a key aspect underlying process quality in inclusive classrooms.

Teacher-child interactions and child engagement

Children's engagement is an auspicious target involved in preschool developmental pathways and learning outcomes (e.g., Castro et al., 2017; in Portugal see Aguiar and McWilliam, 2013; Coelho et al., 2019).

Engagement is the amount of time the child spends interacting with the environment (adults, peers, and materials) in a developmentally and contextually appropriate manner, at different levels of competence (McWilliam, 1991; McWilliam and Bailey, 1995; McWilliam and Casey, 2008). This definition embeds both the quantity and quality of children's behaviors and acknowledges the multidimensionality of the construct in terms of behavioral (positive efforts and involvement with academic activities), cognitive (self-regulations of one's investment or commitment in the learning process), and

social-emotional engagement (affective reactions to teachers or peers and activities in the classroom; Newmann, 1992; Skinner and Belmont, 1993; Fredricks et al., 2004). Studies in preschool settings have focused on the behavioral components of engagement (McWilliam et al., 2003), while studies with school-aged children have on the most part addressed the cognitive and emotional aspects of engagement (Finn, 1989; Neumann et al., 1992; Martin and Rimm-Kaufman, 2015).

Since researchers generally view children's classroom engagement as flexible to change (Fredricks et al., 2004), an important step in designing improvements in the quality of children's participation, particularly those with disabilities, in learning activities is the identification of classroom contexts and features associated with active child engagement, such as the classroom emotional climate and the quality of teacher-child interactions.

Several studies have reported a link between teacher–child interactions and children's engagement, in childcare for infant/toddlers (e.g., Pinto et al., 2019a), in preschool (e.g., Vitiello et al., 2012; Williford et al., 2013a,b; Weyns et al., 2018; Yoder et al., 2019; Alamos and Williford, 2020), elementary school and middle school (e.g., Hosan and Hoglund, 2017; Buhs et al., 2018; LoCasale-Crouch et al., 2018; Heatly and Votruba-Drzal, 2019), and beyond, including adolescence (Dotterer and Lowe, 2011; De Laet et al., 2016; Wang et al., 2020). Substantial research now indicates that the quality of dyadic teacher–child interactions play a key role in facilitating young children's active and positive participation in classroom activities, as well as their wellbeing, agency, inclusion, and significant learning. Generally, children demonstrate higher levels of engagement when they experience warm and sensitive interactions with their teachers that support their autonomy (e.g., Birch and Ladd, 1997; Hughes and Kwok, 2006).

Positive task engagement is characterized by children's enthusiastic, self-directed, and active involvement with classroom activities (Fantuzzo et al., 2004; Downer et al., 2010). Children's ability to participate and persist in classroom activities and learning tasks has been linked to the development of school readiness skills (McClelland et al., 2000, 2007; Hughes and Kwok, 2006). Studies suggest that preschool children's positive engagement with tasks and activities is associated with better attention and impulse control (Chang and Burns, 2005; Bierman et al., 2009). Furthermore, it has been suggested that interest and engagement in an activity strengthens inhibitory and attentional control during the activity (Pessoa, 2009). However, as Vygotsky's theory emphasizes, children do not engage in classroom tasks and activities in isolation of their social relationships. Birch and Ladd (1996, 1997) asserted that children's relationships with teachers and peers can serve as either supports or stressors that may facilitate or hinder children's classroom adaptation and participation.

Children with disabilities tend to engage in lower levels of social play, initiate peer interaction less often, spend less time interacting with peers, are less often chosen as playmates, and are more likely to be rejected by peers than typically developing children (Odom and Diamond, 1998; Pierce-Jordan and Lifter, 2005). In this vein, some studies highlighted the crucial role of teacher's interactions and behaviors in promoting the engagement of children with disabilities (e.g., Mahoney and Wheeden, 1999; Almqvist, 2006; Grande and Pinto, 2009), as these children often need more support to get and maintain active and positive engagement in different activities in the educational settings. For instance, research results show that teacher interactive styles are related to higher levels of engagement and participation of children with disabilities (e.g., Mahoney and Wheeden, 1999; de Kruif et al., 2000; McWilliam et al., 2003; Grande and Pinto, 2009), with teacher responsiveness and emotional tone influencing the levels of engagement of children with disabilities. Similarly, a study by McWilliam et al. (2003) found that elaborations and information giving were associated with children's engagement and that interactions targeted at individual children with disabilities produced more engagement on the part of the children than did group-targeted interaction.

Despite the crucial role of teacher's interactions and behaviors in promoting the engagement of children, with or without disabilities, some studies have shown that preschool teachers are inconsistent in promoting high-quality teacher–child interactions (e.g., Aguiar et al., 2010; Cadima et al., 2018; Coelho et al., 2019, 2022). Therefore, since teacher-child interactions have been associated with teacher's education, experience, and training in ECEC (e.g., Fukkink and Lont, 2007; Hu et al., 2018; Fukkink et al., 2019; for a meta-analysis see Egert et al., 2018), teachers' education can be an excellent opportunity for teachers to develop their relationships, interaction strategies and play skills.

Understanding the primary role of interactions and relationships in creating the capacity for children to engage the classroom as a setting for development and learning is a fundamental precursor to understand the approach to measuring interactions and to changing classroom settings' capacity for engagement. Studies in the everyday life of the preschool environment based on a deeper understanding of engagement and its role in providing support in inclusive education are needed.

Changing teacher-child interactions through professional development

Knowing that teacher-child interactions are crucial in supporting children's development and learning, the challenge is to improve teacher-child interactions. Research in early childhood education generally indicates that effective professional development combines specific training on novel skills, coupled with in-service coaching or consultation

(Sheridan et al., 2009). Such professional development has been shown to be effective in improving instruction and children's outcomes in targeted content areas such as literacy (Powell et al., 2010; Landry et al., 2011; Wasik and Hindman, 2011) and math (Clements et al., 2011). The current work focuses on teacher-child interactions more generally, rather than focusing on a content area. Moreover, before creating a solution we must know the problem (i.e., identify the teacher's needs to improve their education opportunities).

One of the most used measures to evaluate the quality of interactions between teachers and children in preschool settings is the CLASS (Pianta et al., 2008). Although substantial research base shows a positive relationship between CLASS scores and gains in child outcomes, with hundreds of studies reporting significant relations between them (e.g., Nichd Early Child Care Research Network, 2002; Mashburn et al., 2008; Sabol et al., 2013), these relationships, when significant, are typically small (Keys et al., 2013; Araujo et al., 2016), with modest effect sizes (in the range of 0.05–0.10) and in many instances non-significant (Burchinal et al., 2011; Perlman et al., 2016; Brunsek et al., 2017). Evidence from causal designs that include random assignment of children to teachers show CLASS with significant, small causal effects of teacher-child interaction on learning (Carneiro et al., 2019). Reports of modest or no association(s) with child outcomes rightly prompt calls to develop new and improved measures of quality. We posit that two limitations might underlie these results: (1) umbrella-terms and the difficulty in finding conceptual coherence/consistency among studies (for a systematic review see Djamnezhad et al., 2021) and (2) the lack of teachers reflective functioning, regarding their own knowledge and pedagogical practices, involved in the assessment. In fact, in CLASS (Pianta et al., 2008), as in other ECEC quality assessment instruments, in addition to the assessment of the quality of teacher-child interaction, the implementation of specific strategies in daily pedagogical practices should also be assessed (i.e., whether they are desirable and feasible to implement—their desirability and feasibility).

Studies that focus on the nature of and between teacher thought and action are making a significant contribution to how and why teachers do what they do amidst the complexity of the classroom (Schoenfeld, 1999). However, the literature is still scarce. Only a few studies have addressed the feasibility of strategies use in preschool classrooms. Additionally, it is important to explore the teacher's perspective regarding their desirability (i.e., which strategies they consider more desirable). Understanding the reasons teachers attribute to the difference between the strategies desirability and feasibility informs the assessment of teacher education needs and might be operationalized as a new observation grid. These aspects are input to teachers' education and professional development that are both effective and efficient. By evaluating the difference between the desirability and feasibility of these strategies implementation (as well as the reasons that teachers attribute to these differences), we address the need to develop and implement practical and explicit pedagogical strategies that (1) will respond directly to teachers' difficulties/limitations—*"strategies that are important but hard-to-do*," (2) are built on teachers' current knowledge and expertise, (3) are embedded into their daily practice and can be used in a daily basis effectively (i.e., making it a feasible practice), and (4) are tailored to the social, emotional, and behavioral needs of the child as well as the child within the group. Committing to early childhood interaction strategies and inclusion practices means committing to early childhood teacher education for inclusive practices. Knowledge about disabilities alone appears inadequate to achieve quality inclusion. Perhaps more importantly, teachers need hands-on experiences with effective pedagogical approaches to work with children with disabilities in inclusive settings. Currently, a scarcity of research exists on how to facilitate inclusion to draw meaningful implications for ECEC teacher education (e.g., Hu and Szente, 2010; Vieira-Rodrigues and Sanches-Ferreira, 2017). Therefore, this study seeks to examine the variables or key characteristics concerning both teachers' perspectives of the perceived importance and feasibility of high-quality inclusion strategies and ECEC teacher-child interaction needs to provide direction for future teacher. For example, we need to address teachers' perspectives regarding the knowledge and skills they perceive to have to explore if they need coursework offering for successful inclusion practices. Certainly, prior research in Portugal has shown that such courses are currently not offered or required in most teacher education programs (e.g., Monteiro et al., 2020). Perhaps, teachers who have taken courses related to special education or inclusive education, or who have previous experience with children with special needs, are more likely to perceive inclusion as both important and feasible. Therefore, it is important that this research address how these key characteristics, such as preservice teachers' special education coursework, and previous experiences with children, influence their perceptions about the importance and feasibility of high-quality inclusion.

The present study

Based on the accumulated evidence regarding the interaction between quality of environment and child engagement, several authors have developed assessment tools to study aspects of early childhood settings, identifying a range of strategies and intervention approaches recommended as practices to promote engagement within daily classroom routines/activities (Pianta et al., 2020b; Djamnezhad et al., 2021). Despite the extensive empirical findings about strategies contributing to the quality of ECEC settings and to child engagement, a gap still exists between evidence-based practices and the practices teachers develop, suggesting that there is often a tension between teachers' knowledge, beliefs, and practice

(Stipek and Byler, 1997; Pianta et al., 2009; Hamre et al., 2012). Little is known about how teachers consider specific practices in ECEC as desirable and feasible and what factors (i.e., knowledge, human resources, material resources, and time) contribute for teachers to use them with a particular child and/or with the whole group.

Therefore, this study aims to evaluate preschool teachers' opinions about the *desirability* and *feasibility* of a set of strategies, empirically validated, to promote teacher-child interactions in ECEC classrooms, for the group and the child/children with disabilities (within the group). The following research questions are addressed:

> Research Question 1: *According to ECEC teachers, how desirable and feasible is a set of strategies to promote group engagement and the engagement of children with disabilities?*

> Research Question 2: *Are there differences between ECEC teachers' desirability and feasibility ratings of the strategies to use at the child and group levels?*

> Research Question 3: *What reasons do teachers attribute to the feasibility of strategies to use with the group and the child with disability?*

> Research Question 4: *Are individual (e.g., years of teaching experience) and contextual (e.g., number of children per classroom) variables associated with the scores that teachers assign to the desirability and feasibility engagement strategies for the group and the child with disabilities?*

To answer these research questions, a questionnaire focused on specific strategies fostering the quality of teacher-child relationships was developed based on a non-systematic literature review of the most used instruments to assess ECEC quality.

Materials and methods

Participants

The participants were 89 Portuguese preschool teachers (85 female, 95.5%), aged between 25 and 63 years (M = 48.41 years, SD = 9.46). Regarding continuing professional development, 30 teachers (33.7%) had additional training, namely 11 teachers (12.4%) had a master's degree in special education, 10 teachers (11.2%) had a master's degree in other areas of education and 8 teachers (9%) had other complementary training (e.g., workshop on emotional education and mindfulness) and 1 teacher had a PhD (1.1%). Regarding professional experience, 27 teachers had between 10 and 20 years (30.3%) and 6 teachers had less than 10 years of experience (6.7%). Regarding the employment sector, 31 teachers (34.8%) worked in public institutions, 26 teachers (29.2%) in private for-profit institutions and 26 teachers (29.2%) in private non-profit institutions. In what concerns the age of the children they worked with, half of the teachers (N = 46, 51.7%) worked with a mixed-age group, while the rest (N = 37, 48.3%) worked with a homogeneous age group. On average, group sizes varied between 8 and 26 children (M = 20.16, SD = 3.92). Of the 89 classrooms that participated in the study, 67 had children with disabilities (75.3%). Classrooms had, on average, 2 children with disabilities (with a confirmed diagnostic or under evaluation) (M = 1.61, SD = 1.30, range 0–6 children).

Measures

Questionnaire *"Facilitating strategies of teacher-child interaction"*

A questionnaire—*"Facilitating Strategies of Teacher-Child Interaction"*—focused on specific strategies fostering the quality of teacher-child relationships was developed. First, a non-systematic literature review was conducted to identify the most used instruments for measuring ECEC quality. In this review, different instruments were considered, including those that assess *process* and *structural quality* features as well as those focused on teacher-child relationships, both at the dyadic-level (e.g., teacher-child relationship) and classroom-level (e.g., classroom environment); varying in nature, such as observational/descriptive, perceptions, beliefs, representations, knowledge, and attitudes; and including instruments considering typical and atypical development.

A literature search was conducted by entering combinations of the keywords or search expressions ("interaction quality" OR "teacher child interaction" OR "teacher-child interaction" OR "interaction" OR "interaction skills" OR "classroom interaction" OR "teacher-child relation*" OR "teacher-child relationship" OR "classroom environment quality" OR "class*" OR "observed interaction*" OR "observed practice*" OR "global quality" OR "structure quality" OR "process quality" OR "classroom organization" OR "instructional support" OR "emotional support" OR "observed relationship*" OR "classroom quality" OR "teaching quality" OR "social interaction" OR "social behavior" OR "social skills" OR "classroom climate" OR "school climate" OR "classroom environment" OR "school environment") AND ("early education" OR "early childhood education" OR "early childhood education and care" OR "ecec" OR "kindergarten" OR "kindergarten*" OR "kinder*" OR "pre-kindergarten" OR "pre-kindergarten" OR "pre-K" OR "pre K" OR "preschool" OR "preschool*" OR "preschool" OR "pre-school" OR "childcare" OR "child care" OR "early

learning center" OR "early learning center" OR "day care" OR "daycare" OR "center-based child care" OR "center-based childcare" OR "center-based programs" OR "center-based setting*" OR "preschooler*" OR "kindergartener*" OR "early years" OR "child development center" OR "child development center" OR "preschool education" OR "nursery school" OR "preschool children" OR "early child care") AND ("assessment" OR "measure" OR "quality measure" OR "evaluation" OR "instrument" OR "scale" OR "observation" OR "interview" OR "questionnaire" OR "self-report") into the Medline, PsycINFO, and Academic Search Premier electronic databases. Before executing the searches, we applied three filters in the search engine: (a) the area filter, which was specified as "education and educational research" to ensure the suitability of the studies found; (b) the date filter, which was set to limit the search to publications from 2012 to 2022 to ensure the timeliness of the studies (to guarantee that they have scientific relevance); and (c) the type of document, as only articles published in scientific journals, and no book chapters, reports or proceedings of conferences, were considered.

A total of 77 articles published in the last 10 years were screened. From those, 45 instruments were identified, which addressed different features of the classroom environment and the quality of teacher-child relationships and interactions in preschool settings. Following previous work (e.g., Aguiar and Aguiar, 2020), three types of classroom quality measures were identified: (1) global quality measures (2 instruments); (2) process quality measures (31 instruments); and (3) content specific measures (12 instruments). The first category of quality measures (for example, ECERS-R; Harms and Clifford, 1980; Harms et al., 1998) provides summary scores looking broadly across different features of quality, including not only teacher-child interactions but also physical features of the educational setting (such as appropriateness of furniture and space for children; availability of play and learning materials), structuring of activities, and features of the environment important for the teachers. Therefore, typically global quality includes both the physical aspects of the environment and the social interactions in the classroom. Process quality measures, also known as interaction-specific measures, which focus primarily on teacher-child interactions, take a major step toward greater specificity by separating different aspects of interactions. A key example is the CLASS (Pianta et al., 2008), which separates Emotional Support and Instructional Support (as well as Classroom Organization). These CLASS summary scores, however, are limited in the extent to which they go the further step of focusing on interactions involving specific content. Examples of content specific measures (or domain-specific measures), that focus on instructional quality within specific content areas (Burchinal et al., 2011), include the Classroom Observation of Early Mathematics (Clements and Sarama, 2008) and the Early Literacy Observation Tool (Grehan and Smith, 2004).

Since our main objective is to evaluate teacher-child interactions strategies, here, we will focus specifically on global measures and process measures. Thirty-three assessment instruments were identified (for a description see **Table 1**).

Next, after identifying the most used assessment instruments (i.e., the most cited in the literature), a content analysis of these assessment tools was conducted by three researchers. Content analysis included a detailed description of the assessment instruments regarding the construct under study and its definition. Based on the content analysis, the dimensions—empirically validated—that would be considered in the questionnaire were defined [(4 dimensions: (1) emotionally responsive interactions, (2) classroom management, (3) attend to children's perspectives, and (4) scaffolding learning] and 70 items (i.e., 70 strategies) were developed (approximately 15–20 items to cover each dimension). As previously explained, there is a need to increase precision in constructs, in the education sciences field, particularly regarding social-emotional aspects (Djamnezhad et al., 2021). Most constructs are umbrella terms that include a range of approaches and concepts. Moreover, within the field of socio-emotional skills, practitioners and researchers use different constructs to organize, define, and describe the research area (Berg et al., 2019). Therefore, throughout this process, an attempt was also made to overlap dimensions that, despite having different labels in the original instruments, assessed similar constructs. In this way, the intention was to simplify the dimensions (and the items that compose the questionnaire), avoid redundancy, and, on the other hand, to make sure that the item represented the dimension.

After being scrutinized by 5 specialists, from the initial 70 items, 22 items (i.e., 22 strategies) were retained in the questionnaire to cover all the dimensions which, according to the literature, facilitate a positive teacher-child relationship and therefore are critical for all children's engagement, learning and development. For each item/strategy, teachers were invited to respond in terms of its desirability and feasibility, based on their experience in implementing the respective strategy on two levels: (a) with the whole group and (b) with the child/children with a disability and/or at risk within the classroom context. The desirability indicates the extent to which teachers considered each strategy relevant and would like to implement it in their professional practice (DESIRABILITY: 1—not desirable at all, 2—somewhat desirable, 3—very desirable, 4—extremely desirable). The feasibility indicates to what extent teachers thought that strategy is feasible to implement in their classroom (FEASIBILITY: 1—not feasible at all, 2—somewhat feasible, 3—very feasible, 4—extremely feasible). Additionally, teachers had to indicate the reason that justified their response to the feasibility scale, at both levels (group and child), out of four options [WHY: (1) knowledge (K), (2) human resources (HR), (3) material resources (MR), and (4) time (T)].

In the following subsections you can find a definition of the 4 dimensions evaluated in the questionnaire.

Dimension 1: Emotionally responsive interactions

With emotionally responsive interactions, teachers provide a caring social environment and are attuned and responsive to the individual cues and needs of students in their classrooms. Teacher-child interactions are warm and close, and there is high proximity through physical contact and affection (e.g., hugs). These relationships are built on trust, respect, and empathy. There is open and affectionate communication (e.g., teachers use a calming voice and a moderate tone), wherein compliments and praise are frequently used. Teachers invest in emotionally supportive environments, providing comfort, reassurance, and encouragement. There is a positive classroom climate reflected in the enthusiasm, enjoyment, and respect displayed during interactions between the teacher and children. Teachers display high sensitivity and responsivity, through consistent, timely, responsive, and contingent responses in their interactions. Highly sensitive teachers help children see adults as a resource and create environments in which children feel welcomed, safe, and free to explore and learn.

In emotionally supportive environments, teachers create a safe place for appropriate expression/management of emotion, and for emotion understanding of self and others. Teachers help children using a warm approach, emotional sensitivity, and encouragement. Teachers are aware of and responsive to the needs of children in their classroom. Overall, teachers and children have positive relationships, enjoy spending time together, and are respectful in their interactions. Some strategies involved in this dimension include: (1) being warm with children through appropriate physical contact (e.g., giving or returning children's hugs); (2) showing respect for children (e.g., waiting for children to complete their questions before answering); (3) when children are upset, hurt or angry, respond with empathy (e.g., making eye contact, listening carefully); (4) value children's positive and negative experiences and feelings (e.g., regardless of the results, valuing the process, saying, for example, *"well done, good try!"*); and (5) to comfort children when they are upset or hurt (e.g., using soothing words when children face adverse situations). An example of an item included in this dimension is *"Use a smile and a pleasant voice when communicating with children (example: using a calming voice)."*

Dimension 2: Classroom management

Classroom management encompasses teachers' practices to engage children and is defined as teacher-child interactions intended to promote positive behavior and prevent or effectively deal with challenging behaviors in the classroom. Therefore, effective classroom management encompasses effective classroom behavior management (i.e., the teacher's use effective methods in their practices to prevent and redirect children's misbehaviors) in creating a well-functioning classroom. Expectations for behavior are clear and consistent (clear rules are defined and used systematically), and teachers are proactive in their approach to managing behavior. Additionally, teachers respond consistently and, whenever possible, preventively to children's behavior. They also use strategies that make children active participants in classroom activities, for instance, providing opportunities to negotiate rules in the classroom.

Teachers encourage social cooperation, providing peer interactions involving mutual support and mutual help (e.g., promoting cooperation activities and joint play). Also, teachers encourage problem solving and conflict resolution, actively involving children in their conflict resolution (e.g., helping children to expose their problems and think about solutions). Teachers encourage the development of social skills by (1) promoting activities for social skills development (e.g., group discussions with children to analyze daily situations) and (2) modeling the development of social skills (e.g., modeling conflict resolution between peers; prompt and reinforce self-calming behaviors when child is upset/dysregulated). Moreover, they support children to develop appropriate social behaviors with peers, so that interactions are characterized by open dialogue, friendship (e.g., supporting children to talk about conflicts instead of fighting). Overall, a set of practices associated with more positive child behavior include: (1) providing clear and consistent behavioral expectations; (2) monitoring the classroom for potential problems and proactively preventing problems rather than being reactive; (3) efficiently redirecting minor misbehavior before it escalates; and (4) using positive, proactive strategies such as praising positive behavior rather than calling attention to misbehavior.

An example of an item included in this dimension is *"React consistently to children's behavior (example: using the same rules systematically)."*

Dimension 3: Attend to children's perspectives

This dimension refers to the degree to which classrooms and interactions are structured around the interests and motivations of the children (vs. the teacher).

When teachers have a high regard for children's perspectives, they frequently ask for children's ideas and thoughts, follow children's lead, and provide opportunities for children to have a formative role in the classroom. In classrooms where teachers have a high regard for children's perspectives, children are not just allowed to talk but are actively encouraged to talk to one another. At the other end of the continuum are classrooms in which teachers follow very scripted plans for how the day should run, show little flexibility or response to children's interests and motivations, and provide few opportunities for children to express their thoughts or to assume responsibility for activities in the classroom. Teachers in these classrooms may also be very controlling of children's movement, requiring, for example, young children to sit quietly on the rug with their

TABLE 1 Assessment measures/instruments used to evaluate ECEC quality by type of quality.

Type of quality	Measures/Instruments
Global	Assessment of Practices in Early Elementary Classrooms (APEEC; Hemmeter et al., 2001)
	Early Childhood Rating Scale (Revised) (ECERS- R; Harms and Clifford, 1980; Harms et al., 1998)
Content specific	Early Language and Literacy Classroom Observation (ELLCO; Castro, 2005)
	Dortmunder Rating Scale (DO-RESI-E-Ki; Fried et al., 2012)
	Five Facet Mindfulness Questionnaire (FFMQ; Baer et al., 2006)
	Perceived Stress Scale-10 (PSS-10; Cohen et al., 1983)
	Creating Caring Children (CCC): 10 open-ended questions (Carlebach and Tate, 2002)
	Peacemaking Skills for Little Kids/Heling not Hurting: Teaching the I-Care Rules Through Literature (PSLK): 21 open-ended questions (Schmidt and Friedman, 1997)
	Video Assessment of Interactions and Learning (VAIL; Pianta et al., 2014)
	The Preschool Classroom Implementation (PCI) Rating Scale (Frede, 1989)
	Specific Teaching Practices II: Supports for Early Literacy Assessment (SELA; (Smith et al., 2001)
	Classroom Language and Literacy Environmental Observation (CLEO; Holland-Coviello, 2005)
	Social-Emotional and Executive Functioning Classroom Observation Tool (SEEF; Upshur et al., 2017)
	I Can Problem Solve (I) dialogue (Shure, 2000; Vestal, 2001)
Process	Classroom Assessment Scoring System (CLASS; Pianta et al., 2008)
	Preschool and Kindergarten Behavior Scales, version 2 (PKBS-2; Merrell, 2003)
	Assessing School Settings: Interactions of Students and Teachers (ASSIST; Rusby et al., 2001)
	Caregiver Interaction Scale (CIS; Arnett, 1989)
	Early Childhood Classroom Observation Measure (ECCOM; Stipek and Byler, 2004)
	Eco-behavioral System for the Complex Assessment of Preschool Environments (ESCAPE; Carta et al., 1992)
	Teaching Styles Rating Scale (TSRS; McWilliam et al., 1998)
	Teaching Style Rating Scale (TSRS; Domitrovich et al., 2007)
	Teacher Behavior Rating Scale (TBRS; Hart and Robinson, 1996)
	CIRCLE Teacher Behavior Rating Scale (CIRCLE TBRS; Landry et al., 2000, 2002)
	Teacher Behavior Rating Scale-P (TBRS-P; Phillips et al., 2018)
	Behavioral Coding System (BCS; Pianta et al., 2020a)
	Multiple Option Observation System for Experimental Studies (MOOSES; Tapp et al., 1995)
	Teacher Coder Impressions Inventory (TCI; Webster-Stratton et al., 2008)
	Classroom Atmosphere Rating Scale (CARS; Conduct Problems Prevention Research Group, 1999)
	Student-Teacher Relationship Scale (STRS; Pianta, 1996)
	Adult-Child Relationship Scale (ACRS; Pianta et al., 1997)
	Teacher-child structured play task (TC-SPT; Whittaker et al., 2018)
	Individualized Classroom Assessment Scoring System (in CLASS; Downer et al., 2010)
	Coping with Children's Negative Emotions Scale (CCNES; Fabes et al., 2002)
	Devereux Early Childhood Assessments (DECA)-Infant–Toddler and Preschool-2nd edition LeBuffe and Naglieri, 2012; Mackrain et al., 2007)
	Emerging Academics Snapshot (EAS) for individual child–teacher interaction (Ritchie et al., 2001)
	Attachment Q-Set (AQS) (Waters, 1990)
	Observational Record of the Caregiving Environment (ORCE) (see Nichd Early Child Care Research Network, 1996)
	Interpersonal Skills Subscale of the Cooper-Farran Behavior Rating Scale (Cooper and Farran, 1991)
	Teacher Observation in Preschool (TOP; Bilbrey et al., 2010)
	Child Observation in Preschool (COP; Farran and Son-Yarbrough, 2001)
	Prekindergarten Classroom Dynamics Rating Scale (Yun et al., 2010)
	Teacher Belief Q-Sort (TBQ) (Rimm-Kaufman et al., 2009)
	Semi-structured play interview (SSPI; Pianta and Hamre, 2001)
	Social Care and Social Work Improvement Scotland (SCSWIS) scales (Bradshaw et al., 2014)

legs crossed and hands in their laps for long periods of time. When teachers attend to children's perspectives, they actively promote children's engagement through their interactions, by (1) providing interesting activities, instruction, centers, and materials and (2) observing children engagement in peer interactions (e.g., observe children while they play). Teachers'

interactions with children and classroom activities place an emphasis on children's interests, motivations, and points of view, rather than being very teacher driven. Teachers are aware of and responsive to the needs of children in their classroom. Teachers show high responsiveness toward children's interests, for instance, identifying when children need additional help or support (e.g., observing children's facial expressions). Teachers listen to children and create opportunities for them to express themselves (e.g., respecting communicational shifts while talking to children). Teachers balance the attention to the child and the group needs, for instance, through classroom organization in small groups, conciliating the response to the child and to the group. An example of an item included in this dimension is *"Adjust the activities to children's interests and points of view (example: observe if children are involved in the proposed activities)."*

Dimension 4: Scaffolding learning

Scaffolding learning involves education-oriented support, discussions and interactions between a teacher and a learner. It is closely connected to Vygotsky's social constructivist view of learning and his concept of Zone of Proximal Development (ZPD, Vygotsky and Cole, 1978) as well as the constructivist learning theories of Dewey (1923), Bruner (1966), and Piaget (1973). Constructivism's central idea is that learning is constructed, and learners develop new knowledge by building on existing knowledge and experiences. According to Vygotsky and Cole (1978) learning takes place within the ZPD, acknowledging the area in which development is still in progress. The ZPD refers to the gap between what children can do by themselves and what they need assistance with, in order to complete a learning task successfully, in a particular moment or period. Children experience success in the ZPD when they receive instructional scaffolding, one of the most suggested, diverse, and powerful constructivist teaching strategies (Clark and Graves, 2005). Thus, the development and learning of a child can occur most effectively within his or her ZPD, the zone between the child's current and potential levels of development (Vygotsky and Cole, 1978). Modeling and scaffolding provided by adults and more competent peers within the ZPD help children solve interpersonal problems, learn new knowledge, and develop social skills, especially in the context of cooperative activities. Using Vygotsky's theory, the teacher can guide children through instructional scaffolding by adjusting the support offered to fit the child's current level of performance (Verenikina, 2008), while recognizing that it is permanently evolving. A constructivist approach promotes a learning environment in which teachers and children collaborate and share their knowledge (Nicaise and Barnes, 1996). Consistent with the concept of the ZPD, teachers observe children's independent activities to support and scaffold their learning and development as needed not by merely correcting them but by guiding and teaching them. From this perspective, teachers play an important role in scaffolding the cognitive and social development of children. Teacher's learning scaffolding is defined as the support teachers provide within children's ZPD to assist their learning and development of new concepts and skills, and examples include teachers' modeling and participation. Thus, scaffolding learning refers to teachers' balance between feedback and autonomy. Teachers take every opportunity to promote children's choice (e.g., encouraging children to choose between two or more play options). Teachers encourage the development of children's progressive autonomy (e.g., supporting the child when he/she takes the initiative to resolve situations), as well as their creativity. Teachers encourage problem solving (e.g., talk through problems as you *"figure out"* a solution). Children are given frequent feedback that expands their understanding of ideas and encourages their continued participation. Teachers and children engage in frequent conversation with one another in ways that help children extend their language and communication skills. An example of an item included in this dimension is *"Maintain a balance between helping children to explore and facilitating children's independent exploration (example: intervening when the child encounters a difficulty and shows signs of withdrawal)"*.

Questionnaire about sociodemographic characteristics and structural early childhood education and care features

Participants were asked to complete some information about themselves (such as age, education and training, years of experience) and about the ECEC setting where they worked in that moment (such as: group size, age of children, number of children with disabilities, type of ECEC institution).

Procedure

Data collection

After a pre-test with 10 teachers, the questionnaire was made available through an online platform (Lime Survey). Preschool teachers were contacted via email and asked to respond to an online questionnaire/survey, which included an informed consent at the beginning. The study was disseminated through the contacts of the researchers, on social networks and using a database previously prepared by the research team with a survey of the different kindergartens that are part of preschool education network in Portugal and their contacts. Data collection took place between November 2020 and March 2021.

Data analyses

The subscale *feasibility regarding the child* was considered for the purpose of testing the psychometric properties of the questionnaire. This attended to the fact that the *desirability* (for the group and for the child) presented reduced data variability.

TABLE 2 Items descriptive statistics of the questionnaire *"Facilitating strategies of teacher-child interaction"*.

	M	*SD*	Skewness	Kurtosis
Emotionally responsive interactions				
Use a smile and a pleasant voice when communicating with children (example: using a calming voice).	3.12	0.892	−0.648	−0.520
Be warm with children through appropriate physical contact (example: giving or returning children's hugs).	3.66	0.646	−1.242	4.639
Show respect for children (example: waiting for children to complete their questions before answering).	3.34	0.801	−1.129	0.836
When children are upset, hurt or angry, respond with empathy (example: making eye contact, listening carefully).	3.23	0.704	−0.570	0.014
Value children's positive and negative experiences and feelings (example: regardless of the results, valuing the process, saying, for example, *"well done, good try!"*).	3.30	0.728	−0.730	−0.40
Comfort children when they are upset or hurt (example: using soothing words when children face adverse situations).	3.58	0.701	−1.813	3.279
Classroom management				
Provide peer interactions involving mutual support and mutual help (example: promoting cooperation activities and joint play).	3.22	0.766	−0.560	−0.530
React consistently to children's behavior (example: using the same rules systematically).	3.23	0.754	−0.583	−0.419
Actively involve children in their conflict resolution (example: helping children to expose their problems and think about solutions).	2.99	0.819	−0.524	−0.141
Promote activities for social skills development (example: group discussions with children to analyze daily situations).	3.04	0.803	−0.211	−1.036
Model the development of social skills (example: modeling conflict resolution between peers).	2.95	0.795	−0.212	−0.692
Support children to develop appropriate social behaviors with peers (example: supporting children to talk about conflicts instead of fighting).	2.95	0.882	−0.451	−0.549
Provide opportunities to negotiate rules in the classroom (example: encouraging children's participation in rules definition).	3.06	0.860	−0.353	−1.005
Attend to children's perspectives				
Identify when children need additional help or support (example: observing children's facial expressions).	3.10	0.759	−0.507	−0.099
Adjust the activities to children's interests and points of view (example: observe if children are involved in the proposed activities.	3.11	0.716	−0.367	−0.280
Observe children engagement in peer interactions (example: observe children while they play).	3.12	0.817	−0.365	−1.030
Listen to children and create opportunities for them to express themselves (example: respecting communicational shifts while talking to children).	3.04	0.862	−0.656	−0.130
Balance the attention to the child and the group needs (example: conciliating the response to the child and to the group)	2.78	0.812	−0.139	−0.539
Scaffolding learning				
Take every opportunity to promote children's choice (example: encouraging children to choose between two or more play options).	3.13	0.852	−0.623	−0.449
Encourage the development of children's progressive autonomy (example: supporting the child when he/she takes the initiative to resolve situations).	3.20	0.823	−0.804	0.042
Maintain a balance between helping children to explore and facilitating children's independent exploration (example: intervening when the child encounters a difficulty and shows signs of withdrawal).	2.98	0.780	−0.115	−0.942
Encourage problem solving (example: talk through problems as you "figure out" a solution).	3.19	0.756	−0.685	0.163

Prior to analyses, the subscale *feasibility regarding the child level* was examined for the normality of each of the 22 items, revealing that none of the items were higher than the recommended cut-off points—skewness |2.00|and, kurtosis |7.00|(Kline, 1998; **Table 2**).

A confirmatory factor analysis (CFA) was conducted using AMOS 28.0 to assess the *Facilitating Strategies of Teacher-Child Interaction* Questionnaire factor structure as well as the convergent validity of the factors (Byrne, 2001). This intended to test the fit of the proposed Questionnaire and the defensibility of its four-structure factors. Multiple goodness-of-fit indices pertaining to different fit classes, as recommended by several authors (Jaccard and Wan, 1996; Brown, 2015) were used, including: (i) as absolute fit indices, the standardized root mean square residual (SRMR)—expecting to obtain values close to zero as possible; the root mean square error of approximation (RMSEA)—values near or below 0.06 indicate close fit; (ii) as comparative fit index, the comparative fit index (CFI)—indicating an acceptable model with values higher than 0.90; (iii) as parsimony fit index, the PCFI with values greater 0.70 suggesting an acceptable fit.

Findings show that data obtained with the *Questionnaire*—sub-scale *feasibility regarding the child* present good fit indices (χ^2/df = 1.341; RMSEA = 0.064; SRMR = 0.0637; CFI = 0.935; PCFI = 0.822). All indicators loaded substantively (standardized coefficient > 0.5) and significantly ($p < 0.05$) on their respective dimensions; the composite reliability (CR)

TABLE 3 Construct validity of the questionnaire *"Facilitating strategies of teacher-child interaction"*.

	Feasibility	
	Composite reliability	**Average variance extracted**
Emotionally responsive interactions	0.83	0.54
Classroom management	0.91	0.58
Attend to children's perspectives	0.89	0.61
Scaffolding learning	0.85	0.59

and average variance extracted (AVE) are presented in **Table 3**, indicating acceptable values by considering the recommended thresholds of CR > 0.70 and AVE > 0.50 (Fornell and Larcker, 1981). This provides evidence of convergent validity (CR) and discriminant validity (AVE) of both scales of desirability and feasibility.

At this point, the reliability of items within each factor (indicating the degree to which those items are indexes of the latent factor) for the four sub-scales were examined, using the recommended threshold that values should be greater than 0.70 (**Table 4**). Values were found to range from 0.736 to 0.906, thus providing evidence of the internal reliability of all the sub-scales for the four dimensions under analysis.

To answer to the main research questions descriptive analyses and group comparisons were conducted, as described in the Results' section. To carry out the mean difference tests, the assumptions of normality and homogeneity of variances were tested. The significance level of $p < 0.05$ was assumed for analyses. Effect sizes were computed. The magnitude of the effects was interpreted in accordance with Cohen's guidelines (Cohen, 1992).

Results

Research question 1: According to early childhood education and care teachers, how desirable and feasible is a set of strategies to promote group engagement and the engagement of children with disabilities?

Overall, teachers considered all four dimensions important, with a high *desirability* mean score in all dimensions (above 3.68), at both levels (i.e., for both the *child* and the *group*). Rating of *feasibility* were lower than for *desirability*. The dimension *Emotionally Responsive Interactions* registered the higher score and the dimension *Attend to Children's Perspectives* the lower score on the *feasibility* scale.

TABLE 4 Reliability of the four-dimensional model.

	Child		Group	
Dimensions	**Desirability**	**Feasibility**	**Desirability**	**Feasibility**
Emotionally responsive interactions	0.823	0.826	0.810	0.783
Classroom management	0.905	0.906	0.839	0.845
Attend to children's perspectives	0.868	0.883	0.851	0.803
Scaffolding learning	0.852	0.850	0.777	0.736

Research question 2: Are there differences between early childhood education and care teachers' desirability and feasibility ratings at the child and group levels?

The means (*M*), standard deviations (*SD*), paired *t*-test results (*t*), Cohen's-d (*d*) between the sub-scales *desirability* and *feasibility* for all the four dimensions are presented in **Table 5**.

Paired-sample t-tests showed that there were significant differences between teachers' perception of *desirability* and *feasibility* for the total scale and the four dimensions, both when implementing strategies at the *child* and *group* levels. ECEC teachers assessed the *desirability* of classroom strategies higher than *feasibility*. The effect size evaluated with Cohen's d was small to moderate in *Emotionally Responsive Interactions* dimension ($d_{child} = 0.380$, $d_{group} = 0.297$) and moderate in *Classroom Management* ($d_{child} = 0.659$, $d_{group} = 0.428$), *Attend to Children's Perspectives* ($d_{child} = 0.642$, $d_{group} = 0.526$) and *Scaffolding Learning* ($d_{child} = 0.673$, $d_{group} = 0.403$). Overall, the mean difference between *desirability* and *feasibility* registered higher effect size at the *child*'s level than at the *group's* level.

A repeated measures ANOVA was used to ascertain the differences between the dimensions under analysis and conclude on the training needs of ECEC teachers. The dependent variables were the mean difference between *desirability* and *feasibility* in each dimension. The higher the mean difference, the higher the ECEC teachers' necessity. There was an overall significant difference between the mean difference (*Desirability—Feasibility)* in each dimension [child's level: $F(3, 246) = 16.337$, $p < 0.001$, $\eta_p^2 = 0.166$; group's level: $F(2.677, 232.933) = 11.930$, $p < 0.001$, $\eta_p^2 = 0.121$].

The *Bonferroni multiple comparisons* analysis revealed that the *mean difference* in the dimension *Emotionally Responsive Interactions* was significantly lower than in the dimensions for both *child* (*Classroom Management* $p < 0.001$; *Attend to Children's Perspectives* $p < 0.001$; *Scaffolding Learning* $p < 0.001$)

TABLE 5 Comparisons between ECEC teachers' *desirability* and *feasibility* ratings for the four dimensions at the child and group levels.

	For the child								For the group							
	Desirability		Feasibility		Mean difference				Desirability		Feasibility		Mean difference			
Factors	*M*	*SD*	*M*	*SD*	*Dif*	*t*	*p*	*d*-Cohen	*M*	*SD*	*M*	*SD*	*Dif*	*t*	*p*	*d*-Cohen
Emotionally responsive interactions	3.67	0.47	3.35	0.55	0.31	7.414	<0.001	0.380	3.83	0.29	3.57	0.36	0.26	8.142	<0.001	0.297
Classroom management	3.70	0.49	3.06	0.65	0.65	8.947	<0.001	0.659	3.78	0.34	3.39	0.46	0.39	8.509	<0.001	0.428
Attend to children's perspectives	3.68	0.51	3.03	0.66	0.65	9.271	<0.001	0.642	3.78	0.37	3.27	0.50	0.51	9.038	<0.001	0.526
Scaffolding learning	3.68	0.51	3.13	0.68	0.55	7.417	<0.001	0.673	3.80	0.32	3.45	0.41	0.36	8.405	<0.001	0.403
Total scale	3.68	0.46	3.14	0.55	0.52	9.593	<0.001	0.513	3.80	0.29	3.42	0.36	0.38	10.269	<0.001	0.346

TABLE 6 Percentage of responses per dimension.

		No. items	Knowledge (*n*, %)	Human resources (*n*, %)	Material resources (*n*, %)	Time (*n*, %)
Child's level	Emotionally responsive interactions	6	263 (52.60)	68 (13.60)	67 (13.40)	102 (20.40)
	Classroom management	7	329 (56.63)	91 (15.66)	61 (10.50)	100 (17.21)
	Attend to children's perspectives	5	174 (41.93)	86 (20.72)	54 (13.01)	101 (24.34)
	Scaffolding learning	4	156 (47.13)	71 (21.45)	45 (13.60)	59 (17.82)
Group's level	Emotionally responsive interactions	6	284 (54.30)	61 (11.66)	53 (10.13)	125 (23.90)
	Classroom management	7	303(49.84)	63 (10.36)	70 (11.51)	172 (28.29)
	Attend to children's perspectives	5	182 (41.74)	76 (17.43)	49 (11.24)	129 (29.59)
	Scaffolding learning	4	175 (50.43)	52 (14.99)	42 (12.10)	78 (22.48)

and *group* (*Classroom Management* $p = 0.006$; *Attend to Children's Perspectives* $p < 0.001$; *Scaffolding Learning* $p = 0.026$) levels. Furthermore, at the *group*'s level, the *mean difference* in the dimension *Attend to Children's Perspectives* was significantly higher than in *Scaffolding Learning* ($p = 0.003$).

Research question 3: What reasons do teachers attribute to the feasibility of strategies to use with the group and the child with disability?

ECEC teachers identified the reasons for their response to the feasibility scale in each item. The frequency of those reasons was computed for each dimension. Table 6 displays the frequency and percentage assigned to each reason by ECEC teachers.

When analyzing ECEC teachers' reasons for their responses on the *Feasibility* of teacher-interaction strategies at the groups' level, having *knowledge* emerged as the most prominent reason for all the dimensions, followed by having *time* and *material resources*. These results are similar for the child's level, except for the reasons *time* and *human resources*, which were, respectively, the third and second most evoked to justify the *feasibility* of the dimension *Scaffolding Learning*. Regarding this dimension, this is the only both at child and group's levels that the need for *time and human resources* overcomes the need for having *knowledge*.

Research question 4: Do individual (e.g., years of teaching experience) and contextual (e.g., number of children per classroom) variables influence the scores that teachers assign to the desirability and feasibility engagement strategies for the group and the child with disabilities?

Table 7 shows the variables that influence the perception of feasibility in implementing strategies in the classroom, with statistical significance. Surprisingly, individual variables (such as age, professional development) and context variables (such as the total number of children and the number of children with disabilities in the class) were not significantly associated with ECEC teachers' perception of *feasibility* of key dimensions of high-quality teacher-child interaction. On the other hand, ECEC teachers' years of experience, overall satisfaction with student development and the type of institution at which they teach made difference on their perception of *feasibility*. In particular, when comparing to teachers with 10–20 years of

TABLE 7 Individual and contextual variables significantly associated with the *feasibility* of each dimension at the child and group's levels.

Child's level	*N*	Emotionally responsive interactions				Classroom management				Attend to children's perspectives				Scaffolding learning			
		M	*DP*	*t/F/r*	*p*	*M*	*DP*	*t/F/r*	*p*	*M*	*DP*	*t/F/r*	*p*	*M*	*DP*	*t/F/r*	*p*
Years of experience (*t*)																	
10–20 years	25	3.187	0.487			2.897	0.535			2.800	0.428			3.020	0.590		
>20 years	53	3.390	0.572	−1.534	0.129	3.108	0.674	−1.371	0.174	3.102	0.699	−2.346	**0.022**	3.151	0.699	−0.809	0.421
Satisfaction with the development level of the group (*r*)				0.166	0.149			0.311	**0.006**			0.091	0.432			0.176	0.126
Type of school																	
Public	30	3.522	0.408			3.229	0.589			3.147	0.650			3.217	0.685		
Private	24	3.160	0.649			2.839	0.737			2.817	0.760			3.000	0.711		
Semi-public	23	3.370	0.534	**3.121**	**0.050**	3.099	0.574	2.546	0.085	3.044	0.536	1.724	0.186	3.152	0.606	0.713	0.493
Group's level	***N***	**Emotionally responsive interactions**				**Classroom management**								**Scaffolding learning**			
		M	*DP*	*t/F/r*	*p*	*M*	*DP*	*t/F/r*	*p*	*M*	*DP*	*t/F/r*	*p*	*M*	*DP*	*t/F/r*	*p*
Years of experience (*r*)																	
10–20 years	27	3.426	0.353			3.169	0.429			3.030	0.371			3.352	0.423		
>20 years	55	3.621	0.351	**−2.365**	**0.020**	3.491	0.420	**−3.235**	**0.002**	3.353	0.511	**−3.258**	**0.002**	3.482	0.399	−1.358	0.178
Satisfaction with the development level of the group (*r*)				0.186	0.093			**0.268**	**0.015**			0.203	0.067			0.191	0.086
Type of school																	
Public	30	3.661	0.343			3.538	0.405			3.333	0.496			3.467	0.458		
Private	26	3.487	0.371			3.214	0.516			3.108	0.583			3.375	0.443		
Semi-public	26	3.564	0.359	1.669	0.195	3.401	0.404	**3.728**	**0.028**	3.315	0.404	1.687	0.192	3.481	0.323	0.505	0.605

Bold indicates statistical significance ($p < 0.05$).

experience, teachers with more than 20 years of experience rated significantly higher the feasibility of *Attend to Children's Perspectives* [$t(70.703) = -2.346$, $p = 0.022$, $d = 0.626$] at the child's level and the *feasibility* of *Emotionally Responsive Interactions* [$t(80) = -2.365$, $p = 0.020$, $d = 0.351$], *Classroom Management* [$t(80) = -3.235$, $p = 0.002$, $d = 0.423$], *Attend to Children's Perspectives* [$t(80) = -3.258$, $p = 0.002$, $d = 0.470$] and, at the group' level. Notably, it was found that the degree of teachers' satisfaction with the development of their children had a positive significant correlation with the *Feasibility* for implementing strategies to *Classroom Management* in both child ($r = 0.311$, $p = 0.006$) and group's ($r = 0.268$, $p = 0.015$) levels. The type of educational institution was also found to be associated with teachers' perception of *feasibility*. The one-way analysis of variance revealed that teachers teaching in private institution registered significantly lower scores on the *feasibility* on strategies related to *Emotionally Responsive Interactions* [$F(2, 74) = 3.121$, $p = 0.050$, $\eta_p^2 = 0.078$] at child's level and to *Classroom Management* [$F(2, 79) = 3.728$, $p = 0.028$, $\eta_p^2 = 0.086$] at group's level.

Discussion

The aim of this study was to evaluate preschool teachers' opinions about the *desirability* and *feasibility* of a set of strategies, empirically validated, to increment teacher-child interactions in ECEC classrooms, for the group and

the child/children with disabilities (within the group). For this purpose, a questionnaire, called *"Facilitating Strategies of Teacher-Child Interaction,"* focused on specific strategies to promote the quality of teacher-child relationships, was developed. This questionnaire, based on a non-systematic literature review of the most used assessment instruments to measure ECEC classroom quality, lists 22 strategies, which according to the literature, are considered the most effective for teacher-child interactions quality, organized in 4 dimensions: (1) *emotionally supportive interactions*, (2) *classroom management*, (3) *attend to children's perspectives*, and (4) *scaffolding learning*. Regarding the results, our questionnaire showed good fit indices and confirmed the factorial structure of the questionnaire in these four factors (dimensions), which makes it an instrument that can be used by others interested in studying teachers' professional development needs, regarding their knowledge and practices.

In relation to the dimensions included in the questionnaire, in classrooms high on *emotionally responsive interactions*, teachers provide a caring social environment and are attuned and responsive to the individual cues and needs of students in their classrooms. Teacher-child interactions are warm and close, and there is high proximity between them, for instance, through physical contact. The *classroom management* dimension encompasses teachers' abilities to engage children and is defined as teacher-child interactions intended to promote positive behavior and prevent or terminate misbehavior in the classroom (e.g., providing clear and consistent behavioral expectations, monitoring the classroom for potential problems, and proactively preventing problems rather than being reactive). The dimension *attend to children's perspectives* refers to the degree to which classrooms and interactions are structured around the interests and motivations of the children. When teachers have a high regard for children's perspectives, they frequently ask for children's ideas and thoughts, follow children's lead, and provide opportunities for children to have a formative role in the classroom. At last, teacher's *learning scaffolding* is defined as the support teachers provide within children's ZPD to assist their learning and development of new concepts and skills, and examples include teachers' modeling and participation. Thus, scaffolding learning refers to teachers' balance between feedback and autonomy. Teachers take every opportunity to promote children's choice (e.g., encouraging children to choose between two or more play options). Teachers encourage the development of children's progressive autonomy (example: supporting the child when he/she takes the initiative to resolve situations), as well as their creativity. Teachers encourage problem solving (e.g., talk through problems as you *"figure out"* a solution). Children are given frequent feedback that expands their understanding of ideas and encourages their continued participation. Teachers and children engage in frequent conversation with one another in ways that help children extend their language and communication skills.

Knowing the opinions and perceived needs of teachers, the main actors in preschool settings, in particular the importance assigned, and the feasibility of teacher-child interaction strategies is a critical factor for improving ECEC setting quality. The results revealed that, when asked about the strategies *desirability*, which basically represents the state-of-the-art knowledge, as expected, teachers considered all 4 dimensions important, with a high *desirability* mean score in all dimensions, at both levels (i.e., for both the *child* and the *group*). Moreover, ECEC teachers, when evaluating strategies for improving teacher-child interaction quality, scored significantly higher in the *desirability* subscale compared with the *feasibility* subscale (in all dimensions and at both the *child* and the *group* level). This gap between teachers' perceived desirability and feasibility to implement strategies fostering teacher-child interaction quality provides important insights for policymakers, academics, higher education institutions and schools about: (1) what dimensions are important to reinforce in ECEC teachers education and professional development; (2) the need to formulate guidelines for high quality practices in ECEC settings; (3) the need to further investigate conditions for improving ECEC high quality practices, and (4) how school routines should incorporate opportunities for professional development through supportive processes of collaboration between ECEC teachers. Related to this latter aspect, Hamre et al. (2017) highlighted the need to strengthen local programs to effectively support preschool teachers professional development. Different studies have been demonstrating the effectiveness of coaching/modeling (e.g., video feedback, guided practice), listening to teachers, promoting teachers reflective functioning (e.g., Hemmeter et al., 2015; Pianta et al., 2017).

Overall, the mean difference between the *desirability* and *feasibility* subscales registered a higher effect size at the *child*'s level than at the *group*'s level, meaning that it seems to be more difficult to use these strategies when focusing on a child or a subgroup of children with disabilities compared to the whole group, confirming that the inclusion of children with disabilities in preschool settings remains a challenge (Zabeli and Gjelaj, 2020). Challenges are often reported to be related to teacher preparedness to respond to more complex needs presented by children with disabilities raising concerns regarding the provision of supports to individual children in the preschool. Hau et al. (2020), in a study about preschool teachers' perspective on the inclusive processes, questioned whether the goals of inclusion, such as participation, engagement and learning are being fulfilled for all children. The authors found that the focus of teachers' attention was on the group-related processes when compared to individual-related processes. In our study, the higher degree of teacher's needs (mean difference between desirability and feasibility) allocated at the child's level may also reflect that.

A more detailed analysis of the results revealed that when comparing the mean difference between *desirability* and

feasibility across dimensions, the effect size was small to moderate in *Emotionally Responsive Interactions* dimension and moderate in the remaining domains (*Classroom Management*, *Attend to Children's Perspectives* and *Scaffolding Learning)* for both *child* and *group* levels. Therefore, strategies related to the *Emotionally Responsive Interactions* dimension seem to be less needed, in the sense that teachers seem to consider them more feasible/easier to implement. These results are aligned with previous studies stating that among different self-identified dimensions or domains of improvement, emotional support is the less evoked by ECEC teachers (Block et al., 2019). The other dimensions comprise specific instructional supports basic to promoting students learning and developing and, thus more connected with acquired knowledge throughout initial and continuing professional education. In turn, *Emotionally Responsive Interactions* (i.e., being warm, respectful, and supportive) may be both the most tangible aspect of competence for teachers and an individual characteristic pertaining to their repertoire and therefore, more easily identified in themselves and more easily implemented in classroom.

Furthermore, at the *group*'s level, the *mean difference* in the dimension *Attend to Children's Perspectives* was significantly higher than in the *Scaffolding Learning* dimension. When teachers are faced with group-level diversity, they find it more difficult to respond to children's perspectives, which is not so when it comes to meeting the specific needs or perspectives of a child or subgroup of children with disabilities [most of the time, the teacher has additional help in the classroom, for instance, through the presence of a special education teacher, to meet the needs of the child(ren) with disabilities].

The reasons provided by teachers to explain the difficulty in the feasibility of certain strategies were analyzed. The results show that across all dimensions, the main reason teachers give for the difficulty in feasibility, both at the group and child's level, is knowledge. In this case, lack of knowledge. These results are congruent with those of previous studies that point knowledge as one of the most requested resources to improve preschool teachers' practices (e.g., Hamre et al., 2012; Zabeli and Gjelaj, 2020). It is commonly held that teachers' knowledge of ECEC is a fundamental factor determining the quality of a classroom with impact on children's learning and development (Slutsky and Pistorova, 2010; Zaslow et al., 2010).

Accordingly, the second most important reason to explain the difficulty in implementing teacher-interaction strategies is time. In this study, this reason can be related to having enough time to spend on the children under supervision or to having time to plan, document and analyze—for the whole group or attending to a particular child. OECD (Taguma et al., 2012) referred to time as an important quality factor in promoting teacher-child interactions.

Then, we analyzed the relationship between teachers' responses to the questionnaire and individual and contextual variables, and we found statistically significant results between the *feasibility* sub-scale at the group level, and the socio-demographic variables of *years of experience*, *type of school* and *teacher's satisfaction with the development level of the group*.

Regarding the variable *years of experience*, we found statistically significant differences for the feasibility subscale at the group level in 3 dimensions (all dimensions except for *scaffolding learning*). We found that the mean *feasibility* for the 3 dimensions is statistically significant higher for teachers with more than 20 years of experience (vs. teachers with between 10 and 20 years of experience). Thus, teachers with more years of service find the use of *emotional supportive interactions*, *classroom management* and *attend to children's perspectives* strategies more feasible. Professional experience is reflected in *feasibility*, that is, in knowing how to do it. This result shows the importance that experience can have in incorporating these strategies into the daily routine of interactions. This study did not assess this aspect, but in other studies, learning from experience and from other colleagues is pointed out as a reason for change (Vieira-Rodrigues and Sanches-Ferreira, 2017).

Regarding the variable *type of school*, we found statistically significant differences for the *feasibility* subscale at the *group* level only for one dimension, that of *classroom management*. In particular, the results show that the average *feasibility* of strategies related to this dimension is lower for private educational institutions than for public institutions and semi-public schools. In private institutions, classrooms may have more children (i.e., higher staff/child ratio) and teachers may be younger (i.e., have less experience), which has a particular impact on such a training/experience-dependent dimension as is the case of *classroom management*. Regarding the variable *teacher's satisfaction with the development level of the group*, the results show significant differences for the subscale of *feasibility* at the child and group's level for the dimension *classroom*. In particular, the results show that the average *feasibility* of strategies related to this dimension is higher for teachers who are more satisfied with the development level of the group. If we consider that when teacher's satisfaction with the development level of the group is high, it means that they consider the strategies used effective, and if we consider that these strategies were recognized as desirable by all, then we can conclude that the satisfaction with development level of the group can also result in greater feasibility of implementation.

Conclusion and implications for teacher education

This study shows a large gap between teachers' perspectives on the importance and feasibility of process quality strategies (facilitators of teacher-child interactions) to be used in early childhood inclusion classrooms. Understanding the reasons teachers attribute to the difference between the strategies

desirability and *feasibility* informs the assessment of teacher education needs and might be operationalized as a new observation grid. These aspects are input to teachers' education and professional development that are both effective and efficient. By evaluating the difference between the *desirability* and *feasibility* of these strategies implementation (as well as the reasons that teachers attribute to these differences), we address the need to develop and implement practical and explicit pedagogical strategies that (1) will respond directly to teachers' difficulties/limitations—"*strategies that are important but hard-to-do*", (2) are built on teachers' current knowledge and expertise, (3) are embedded into their daily practice and can be used in a daily basis effectively (i.e., making it a feasible practice), and (4) are tailored to the social, emotional, and behavioral needs of the child as well as the child within the group.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

Ethical approval was not provided for this study on human participants because the study followed with ethical procedures as explained in the method section. The patients/participants provided their written informed consent to participate in this study.

Author contributions

MS-F and JG: conceptualization, study design, data collection, data analysis, and article writing. SBA: data collection, article editing, and revision. SA: data collection, data analysis, and article writing. SB: data collection and editing and revision of the article. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

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Supporting children's social play with peer-based intervention and instruction in four inclusive Swedish preschools

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This multiple case study investigated a peer-based intervention and instruction (PBII) for social play, Play Time/Social Time (PT/ST), in four inclusive Swedish preschools. PT/ST contains 28 learning activities where children playfully practice six social skills with significance for social play and friendships. One teacher in each preschool was trained and instructed to implement PT/ST, two with coaching early in the implementation, and two without. At each preschool, one child with special educational needs (SEN) in social play (n = 4) and one or two socially skilled peers (n = 6) participated. The study aimed to explore how the teachers perceived the influence of PT/ST on social engagement and social play skills in the children with SEN, with/without coaching, and if PT/ST supported social play between the children with and without SEN. It also aimed to examine the feasibility of PT/ST and the influence on preschool inclusion quality in the preschools, with/without coaching. Observational assessments and video observations were used. The results indicate that PT/ST was beneficial for the children with SEN to engage in social play with peers and practice social skills, and for the preschool's inclusion quality regarding involvement in peer interactions and guidance in play, both with/without coaching for the teachers. However, the coaching strengthened the intervention fidelity. Social play occurred between the children with and without SEN in activities where they seemed similarly attracted by the toys and play materials and when they all could engage in the play goals, tasks, and roles. For this, they sometimes needed instructions and encouragement from the teachers.

KEYWORDS

social play, preschool instruction, preschool intervention, inclusion, peer-based, social skills

Introduction

For preschool children, playing with peers is crucial. Both because play in its own right gives children joy and wellbeing (Seland et al., 2015; Lundqvist, 2016) and because it contributes to children's learning, development, and social participation (OECD, 2015; Joseph et al., 2016). Social play between children may also give children opportunities to establish friendships, including social and emotional experiences of intimacy and positive emotions, but also competition and conflict (Maguire and Dunn, 1997; Dunn and Cutting, 1999; Kochenderfer-Ladd and Ladd, 2019). With increasing age, children's social play usually becomes more collaborative and based on pretending in the form of dramatic role-plays (Bodrova, 2008). It will thus also require increasingly complex social skills in the child (Garvey, 1990; Vig, 2007; Movahedazarhouligh, 2018), such as persisting when the peer does not respond to a social invitation or play idea, accepting non-responsiveness, or taking new initiatives that contribute to the shared play rhythm (Odom et al., 1997). Based on a classical taxonomy for participation in social play developed by Parten (1932) and still applied in research, policy, and teaching (World Health Organization [WHO], 2007; Barton, 2016; Johnson et al., 2019), children develop from the early forms of social play; solitary play, onlooker, and parallel play, to the more mature associative and cooperative play. This development occurs in an interplay between social, cognitive, and communicative processes and in children's interactions with others (Williams et al., 2000), for which their engagement is a crucial mediating factor (De Kruif and McWilliam, 1999; Coolahan et al., 2000; Sjöman et al., 2016). Thereby, access to relationship quality with both adults and children matters for children's participation in social play and their learning of social skills (Soukakou, 2016; Kesäläinen et al., 2022). For play to be an opportunity for learning and participation for all children, adults may also need to get involved in children's play by utilizing and enriching the children's play ideas and actions (Boat et al., 2010; Johnson et al., 2019). For example, Raspa et al. (2001) found that preschool teachers with warm and affective interaction styles, who used many elaborations, i.e., instructing/informing children to expand their engagement, had more children involved in pretending, persisting, and talking in their classrooms.

The complexity of social play emerges in the sociodramatic, cooperative pretend play for which children use negotiations to interact and experience togetherness (Janson, 2001; Barton, 2016). In these negotiations, the children try to agree on common play goals and argue for and convince each other of appropriate roles and tasks, which can change during the play. They occur in three different but related contexts, which often extend over time: the physical context of space, people, and objects; the social context of communicative exchange; the symbolic context of transforming people, objects, and actions (Janson, 2001; Bodrova, 2008). Cooperative play does not necessarily mean that all children who play together experience all these contexts in the same way but presupposes that they all engage in the play based on the negotiated goals, roles, and tasks.

Regarding inclusion, international education policy has shifted to emphasize a welcoming, creative and supportive learning community where every child is valued (European Agency for Special Needs and Inclusive Education [EASNIE], 2017), rather than emphasizing learning environments based on children's various disabilities (United Nations, 2006, 2015). Belonging, engagement, and learning for all children thus constitute both means and goals for high-quality inclusive early childhood education (ECE) (European Agency for Special Needs and Inclusive Education [EASNIE], 2017). With this perspective, the opportunities for children to participate in play with peers in preschool will depend on the availability of positive relationships based on their different personalities, interests, perceptions, experiences, social skills, and social play behaviors, and the guidance they may need to play together (Johnson et al., 2019).

For some children, disability, and/or, a non-adapted learning environment, can counteract participation in social play with peers. For example, some children with a disability may be less likely to engage in social play and to express their experiences while playing. They may thus also miss opportunities to learn and use more complex social play behaviors that lead to mutual exchange and communication with peers with typical development (TD) (Odom et al., 2006; Lifter et al., 2011; Barton, 2016). This could be the case, for example, for children with autism spectrum disorder (ASD) (Adler et al., 2014; Erickson et al., 2014) and intellectual disability (ID) (Guralnick et al., 2009), for whom there are often challenges in reciprocal social interaction and communication. A Swedish study showed that even though preschool children with ID were involved in the same kind of play situations and used the same toys as peers with TD, their play was less social and cooperative (Luttropp and Granlund, 2010). This study also showed that the teachers decided the interactions more often for children with ID than for children with TD and that they were more often physically closer to children with ID. In contrast, a study by Skogman (2004) showed that staff in Swedish preschools sometimes tended to take a more passive approach, especially in children's free play. This sometimes led to more moments of loneliness for children with disabilities, as compared to their TD peers. A disability such as ADHD, which involves difficulties with attention, hyperactivity, and impulsivity [American Psychiatric Association [APA], 2013], can also pose challenges to children's participation in social play with peers (Sjöman et al., 2016).

Furthermore, a Swedish review of research and reports on play for children with disabilities also shows the importance of the physical environment to enable play (Westling Allodi et al., 2019). For example, play materials or surfaces are not always physically accessible to all children. In addition, too much play material and unspecified play surfaces can

make it difficult for some children to concentrate on a play activity. However, not only children with disabilities may have difficulty participating in social play. In a large study sample of Swedish preschools including about 9,100 children, children with disabilities accounted for about 4% and children with other special educational needs (SEN) for about 14%. According to the preschool staff, about 55% of the children with disabilities and about 60% of the children with other SEN had difficulties in social play (Lillvist and Granlund, 2010).

Peer-Based Intervention and Instructions (PBIIs) are complementary teaching methods supported in systematic research reviews for inclusive ECE (Division for Early Childhood, 2014; Wong et al., 2015; Hume et al., 2021). These are based on the premise that children learn social skills and adaptive behaviors in interaction with other children and with the guidance of adults (Guralnick, 1990). Although PBIIs aim at children perceived to need to develop social skills, these can also stimulate social learning for the more socially competent peers who are their interaction partners (Odom et al., 1985; Carter et al., 2008). Play time/social time (PT/ST) is a PBII aiming to promote social play and social skills acquisition for preschool children (Odom et al., 1997). PT/ST provides social skills lessons and social play activities and includes various evidence-based strategies. These are *modeling* (demonstrating and encouraging children to use social skills with peers), *prompting* (supporting children verbally or with gestures and physical guidance to develop goal skills), and *feedback* (giving children responses to increase the likelihood of children using social skills, i.e., not just praising) (Wong et al., 2015; Hume et al., 2021).

Initially, researchers developed PT/ST based on extensive observations of activities in preschools that supported interactions between children (Odom et al., 1990) and in collaboration with teachers (Odom et al., 1993), which in turn generated information for interventions that researchers tested with single-subject design in preschool environments (McConnell et al., 1991; Odom et al., 1992). Several research groups have since tested the effectiveness of PT/ST. In a treatment comparison study, Odom et al. (1999) examined the effects of interventions for promoting the social skills of children with disabilities. The study had five intervention conditions and included TD peers in the play activities: environmental arrangements (EA), child-specific (CS), peer-mediated (PM), comprehensive (where features from the previous three were combined), and a control (no intervention) condition. The result shows positive effects for the children with disabilities, especially for the EA, CS, and PM conditions regarding the frequency of social interaction, whereas the CS and PM conditions had the greatest impact on the quality of interaction and teachers' ratings of social competence, and the EA condition on peer ratings. Moreover, three Polish studies, including children with ASD, ID, motor and sensory disabilities, low social skills, and TD, tested the overall effects of PT/ST (Szumski et al., 2016, 2019; Smogorzewska and Szumski, 2018). These studies showed that PT/ST improved the children's social skills and ability to understand other people's thoughts and feelings (i.e., the theory of mind). Children with low social skills improved most, even though all children benefited from PT/ST, including their TD peers.

The study context

Swedish preschools enroll about 95% of all children aged 3–5 years (Swedish National Agency for Education [SNAE], 2021). The preschool settings vary in size (children, staff, and units/classes) and organizations (municipal, independent, or parent cooperatives). In addition to the national compulsory curriculum, preschools can add pedagogical orientations such as Reggio Emilia, Waldorf, or Outdoor (Swedish National Agency for Education [SNAE], 2022). Preschool staff includes teachers with university education (about 43%), childcare workers with upper secondary education (about 17%), and staff without pedagogical education (about 40%) (Swedish National Agency for Education [SNAE], 2021). Although not required by the legislation as in school (SFS, 2010/800), many Swedish preschools have access to special educators for supervision (Swedish National Agency for Education [SNAE], 2004). Usually, they have assignments in several settings for the preschool organizer, the municipality, or the county councils. According to the compulsory national curriculum (Swedish National Agency for Education [SNAE], 2011, 2018) and the Education Act (SFS, 2010/800), the preschool staff should adapt the education to each child and pay special attention to children who need more guidance and support. In Sweden, the access to inclusive preschools for young children is thus high. The preschool curriculum also emphasizes the importance of play and social interactions with peers for children's development and learning (Swedish National Agency for Education [SNAE], 2011, 2018). By tradition and supported by the curriculum, children in Swedish preschools have higher access to free play and self-chosen activities than teacher-instructed activities (Coelho et al., 2021). Previous studies have pointed to the challenge for the preschool staff to combine free playing, child agency, teaching, and care to ensure play participation and social learning for all children (Åström et al., 2022), not least when it comes to children with SEN. Investigating PT/ST can contribute knowledge about how inclusive preschools can proactively support children's social play and promote their social skills development.

Aims

In this multiple case study, four teachers at four inclusive preschools implemented PT/ST with a two-model design. Two of the teachers received training in the program,

implementation instructions, and a manual for lessons and play activities. The other two teachers received the same training, instructions, and manual, with additional coaching. The study had two aims. First, it aimed to explore if there were differences in how the teachers in the two models perceived the influences of PT/ST on social engagement and social play skills in the children with SEN and if PT/ST supported social play between the participating children. Second, it aimed to examine the implementation feasibility of PT/ST and the influences on inclusion quality in the preschools, with and without coaching. These were the research questions:

1. Were there differences in how the teachers that received and did not receive coaching perceived social play skills and social engagement in children with SEN?
2. Did PT/ST support social play among children with SEN and their TD peers? What were the facilitators and barriers to social play?
3. Were there differences in the fidelity and completion of the PT/ST implementation in preschools that received and did not receive coaching?
4. How was the inclusion quality in the preschools that did and did not receive coaching?

Materials and methods

For this multiple case study (Yin, 2018) we used a mixed-method approach with both simultaneous and sequential strategies to analyze the data (QUAL/quan; Morse, 2010), and we summarized the data in four descriptive case studies (Corr et al., 2020).

Recruitment of participants and training of teachers

Inclusion criteria

To participate in the study, the preschools needed consent from the guardians (a) for one child, the staff considered to have SEN in social play with peers, with or without disabilities, and (b) for one or more children, the staff considered as socially skilled (hereafter, peers), aged between three to five. We allowed all settings that signed up for the study meeting these criteria to participate. However, we had set a limit of 10 participating preschool units/classes to enable the coaching and observations that the first author would make during the study.

A convenience sample

We recruited the participants via a research-practice network that included principals, teachers, childcare workers, and special educators from different preschools and municipalities in Sweden. Since childcare workers often have similar responsibilities as teachers to plan and perform activities in Swedish preschools, they could also sign up for the study. Based on our previous knowledge of Swedish preschools, most settings enroll more than one child with a disability or other SEN, making it possible for several preschools within the network to participate. By this convenience and snowball sample, we also assumed some variation of the preschool settings (Bryman, 2016) for size, organization, and pedagogical orientation. Via the network, we sent an invitation to a workshop on the background and purpose for PT/ST, which reached 94 staff. Of these, 15 agreed to the workshop, which lasted about 5 h. At the end of the workshop, we submitted the study request, to which two preschools responded positively (Alpha 1, Beta 1). Later, three additional preschools from the network signed up for the study (Alpha 2, 3, Beta 2).

The two model implementation design, the basic training, and dropout

We divided the five preschools into two groups, one where the teachers should get basic training and instructions for PT/ST (Alpha 1–3) and one where the teachers should get additional coaching (Beta 1–2). In January 2018, the three teachers (from Alpha 2, Alpha 3, and Beta 1) participated in a 4-h training and instruction session. This session included a video-recorded role-play of the learning activities performed by the first and second author and question time and instructions for the teacher-observations of the children with SEN; pre-and post-PT/ST (see section "Measures"). Since the teachers at Alpha 1 and Beta 2 could not participate in the first session, they received the corresponding basic training and instruction by the first author in February 2018, including the video-recorded role-play and question time at their preschools. These lasted about 2 h, respectively. After completing the basic training from February and ahead, the teachers should perform three learning activities per week, including their pre-and post-observations. The teacher in Alpha 3 dropped out of the study due to staff changes after completing the initial observations (for the recruitment and training procedures see **Supplementary Table 1**). For the four preschools that participated in the study (**Table 1**), we extended the implementation period to June 2018 due to children or staff's sick leave causing delays. As noted in **Table 1**, all participating preschools had access to one contracted special educator. For the preschool's Alpha 1 and Alpha 2, we instructed their special educators not to coach the preschool teachers in the PT/ST intervention.

The additional coaching

The first author conducted the coaching for the teachers in Beta 1 and Beta 2, in direct connection with the fidelity observations of learning activities (see section "Measures") three times at each preschool, early in the implementation. The coaching addressed the goal of the last and the preceding

TABLE 1 Description of the participating preschools.

	Alpha 1	Alpha 2	Beta 1	Beta 2
Municipality population	39,000	78,000	960,000	78,000
Type of municipality	Industrial/rural	Suburban	City	Suburban
Type of preschool	Municipal	Independent	Independent	Municipal
Additional pedagogical orientation to the compulsory Swedish preschool curriculum	No	Reggio Emilia	Reggio Emilia	No
Teacher/children ratio	6.3	6.3	5.2	5.6
Number of children, setting	95	95	115	60
Number of children, intervention unit/class	19	19	21	17
Age of children, intervention unit/class (years)	3–4	4–5	3–5	1–4
Opening hours (a.m. to p.m.)	6.30–5.30	6.30–5.30	6.30–6.30	6.30–5.30
Access to a contracted special educator	Yes	Yes	Yes	Yes

Data on municipality population and teacher/children ratio are approximate.

TABLE 2 Participating children and teachers with pseudonyms for the case studies.

Preschools	Intervention children with SEN	Age (in years)	Type of SEN	Intervention peers, age (in years)	The teachers, work experience (in years)
Alpha 1	Alex ♂	4	ASD	Sara ♀ (5)	Anita ♀ (10) [a]
Alpha 2	Bill ♂	4	Unspecified	Sam ♂, Sofie ♀ (4)	Beatrice ♀ (15)
Beta 1	Carl ♂	5 ½	Unspecified	Simon ♂ (5 ½)	Celia ♀ (5)
Beta 2	Dean ♂	5	ASD, limited verbal speech, using PECS	Sigge ♂, Sebastian ♂ (5)	Danielle ♀ (10)

SEND, SEN, Special Educational Needs with or without a Disability; ASD, Autism Spectrum Disorder; PECS, Picture Exchange Communication System (Frost and Bondy, 2002).
[a]Experienced child care worker that during the study underwent preschool teacher education.

learning activity with guiding questions such as "What did you do?," "How did it feel?," "What do you think about what happened?," and "What would you like to do differently?" (Kucharczyk et al., 2012). Since the teachers did not perform the learning activities concurrently, the coaching sessions occurred differently and varied in time from 10 to 36 min.

Participants

The teachers

Three teachers and one experienced childcare worker (hereafter, teachers) participated in the study (Table 2). The teachers had an average work experience of 10 years.

The children

Ten children participated in the study, four of the children had SEN, and six of the children participated as peers (Table 2). **Alex** was a 4-year-old verbal boy with ASD. His peer Sara was a 5-year-old girl. **Bill** was a 4-year-old verbal boy. His peers were Sam and Sofie, a boy and a girl, 4 years old. **Carl** was a five-and-a-half-year-old boy. Carl went to a speech therapist due to speech difficulties. His peer was Simon, a five-and-a-half-year-old boy. During the study, Simon was a little bit concerned over changes in the home situation, which could have influenced his social engagement with peers in preschool and he interrupted his participation after 11 lessons/play activities. **Dean** was a 5-year-old boy with ASD. Dean used Picture Exchange Communication System (PECS; Frost and Bondy, 2002) to communicate as he had few spoken words. Since Dean was older than the other children in his unit, two children at his age from another unit/class in the preschool participated as peers, Sigge and Sebastian, both 5 years old. During the PT/ST implementation, the teacher instructed and prompted Dean and his peers in PECS, simultaneously with her instructions on their play interactions.

Dropout of peers

The PT/ST manual suggests that the preschools ask for consent for more than one peer to compensate for any absences that may prevent their participation during the implementation. However, the same child with SEN is expected to participate. Alpha 1 and Beta 1 had consent for more than one peer in case of dropouts and planned the PT/ST activities for one peer at a time. Alpha 2 and Beta 2 had consent for two peers and planned the PT/ST activities for two peers at a time. According to the teachers' logbooks, another peer than Sara in Alpha 1 discontinued participation after three lessons/play activities, and one peer in addition to Sara participated in lesson/play activity 12; in Beta 1 the peer Simon discontinued participation after 11 lessons/play activities, and another peer participated in five lessons/play activities. Since we have no further data about these

children they are not included in the study. In Alpha 2 and Beta 2, the two peers participated throughout the implementation.

Implementation procedures and processes

The program: Play time/social time

Play time/social time (PT/ST) addresses 3–5-year-old children and focuses on six observable social skills that children use to begin or maintain social play interactions with peers, with potential for friendships; sharing with others, requesting to share, persistence, initiating/organizing play, agreeing to play, providing help, and helping others (Odom et al., 1997). The PT/ST program covers 28 lessons with play activities. It starts with three introductory lessons, where the teacher set up, introduces a play activity, and talks to the children about playing together. The following 25 lessons contain two parts. In the first part of the lesson (about 5 min), the teacher introduces a new social skill, reviews the previously learned social skills, and lets each child practice/repeat the target skill, first with the teacher and then with the peer/peers. The teacher playfully demonstrates and models how to interact. In the second part of the lesson, the play activity follows (about 5–10 min), where the children practice the skills. The teacher has prepared the play activity in advance with toys and materials. Each play activity focus on a specific theme, e.g., pretend play like a grocery or constructive play like building blocks. The teacher introduces the play activity, suggests how to use the toys and materials and interact, for example, by assigning the children interaction roles appropriate to their current levels of social skills, and may prompt the children and give them feedback without overly directing their play.

Translations and adaptations of the manual and program

An authorized translator translated PT/ST to Swedish. For the implementation instructions, we used "learning activity" as the overall concept for the lessons and play activities. Further, we used "mini-circle time" for the first part of the lesson, and "playgroup" for the following play activity. "Lesson" is not used in Swedish preschools even though the concept of *teaching* was launched for preschool in addition to *care*, through the current Education Act in 2010 (SFS, 2010/800; Sheridan and Williams, 2018). However, circle time is a teacher-instructed preschool activity practiced in most Swedish preschools, which is structurally similar to a lesson. During circle time, the teachers call over the children, inform them about activities, initiate theme discussions, and sing together with the children (often sitting in a circle on the floor). In this study, the teachers implemented the learning activities with a less structured use and reduction of scaffolding than in the original program (Odom et al., 1997), although the teachers were still encouraged to give prompts and feedback to the children when needed.

Measures

Teacher impression scale

Before and after implementing the PT/ST program, the teachers conducted three to four approximately 5-min play observations using the teacher impression scale (TIS) (Odom et al., 1997) for each of the children with SEN. The TIS has 16 items reflecting prosocial behaviors that children use to initiate or maintain contact and interactions with peers at play, like "The child is persistent at social attempts," "The child continues an interaction once it has begun." The teachers assessed the extent of these behaviors on a five-point Likert scale (1 = never performs skill to 5 = frequently performs skill) and completed the ratings on the TIS immediately after each observation. When the teachers had completed all the observations, they calculated the average score for each item, pre, and post. In previous Swedish studies, the internal consistency for TIS was high, with Cronbach's alpha (CA) = 0.97 (Gladh et al., 2021; Sedem et al., 2022). It also had highly correlated test-retest scores (r = 0.94) (Sedem et al., 2022).

Children's engagement questionnaire

Complementing the information from the TIS observations of the children with SEN, the teachers used CEQ (McWilliam, 1991) before and after the implementation of PT/ST. The original children's engagement questionnaire (CEQ) has 32 items to assess young children's engagement in relationships and activities. It has previously been validated and adapted for teachers in Swedish preschools (Almqvist, 2006), with high internal consistency (CA = 0.92). For this study, the teachers completed three subscales of the original CEQ (Granlund et al., 2015). These were *CEQ1 Engagement* with 29 questions like "Tries new ways to play with things," *CEQ2 Interaction with other children* with 16 questions like "The child understands what other children mean," and *CEQ3 Interaction with the preschool teacher* with 16 questions like "The child understands what I mean." In CEQ1, the teachers estimated each item on a four-point Likert scale (1 = *rarely happens* to 4 = *happens very often*). In CEQs 2 and 3, they estimated each item on a five-point Likert scale (1 = *seldom* to 5 = *most often*).

Inclusive classroom profile

To evaluate the inclusion of preschool quality for children with SEN in preschools, the first author conducted inclusive classroom profile (ICP) observations (Soukakou, 2012, 2016; Soukakou et al., 2014) as a trained observer, twice at each preschool, one before and one after PT/ST. Each observation took between two and 3 h to complete. The ICP, which employs a 7-point Likert Scale format (1 = *inadequate*, 5 = *good*, and

7 = *excellent quality*), has 12 items based on factors supporting development in children with SEN (Soukakou, 2016). For this study, we selected the items focusing on social interactions and play. These were (2) *Adults' involvement in peer interactions,* (3) *Adults' guidance of children's free-choice activities and play,* and (6) *Relationships between adults and children*.

Video-recorded learning activities

During the study, we had mini-circle times and playgroups video-recorded, comprising 209 min of material: Alpha 1; 37 min, Alpha 2; 1.23 min, Beta 1; 54 min, and Beta 2; 35 min. From this material, we selected three playgroups for each of the four children with SEN. These were from the beginning and the middle of the PT/ST implementation. We analyzed a 5-min sequence for each of the 12 playgroups, yielding 60 min of video recordings (**Table 3**). For playgroups that lasted 5 min, we selected the whole sequence of play that started immediately after the mini-circle time (five cases). When the video recordings of the playgroups were more than 5 min, we counted 5 min from the end of the playgroup and back and started analyzing from there to include the end of the play (seven cases). To analyze the video-recorded playgroups, we used the coding scheme Observation of Social Participation in Play (OSPiP; Allodi Westling et al., 2019). OSPiP is based on the Friendship Observation Scale (FOS) (Bauminger et al., 2008), and was adapted to the content of PT/ST. It includes (1) Play Behavior (*unoccupied, onlooker, solitary play, parallel play, cooperative play*); (2) Social Play Behavior (*share toys with peers, ask for help the peer, offer to help the peer, other type with the peer, persist in interaction, keep trying, give suggestions, organize, solve problems, no pro-social behavior*); (3) Communication (*no/non-verbal communication*); (4) Interfering Behavior (*stereotype, negative, and no interfering behavior*); (5) Expressing emotions (*positive, negative, neutral*). The OSPiP has a partial sampling format based on 15-s intervals, and we used it with the Noldus Observer XT software, version 14.2 (Zimmerman et al., 2009). The primary behavior within each of the previously described categories occurring during the interval was coded. If multiple behaviors occurred during the session for relatively the same amount of time, the most advanced or positive behavior was coded. Two coders independently analyzed 42% of the video-recorded playgroups, and the interrater reliability with Cohen's kappa was 0.87, thus considered as strong (McHugh, 2012).

Fidelity observations, completion checklist, and logbooks

To evaluate the fidelity of the implementation, the first author performed observations of 14 learning activities with a revised version of an implementation checklist for social interaction interventions, corresponding to PT/ST (Odom et al., 1997). For convenience, since the preschool Alpha 1 was located geographically more distant than the other preschools, their special educator performed fidelity observations and video recordings for the study. For similar convenience, the special educator at Beta 1 performed two fidelity observations. To monitor to what extent the teachers applied PT/ST, the teachers used a checklist to fill in the dates for their completed PT/ST activities (for fidelity and completion checklists, see **Supplementary material**).

Data analysis

To examine how the teachers perceived social skills in free play situations and the engagement in social interactions and preschool activities for children with SEN, we calculated their pre, and post-intervention mean scores and SD for the TIS (Odom et al., 1997) and the CEQs (McWilliam, 1991;

TABLE 3 The sample of analyzed playgroups (PG) with PT/ST learning goals[a] for children with SEND (Alex, Dean) and SEN (Bill, Carl) and their peers (Sara, Sam, Sofie, Simon, Sigge, Sebastian).

	Alex (Alpha 1)	Bill (Alpha 2)	Carl (Beta 1)	Dean (Beta 2)
PG # 3: Sharing and persistence				Sigge, Sebastian
PG # 4: Sharing and persistence—review and practice		• Sam, Sofie		• Sigge, Sebastian
PG # 5: Sharing and persistence—review and practice	• Sara		• Simon	
PG # 7: Requesting to share—target children	• Sara		• Simon	
PG # 9: Sharing, persistence, requesting to share—review and practice	• Sara			• Sigge
PG # 10: Sharing, persistence, requesting to share—review and practice		• Sam, Sofie	• Simon	
PG # 11: Play organizing—peers		• Sam, Sofie		
Minutes	15	15	15	15

PT/ST, play time/social time (Odom et al., 1997); SEND, SEN, Special Educational Needs with or without a Disability.
[a]The preschool teachers were instructed to perform three learning activities per week, including mini-circle time and playgroup, from February to June 2018.

Granlund et al., 2015). By analyzing the video recordings with OSPiP, we obtained data on frequencies and proportions for play and prosocial behaviors in the children with SEN from the beginning and the middle of the implementation (**Figures 1**, **2**, also see **Supplementary Figures 1–4**, and **Supplementary Tables 2,3**). From these video recordings, we traced examples of facilitators and barriers to children's social play, of which we selected two representative vignettes for each child with SEN. The selection of vignettes reflected the variation of social play behaviors and skills for each child with SEN and corresponded in time for the playgroups for all children with SEN. These were for Alex from playgroups 5 and 9; Bill from

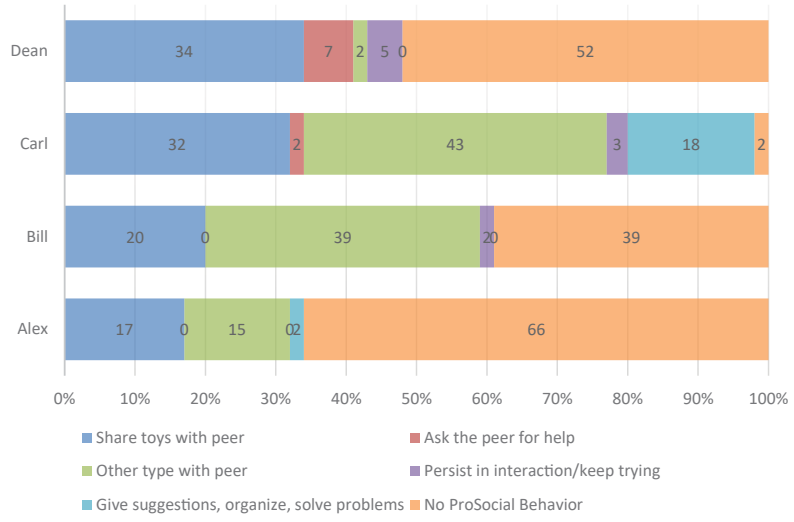

FIGURE 1
Distribution of prosocial behaviors (%) for children with SEN during 12 video-recorded PT/ST playgroups with peers (15 min/child), observed with OSPIP. For Alex playgroup 5, 7, 9; for Bill playgroup 4, 10, 11; for Carl playgroup 5, 7, 11; and for Dean playgroup 3, 4, 9; PT/ST = play/time social/time (Odom et al., 1997); SEN = Special Educational Needs; OSPiP = Observation of Social Participation in Play (Allodi Westling et al., 2019).

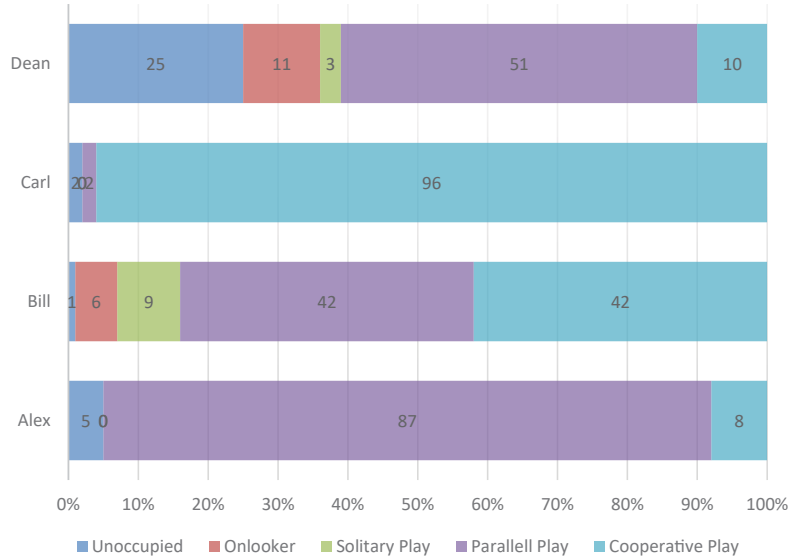

FIGURE 2
Distribution of play behaviors (%) for children with SEN during 12 video-recorded PT/ST playgroups with peers (15 min/child), observed with OSPiP. For Alex playgroup 5, 7, 9; for Bill playgroup 4, 10, 11; for Carl playgroup 5, 7, 11; and for Dean playgroup 3, 4, 9; PT/ST = play/time social/time (Odom et al., 1997); SEN = Special Educational Needs; OSPiP = Observation of Social Participation in Play (Allodi Westling et al., 2019).

playgroups 4 and 11; Carl from playgroups 5 and 11; Dean from playgroups 4 and 9. Since Carl exclusively played cooperatively in the sample of playgroups, his two vignettes describe only facilitators for play synch, while the others describe both facilitators and barriers.

Ethical considerations

The Regional Ethical Review Board in Stockholm approved the study (Diary Number 2016/5:8), and it follows the regulations for research data (SFS, 1998/204, 2018/218; General Data Protection Regulation [GDPR], 2016/679). Principals and preschool teachers were informed about the study and submitted consent for participation. The guardians of the children in the study were informed about the study and consented to their children participating. This consent included agreements for participation in the PT/ST activities, the observations, and the video recordings. In addition, the teachers were aware of the children's willingness to participate, from PT/ST activity to activity. The guardians at the preschools whose children did not participate in the PT/ST activities, the observations, and the video recordings received information about the study. There were no reports of harm by the children or the preschool staff.

Results

Alex, Alpha 1

Fidelity and completion of the play time/social time implementation

At Alpha 1, the teacher Anita implemented PT/ST with training and manual and without coaching. She fulfilled fidelity of PT/ST to a relatively high degree, 70% (**Table 4**). Sometimes, in the mini-circle times during the fidelity observations, Anita did not describe to Alex and the peer Sara ways to play with each other and the material and did not repeat the rules for the playgroup. In her instructions, she sometimes did not give any examples of how they were good playmates previously concerning the skills in PT/ST. Otherwise; she adhered to the instructions. The completion of her PT/ST implementation was high, 82% (**Table 4**). According to her completion checklist, Anita just excluded the three introductory mini-circle times, and the learning activities 20 and 25.

Adult involvement in peer interactions, adults' guidance of children's free-choice activities and play, and relationships between adults and children

Pre-test observation with ICP regarding preschool inclusion quality took place indoors and post-test observation outdoors. For Alpha 1 it was noted an increase in inclusion quality in the ICP observations regarding the teachers' involvement in peer interactions (from score 3 to 4), and guidance of children's free-choice activities and play (from score 2 to 6), before and after PT/ST (**Table 5**). For relationships between teachers and children, no difference was observed, thus remaining low (score 2).

Social skills in free play situations and the engagement and involvement in social interactions and preschool activities

According to the teacher's observations with TIS (**Table 6**), Alex's use of social skills increased after the implementation of PT/ST (from a total mean score of 2.7 to 3.4). Correspondingly, the teacher estimated an increase in the engagement and involvement of preschool activities in CEQ1 (from a total mean score of 2.7 to 3.3) and social interactions with peers in CEQ2 (from a total mean score of 2.1 to 3.1). The increase was lower for interactions with staff in CEQ3 (from a total mean score of 4.3 to 4.4) (**Table 6**).

Prosocial and play behaviors with peers during play time/social time playgroups

In the sample of video-recorded playgroups at the beginning and middle of the implementation of PT/ST, Alex used prosocial behaviors 34% of the time. For Alex, these behaviors were primarily about sharing and other prosocial behaviors like seeking the peer Sara's attention or giving her attention and temporarily proposing a play idea (**Figure 1**). Alex's play behaviors during these playgroups corresponded with how he used prosocial behaviors (**Figures 1**, **2**). Sometimes Alex played cooperatively (*Vignette 1*), but primarily he engaged in parallel play (*Vignette 2*).

Vignette 1. facilitators for social peer play

For Playgroup 9 (*Sharing, Persistence, Requesting to share*), Anita has prepared the table by putting a large piece of paper in front of Alex and Sara. She has also provided them with each pencil in different colors and has put more pencils in other colors on the table closest to Alex. Anita suggests Alex and Sara draw their families, to which they both respond positively. As in the previous session, Alex engages most in parallel play. However, as Anita comments on their drawings coming together, the play shifts from parallel to cooperative. Literally and figuratively, Alex has drawn his father so tall that he ends up in Sara's family. The session ends with Alex looking at Sara, seemingly amused as she laughs at the raindrops that she draws falling on her family.

Vignette 2. barriers to social peer play

For Playgroup 5 (*Sharing and Persistence, Review and Practice*) the teacher Anita has prepared the table for Alex and the peer Sara with a box of blocks and cars. When starting to

TABLE 4 Frequencies of fidelity and completion of PT/ST implementation in Swedish preschools (N = 4).

Preschool	Coaching	Peers in playgroups	Fidelity		Completion	
		N	%	*n*	%	*n*
Alpha 1	No	1	70	39/56	82	23/28
Alpha 2	No	2	87	49/56	89	25/28
Beta 1	Yes (3 times)	1	91	51/56	57	16/28
Beta 2	Yes (3 times)	1 or 2	88	37/42	46	13/28

PT/ST, play time/social time (Odom et al., 1997).

TABLE 5 Inclusion quality in observations with ICP, items 2, 3, 6, before and after the PT/ST implementation, for the preschool units.

Ratings	Alpha 1		Alpha 2		Beta 1		Beta 2	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Item 2								
Adults' involvement in peer interactions	3	4	6	6	5	6	6	2
Item 3								
Adults' guidance of children's free choice activities and play	2	6	5	6	5	6	4	2
Item 6								
Relationships between adults and children	2	2	2	2	2	2	2	2

ICP, Inclusive Classroom Profile, min = 1, max = 7 (Soukakou, 2016); PT/ST, play/time social/time (Odom et al., 1997).

TABLE 6 Teachers' ratings of social skills, engagement, and involvement in interactions with other children and preschool staff at pre and post PT/ST-intervention for children with SEND (Alex, Dean) and SEN (Bill, Carl) observed with the teacher impression scale (TIS) and three children engagement questionnaires (CEQ).

Ratings	Alex		Bill		Carl		Dean	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
TIS								
Item mean	2.7	3.4	2.5	3.8	3.3	2.8	2.7	3.8
SD	1.54	0.90	0.63	0.54	0.81	0.83	1.34	1.11
Total score	43	55	40	61	54	45	44	61
CEQ1								
Item mean	2.7	3.3	2.1	2.8	1.7	1.8	1.8	2.3
SD	1.09	0.87	0.46	0.74	0.60	0.66	0.99	0.86
Total score	81	96	63	82	52	53	55	69
CEQ2								
Item mean	2.1	3.1	2.6	3.5	2.9	2.6	2.1	3.3
SD	1.13	1.05	0.69	0.70	0.96	0.68	1.11	0.78
Total score	35	50	42	57	47	43	34	54
CEQ3								
Item mean	4.3[a]	4.4	3.5	4.6	3	3.6	3.3	4
SD	0.72	0.86	1.24	0.65	1.14	0.91	1.5	0.94
Total score	87[a]	88	70	93	60	72	70	80

PT/ST, play/time social/time (Odom et al., 1997); SEND, SEN, Special Educational Needs with or without a Disability.
TIS, 16 questions, Likert scale, minn = 1, max = 5 (Odom et al., 1997); CEQ1 Engagement, 29 questions, Likert scale: min = 1, max = 4; CEQ2 The child's interaction with other children, 16 questions, Likert scale: min = 1, max = 5; CEQ3 Preschool staff's experience of interaction with the child, 20 questions, Likert scale: min = 1, max = 5 (McWilliam, 1991; translated from Swedish to English from Granlund et al., 2015).
[a]Missing value, item 1 The child begins the interaction, replaced with 3.

play with the blocks Alex exclaims "A tunnel!" Anita answers "Yes, can one build a tunnel?" Alex continues to build with the blocks on his own, without sharing the material with Sara or trying to play together with her. Nevertheless, he is playing close to her in a similar way and with the same material. When he is sharing, later in the playgroup, Anita has encouraged him to do so. During the playgroup, Alex mainly talks to Anita. However, he is also looking and laughing at Sara putting together her cars, and once calling her attention to his construction by shouting "Look, Sara, look! A big tower!" Sometimes, we interpreted Alex's behavior as interfering. This is when he is avoiding Anita's attempt to get him to share blocks with Sara, or when he is protecting his blocks from Sara. Then Sara appears a little bothered, but seemingly she awaits Anita's actions rather than asking for blocks from Alex herself. Once at these moments, she looks questioningly, at the special educator who is video recording the playgroup. Alex, on the other hand, seems satisfied and happy with the situation.

Bill, Alpha 2

Fidelity and completion of the play time/social time implementation

Beatrice at Alpha 2 implemented PT/ST with training and manual, without coaching. She fulfilled fidelity of PT/ST for the participating children to a high degree (87%), see **Table 4**. During the four fidelity observations, Beatrice twice did not describe the routine for the mini-circle time and the rules for the playgroup or described to Bill, and the peers, Sam and Sofie, how they were good playmates on previous days regarding the skills in PT/ST. Once she did not repeat the rules for the playgroup. Otherwise, she adhered to the instructions. Likewise, the degree of completion of her implementation of PT/ST was high, 89% (**Table 4**). According to her completion checklist, Beatrice just excluded the learning activities 15, 22, and 24.

Adult involvement in peer interactions, adults' guidance of children's free-choice activities and play, and relationships between adults and children

Regarding preschool inclusion quality, pre-test observation with ICP took place indoors, and post-test observation indoors and outdoors. For Alpha 2 it was noted an increase in inclusion quality in the ICP observations regarding teachers' guidance of children's free-choice activities and play (from score 5 to 6), before and after PT/ST (**Table 5**). For teachers' involvement in peer interactions, the scorings remained high (score 6), and for relationships between teachers and children, these remained low (score 2).

Social skills in free play situations and the engagement and involvement in social interactions and preschool activities

According to the teacher's observations with TIS, Bill had increased levels of social skills in play situations, from 2.5 in pre-observation to 3.8 in post-observation, in the total mean scores (**Table 6**). Correspondingly, the teacher-rated levels of engagement (CEQ1) increased from a total mean score of 2.1 to 2.8, involvement in interactions with peers (CEQ2) from a total mean score of 2.6 to 3.5, and with staff (CEQ3), from a total mean score of 3.5 to 4.6 (**Table 6**).

Prosocial and play behaviors with peers during play time/social time playgroups

For Bill, the analysis of the video-recorded playgroups shows that he often used prosocial behaviors with his peers, Sam and Sofie, to 61%, and with variation by sharing toys and persisting, for example (**Figure 1**). He also used other prosocial behaviors like standing in line for the restaurant. Correspondingly, as noted in **Figure 2**, Bill played parallel and cooperatively with Sam and Sofie, to 42% respectively, in the sample of playgroups (*Vignette 3*). However, he also engaged in solitary, and onlooker play, to 15%, with a few moments of being unoccupied (*Vignette 4*).

Vignette 3. facilitators for social peer play

Before Playgroup 11 (*Play organizing, Peers*), Beatrice has set the table for a restaurant play with a toy cash register, notebook, and pencil for the restaurant staff, and plates, mugs, plastic bags, two of each, for the customers. Bill plays cooperatively and seems socially engaged throughout this session. When he stands still, silent, he waits for his turn after Sofie to order food from Sam who runs the restaurant. He seems to enjoy the situation like Sam and Sofie and smiles sometimes. During the first half of the play, Bill does not say anything but shows non-verbal communication. He then speaks to confirm or tell his orders.

Vignette 4. barriers to social peer play

In Playgroup 4 (*Sharing and Persistence, Review and Practice*) the teacher Beatrice has prepared bricks to build tracks and tunnels for cars. Beatrice instructs Bill, Sam, and Sofie "Then you can start building the tracks! And, remember that you can make tunnels too." Initially, Bill engages in cooperative play. He follows Sam and picks up bricks for the common tunnel construction, which also Sofie is playing with, in interactions with both of them. Then his play behavior switches between onlooker and parallel play, and some seconds unoccupied. Bill seems to look at and listen to Sam and Sofie but plays alongside them. For example, by driving on the track that they have built, or by jumping himself as Sam is talking about the bump for the cars. Finally, his behaviors change to solitary play. Just before this, when Sam notes that Bill doesn't follow his construction plan, he tells him "But Bill, that's not how it should be," and to Sofie "Look what Bill has done, Sofie," and back to Bill "It should not be like this, Bill, it should be as if it is the bridge, that you jump over here. So that you land on that second jump." Sam shows Bill how he thinks he should act with the cars. Bill does not comment or act otherwise prosocial. After Sam has instructed and corrected Bill, Bill continues to play with his car alone. "Funny Bill," says Sam. Sam does not sound angry when saying this, and Beatrice, even though having her attention focused on their play, does not comment on this. When playing alone with the car on the floor, Bill drives his cars in circles, stereotypically. Emotionally, he appears neither happy nor sad, but for some moments a bit frustrated.

Carl, Beta 1

Fidelity and completion of the play time/social time implementation

The preschool teacher Celia at Beta 1 implemented PT/ST with training and manual, and coaching. She fulfilled fidelity of instruction of PT/ST for the participating children to a high degree (91%), see **Table 4**. During the four fidelity observations,

Celia once did not introduce the mini-circle with a song, rhyme, or phrase, and twice did not describe the routine for the mini-circle time and the rules for the playgroup. During her instructions for Carl and Simon, she twice did not give examples of how they were good playmates on previous days concerning the skills in PT/ST. The completion of the PT/ST implementation at Beta 1 was low, 57% (Table 4). Celia excluded the learning activities 8–10, 13–20, and 23–25 due to sick leave for her, Carl, or other staff.

Adult involvement in peer interactions, adults' guidance of children's free-choice activities and play, and relationships between adults and children

The pre-test ICP observation regarding preschool inclusion quality took place indoors and the post-test observation both outdoors and indoors. For Beta 1, it was noted an increase in inclusion in the ICP observations quality regarding the teachers' involvement in peer interactions, from score 5 to 6, and guidance of children's free-choice activities and play, from score 5 to 6 (Table 5). For relationships between teachers and children, no difference was observed, thus remaining low (score 2).

Social skills in free play situations and the engagement and involvement in social interactions and preschool activities

According to the teacher's estimations, Carl showed decreased levels of social skills in non-staged play situations in pre-and-post observations with TIS, from a total mean score of 3.3 to 2.8 (Table 6). Similarly, he showed a decrease in their ratings with CEQ2, measuring his interactions with other children, from a total mean score of 2.9 to 2.6. However, after PT/ST the teachers observed somewhat increased levels of engagement, from a total mean score of 1.7 to 1.8, and interactions with teachers, from a total mean score of 3 to 3.6, in pre and post CEQ 1 and 3.

Prosocial and play behaviors with peers during play time/social time playgroups

In the sample of PT/ST playgroups from the beginning and middle of the implementation, Carl used prosocial behaviors to 98%. For Carl, these behaviors were primarily about sharing and other prosocial behaviors like waiting for his turn or agreeing with Simon but also about proposing play ideas, persisting in interaction, and asking Simon for help (Figure 1). Similarly, as noted in Figure 2, Carl played mainly cooperatively, to 96%, with Simon in the selection of playgroups (*Vignette 5, 6*). It was only for a few moments that he played in parallel with Simon or was unoccupied.

Vignette 5. facilitators for social peer play

For Playgroup 5 (*Sharing and Persistence, Review and Practice*), Celia has prepared two tables with goods for a grocery. She gives Carl and the peer Simon play suggestions "We have a basket and a wallet with money. Here a person can buy things" (referring to one of the tables). Celia has put a cash register, money, and plastic bag at another table and says, "The salesperson can pack all the goods and count how much you have to pay." She instructs the peer Simon to be a salesperson and Carl to be a customer and switch roles. Carl and Simon play cooperatively throughout the session. Prosocial, Carl shares toys and play material with Simon, and follows his suggestions to continue playing. He starts taking up the goods from the bag to prepare the next section of the play, agreeing when he instructs him to scan the goods or directs them into different roles, and waiting in the store for him to start buying when Carl is the salesperson. They both seem satisfied and smile a lot. Carl talks during the playgroup, in response to Simon's questions and suggestions in the play and with the teacher. They also talk about things outside the play situation, seemingly without losing their play engagement.

Vignette 6. facilitators for social peer play

Ahead of playgroup 11 (*Play Organizing*), Simon the peer did not want to participate in the mini-circle time. Nevertheless, the staged play situation, the hamburger stand, occurred, where Celia supported the interactions between Carl and Simon as intended. In this session, Carl plays cooperatively, and he shows a variation of prosocial behaviors like in Playgroup 5. Celia is now included in the play, and she is the customer. First, Simon takes up the order, and Carl is sitting on the counter writing up the orders coming in, and giving suggestions for the menu. Simon gives Celia as the customer suggestions of what food they have. Carl confirms Celia's request for food: a hot dog. Simon is standing close to Celia who is ordering, telling her what they can offer. Celia instructs Simon to tell Carl to order. When Carl is sitting and writing on the menu, Celia prompts Simon to initiate another step of the play. She also instructs Simon to take her mobile phone and to tell Carl that he may pretend to order from it. In turn, Simon instructs Carl on what to say to Celia, who is now the customer "What do you want to order?" which Carl follows.

Dean, Beta 2

Fidelity and completion of the play time/social time implementation

The teacher Danielle implemented PT/ST with training, manual, and coaching. She fulfilled fidelity of PT/ST for the participating children to a high degree (88%), see Table 4. During the three fidelity observations, Danielle did not give examples for Dean, and the peers Sigge, and Sebastian, on how they were good playmates in previous days in

connection to the skills in PT/ST. Otherwise; she adhered to the instructions. In terms of completion, in turn, she fulfilled the learning activities to a low degree, 46% (Table 4), excluding learning activities 8, and 12–25, due to sick leave for her, Dean, or other staff.

Adult involvement in peer interactions, adults' guidance of children's free-choice activities and play, and relationships between adults and children

The pre-observation with ICP regarding preschool inclusion quality took place indoors and the post-observation outdoors. For these occasions, there was a decrease in the teachers' involvement in peer interactions (from score 6 to 2), and guidance of children's free-choice activities and play, from score 4 to 2 (Table 5). For relationships between teachers and children, there was no difference between observations, thus remaining low (score 2).

Social skills in free play situations and the engagement and involvement in social interactions and preschool activities

According to the teacher's estimations, there was a major change for Dean in using social skills in play situations before and after the implementation of PT/ST, from 2.7 to 3.8 in total mean scores for pre-and-post observations with TIS (Table 6). Similarly, there was an increase in the teacher's ratings of engagement and involvement in preschool activities (from a total mean score of 1.8 to 2.3) and social interactions with peers (from a total mean score of 2.1 to 3.3) and staff (from total mean score 3.3 to 4) for Dean on all three pre-and-post CEQ: s (Table 6).

Prosocial and play behaviors with peers during play time/social time playgroups

In the video-recorded playgroups at the beginning and middle of the PT/ST-implementation of PT/ST, Dean used prosocial behaviors 48% of the time. For Dean, he did so primarily by sharing toys, with 34%. He also asked his peers for help, to 7%, and persisted, to 5% (Figure 1). He once used other prosocial behaviors by bringing his PECS picture to communicate to his peers. Otherwise, when Dean was sharing during parallel play, Danielle prompted him to ask for a toy from his peers by pointing at the PECS picture. Then Dean, also prompted by her, took the picture and handed it over to Sigge or Sebastian. In turn, Sigge or Sebastian gave Dean the toy prompted by Danielle. Regarding using play behaviors with peers in the video-recorded sequences of the playgroups, the result for Dean corresponds to the extent of prosocial behaviors (Figures 1, 2). Dean was primarily engaged in parallel play, to 51%, with shifts to unoccupied play, to 25%, onlooker play, to 11%, cooperative play, to 10%, and solitary play, to 3% (*Vignette 7, 8*).

Vignette 7. facilitators for social peer play

For playgroup 4 (*Sharing and Persistence, Review and Practice*), Dean and his peers, are going to play with toy trains and tracks. Sigge and Sebastian build a rail in a circle, and Dean is first sitting beside onlooking or unoccupied. The teacher, Danielle, suggests Sigge and Sebastian build another track so that Dean can join; she also prompts Dean to ask for a piece with PECS so that he can extend the tracks together with Sigge and Sebastian. Sigge continues with a piece into the circle where Sebastian first laid a piece. Persisting, Dean cooperatively follows the invitation and puts his piece into the middle. However, Sebastian changes the pieces and Dean puts his train on the tracks, in parallel play. At the next point, however, Sebastian lets Dean put a straight piece of the track into the circle, rejecting Sigge's bent piece. Yet persisting, Dean takes a PECS picture to ask for a piece, again turning to cooperative play. When Dean exchanges the PECS picture to get a piece from Sigge (sharing), Sebastian disturbs this interaction, and takes the train from Sigge and throws it away. Beatrice then tries to help Dean and Sigge to continue sharing.

Vignette 8. barriers to social peer play

For playgroup 9 (*Sharing, Persistence, Requesting to share, Review and Practice*), where Dean and Sigge participate, Danielle has prepared pencils and coloring paper with three familiar cartoons; Superman, Spiderman, and Pokemon. Dean chooses one paper with Spiderman and Sigge one with Pokemon. Danielle puts the pencils next to Sigge and instructs Dean to ask for the pencils with his PECS picture of a pencil. Prompted by Danielle with the sign and the word for the color he wants, Dean immediately takes the PECS picture to request a pencil from Sigge. Dean and Sigge have one drawing each during the session. Throughout the playgroup, Dean exhibits parallel play. He consistently demonstrates non-verbal communication with Sigge, except when he engages in his drawing, but only communicates with him when exchanging pencils by using PECS.

Discussion

The first aim of this study was to explore how the teachers, who received/did not receive coaching, perceived the influences of PT/ST on social play skills and the social engagement in children with SEN, and if PT/ST supported social play between children with SEN and their peers.

The results of the teachers' observations with TIS and CEQ showed increased scores for social skills in free play and engagement in interactions with other children, after the application of PT/ST for three of the children with SEN in the study; Alex, Bill, and Dean. For the fourth child with SEN, Carl, the teacher did not observe the same increase in social skills in free play after PT/ST. Possibly this outcome could

reflect that his peer Simon, due to circumstances outside the preschool, became less socially motivated during the PT/ST implementation and interrupted his participation. Thereby it was not the same continuity in the playgroups as intended. However, in the CEQ estimations, the teachers perceived Carl to be more engaged in other preschool activities and interactions with them after PT/ST. Besides, he demonstrated exclusively cooperative play behaviors in the random sample of video-recorded PT/ST playgroups. This may indicate that adult-guided activities were favorable for his social participation.

Illustrated by the vignettes from the playgroups, all the children with SEN used social play and prosocial behaviors in the PT/ST playgroups, with some differences in the type and occurrence of social play behaviors. While, as noted, Carl only showed cooperative play behaviors, Alex and Dean mostly showed parallel play. Bill, in turn, engaged in as much parallel as cooperative play. In addition, the video-recorded observations showed that the extent of prosocial behaviors corresponded to the social play behaviors of children with SEN. The more complex or varying prosocial skills we observed, the higher the prevalence of more complex social play behaviors.

Through the video recordings, we could also identify possible facilitators and barriers to the children's social play in the playgroups. In our study, social play between the children seemed to occur when the toys and play materials similarly attracted the children and when the play situation and play goals, tasks, and roles engaged and fitted all the children. In addition, how the teachers instructed and encouraged the children in their interactions may have contributed to social play, although it is difficult to conclude from this study. Conversely, barriers to social play seemingly arose when the children were not attracted in the same way by the toys and play materials or when the play situation did not allow for a division of tasks or roles that resulted in shared play. The vignettes from the video-recorded playgroups also showed that communicative exchanges between the children seemed to be an integral part of children's social play interactions. These could include verbal and non-verbal communication, and alternative and complementary means of communication, such as PECS for Dean. When his teacher, Beatrice, prompted him and his peers to use PECS, social play interactions both seemed to arise and be a bit delayed. Regarding this, our results exemplify the understanding of social play that Janson (2001) has described. In this, social play is about interactions and community in three different but parallel contexts: the physical, the social (where communication is crucial), and the symbolic, which seem to coincide in children's expressions of togetherness.

Further, the vignettes in this study illustrated that Bill and Dean, at some points, were seemingly outside social play with their two peers, in a similar way as the peer Sara sometimes was outside when Alex was playing with the teacher (although all in safe and secure situations). Previous studies on friendship for children with ASD (Bauminger et al., 2008; Kent et al., 2020) have shown that it may be more challenging for a child who is about to develop social play skills to maintain play interactions with several children involved. Similarly, Rouse (2018) found that it might be more difficult to support children with TD to play with children with low social skills if they have access to more socially responsive interaction partners. Furthermore, Freeman and Kasari (1999) pointed out that what might seem to be a lack of interest in peers can prevent children with ASD from reaching affiliation and developing friendships. In connection to the results from this study, this might indicate three things. First, teachers may need to support children differently, depending on how many are playing together. Second, even peers perceived as socially skilled may need social play instructions and encouragement. Third, when teachers apply an intervention such as PT/ST, they may need to consider the participating children's personal social play preferences, including what might appear as an unwillingness to social play (Odom, 2019). If children are not encouraged and instructed in social play interactions with peers, they may miss opportunities to learn social skills to both initiate and refrain from social play. Beyond that, Barton (2015) has concluded that social play, and not just social skills, should be an instructional goal for children who do not exhibit more advanced social play behaviors.

The second aim of this study was to examine the feasibility of implementing PT/ST with and without coaching, and the influences of the program on preschool inclusion quality. First, the coaching was positively associated with implementation fidelity, with lower levels of fidelity in the basic condition (Alpha 1 and Alpha 2) and higher levels of fidelity in the add-on model (Beta 1 and Beta 2). We expected these results, as previous studies have shown that coaching is important to achieve intervention fidelity (Strain and Bovey, 2011; Boyd et al., 2016). Nonetheless, in this study the levels of fidelity were also satisfactory for the two teachers in the basic condition, Alpha 1 and Alpha 2, indicating that the training, manual, and instructions reached far. Another result was that after implementing PT/ST, Alpha 1 and Alpha 2 had higher levels of completion than Beta 1 and Beta 2, even though not coached. They also had a higher T/C ratio. Even though we cannot comment on the significance of the allocation of resources for their implementation of PT/ST, factors that seem to have contributed to less completion for Beta 1 and Beta 2 were teachers' and children's sick leave and absence. For our study context, it has previously shown that staff shortages and lack of continuity in staff competence might influence measures for children with SEN (Roll-Petterson et al., 2016; Ginner Hau et al., 2020).

Finally, higher levels of preschool inclusion quality regarding the teachers' involvement in peer interactions after the PT/ST implementation were observed for two of the four preschools (Alpha 1, Beta 1). For Alpha 2 the scorings for this item remained at the second-highest level (between *good* and *excellent quality*), before and after PT/ST. For these three preschools, higher levels of teachers' guidance of children's free-choice activities and play were also observed. Beta 2 instead

showed lower levels for both these items in the post-observation after implementing PT/ST. This means that the results of preschool inclusion quality were not associated with coaching in this study. One explanation for the lower scorings for Beta 2 could be that the post-observation was conducted outdoors in a different situation from the pre-test when the entire preschool had gathered in the yard to look at siblings leaving school for the summer vacation in a nearby building. In this situation, the teachers were not so close to the children so that they could pay special attention to children with SEN. Yet, the post-observations at the three other preschools in the study were partly also outdoors and they showed increased preschool inclusion quality regarding these ICP items. However, in these observations, they had organized teachers and children in groups in a similar way as indoors. This might indicate that it is possible to form inclusive learning environments even outdoors, although we cannot draw any sure conclusions about this from this study. None of the preschools in the study showed changes in the item concerning relations between teachers and children with SEN, with low levels in pre and post-observations. To score higher ICP levels for *Relationships between adults and children*, the preschools need to provide children with SEN, visual support, and additional resources for supporting their emotional needs and development. This even if they reach higher levels of later ICP criteria such as *Adult responsiveness to children's interests* and *Adult responsiveness to children's emotional needs*. A similar outcome appeared in a previous study that examined the use of ICP in Swedish preschools (Lundqvist and Larsdotter Bodin, 2018). Many Swedish preschools offer pictures for daily activities, but not visual support to express needs and feelings, which would be important to provide quality relationships between adults and children. If it were not for the lack of such support Alpha 1, Alpha 2, and Beta 1, would have reached levels of either good or excellent quality both pre and post-ICP, even for this item.

In summary, the results of this study suggest that the PT/ST activities made it possible for the children with SEN to engage in social play with peers and practice social skills, with and without coaching for their teachers. The results also indicate that coaching strengthened the intervention fidelity but did not seem associated with preschool inclusion quality; the two preschools that implemented PT/ST without coaching also received higher preschool inclusion quality scores at post-observation regarding adults' involvement in peer interactions and guidance of children's free choice activities and play.

Limitations and strengths

Due to the broad inclusion criteria for the participating children with SEN, and the lack of a control group, this study cannot generalize the results of the influences of PT/ST on their social play with peers and learning of social skills. Instead, the study may provide *a proof of concept* (Oxford English Dictionary [OED], 2022) of PT/ST to support social play between children with and without SEN and their social learning, which would suggest further studies with a different design in Swedish preschools. Other limitations of this study are that two of the preschools did not fully complete the program and that we performed the ICP observations, pre, and post, in different situations, indoors and outdoors. In addition, even though PT/ST allows various peers to participate in the program, as in the preschools, Alpha 1 and Beta 1, this can be important in understanding the play engagement of the children with SEN. One strength of the study is that the different measures we used regarding social play, engagement, interactions, and social skills (TIS, CEQ, OSPiP) complemented each other when interpreting the results. Another strength is that the video-recorded playgroups provided an opportunity to analyze possible facilitators and obstacles for children's shared play experiences in teacher-led playgroups.

Conclusions and implications

The result from our study indicates that children's engagement and participation in social peer play seem to be associated with their common play goals, and a division of roles and tasks that they find meaningful and manageable. To enable this, preschool staff in inclusive settings may need to offer both children with and without SEN, targeted support, which the PT/ST program offers. Assigning peers for parts of the free playtime would extend PT/ST to an even more naturalistic form of instruction. In a continued implementation, the professional teacher training and coaching could also address the relational aspects of preschool inclusion quality. This could include resources to support children's social-emotional development and communication, and strategies for playgroups with two or more children included. From the results of this study, we also conclude that it would be necessary to involve more preschool staff in the implementation in each setting; both to ensure they all use similar approaches and to enable a more complete program fulfillment, as staff shortages may affect the continuity of implementations.

Data availability statement

The original contributions presented in this study are included in the article/**Supplementary material**, further inquiries can be directed to the corresponding author.

Ethics statement

The studies involving human participants were reviewed and approved by the Regional Ethical Review Board

in Stockholm. Written informed consent to participate in this study was provided by the participants' legal guardians.

Author contributions

MG planned the study, recruited the participants, collected the data, performed the quantitative and qualitative analyses, and wrote the article. ES planned the study, supported the qualitative analyses, and contributed to the revision of the article. MWA planned the study, supported the quantitative analyses, and contributed to the revision of the article. SO wrote a section of the article and contributed to the revision of the article. All authors approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

Supplementary material

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/feduc.2022.943601/full#supplementary-material

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Patterns of observed child participation and proximity to a small group including teachers in Swedish preschool free play

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The participation of all children in preschool activities is the main outcome of inclusive Early Childhood Education and Care (ECEC). The current study used the Child Observation in Preschool (COP) to explore the observed participation patterns in the free play of a sample of 3–5-year-old Swedish preschool children ($N = 453$), and to examine the characteristics of the resulting clusters in terms of child and preschool unit characteristics. Based on a series of hierarchical and K-means cluster analyses, we identified eight distinct and meaningful clusters that could be ranked from very high to very low observed participation. Four of the clusters indicated average-to-very high observed participation. Two clusters indicated low-to-very low observed participation. The cluster displaying low observed participation had high proximity to a small group including teachers. On average, children in this cluster came from preschool units with significantly more second language learners. The cluster displaying a very low observed participation had low proximity to a small group including teachers. On average, children in this cluster were significantly more often second language learners, and the children came from units with a significantly higher number of resource staff. No significant differences appeared in the number of children with special educational needs across the clusters, although tendencies emerged. The results imply that the children in this sample had a varied degree of observed participation. Two clusters of children appeared to have difficulties in participating in free play activities where second language learners and children from preschool units with more second language learners were more common. Preschool teachers need to identify children who participate less in preschool activities and who might benefit from more teacher proximity. Teachers also need to reflect on how their proximity impacts the participation of children differently and on the type of support they provide when being close to the children.

KEYWORDS

preschool, participation, inclusion, engagement, free play, special needs, second language, person-oriented

Introduction

The goal of inclusive Early Childhood Education and Care (ECEC) is to ensure that every child participates in preschool activities and feels part of the group (Nilholm and Göransson, 2017). This is especially important for children with disabilities, special educational needs (SEN; Odom et al., 2011; Bartolo et al., 2016), and disadvantaged children, including second language learners (SLL; OECD, 2018). In Swedish ECEC, termed preschool, the activities mostly take place within the frame of *free play* where teachers offer the children a relatively large freedom and agency to decide what they do and where they go. More than half of a typical preschool day is spent in free play indoors and outdoors and children interact as often with peers as with teachers (Åström et al., 2022). This places free play as a key activity setting in the preschool microsystem of children in Swedish preschools (Bronfenbrenner and Morris, 2006; Merçon-Vargas et al., 2020). Knowledge of to what extent children participate in Swedish preschool free play is, however, scarce.

Swedish preschools are not described by the concept of inclusive since preschool is universally welcoming to all children. Most children aged 1 and 5 years (86 %) and almost all children aged 4 and 5 years (95 %) attend preschool on a regular basis (Swedish National Agency for Education, 2022a). Most children with established disabilities or special educational needs (SEN) are served in the same preschools as other children in their neighborhood. About 25 % of the children in Swedish preschools have a foreign background (Swedish National Agency for Education, 2022b), implying that the child or the child's caregivers are born abroad, with a large variation across preschools related to residential segregation (Delblanc, 2022). Many of these children are likely second language learners of Swedish. The national preschool curriculum, Lpfö 18 (Swedish National Agency for Education, 2019), governs all preschools. The curriculum stresses the importance of democratic values, a holistic approach to child development, and the importance of play for its role in children's learning and development and in its own value. Children should be provided with opportunities to learn both through their interaction with teachers and the other children in the group. Education should be of equivalent value throughout the country which requires differences in structure and resources. Teachers should specifically attend to children who for various reasons need extra support, permanently or temporarily, and all children's needs should be met. In a prevalence study (Lillvist and Granlund, 2010), about 15–20% of preschool children were estimated to have SEN. Some of these children were formally identified (e.g., by diagnosis) by external services, such as child health services, child habilitation, or child psychiatry. Most children were identified by preschool teachers only and can be referred to as informally identified children or teacher-perceived children with SEN. Both formally and informally identified children displayed similar problems, namely, problems with speech and language, peer interaction, and attention.

Previous Swedish observational studies conducted within and across free play (Lillvist, 2010; Luttropp and Granlund, 2010) compared the participation of children with disabilities, children with SEN, and typically developing children and found minor differences in the preschool activities that the children attended. Differences concerned less verbal interaction with peers among children with disabilities compared to typically developing children. Luttropp and Granlund (2010) also found that children with intellectual disabilities were more frequently observed in proximity to a teacher than their typically developing peers. No differences appeared in children's observed level of engagement. International research has shown that children with SEN spend less time with peers (Kuutti et al. 2021), participate less in social play (Suhonen et al., 2015; Kesäläinen et al., 2022), pretend play (Wong and Kasari, 2012), have smaller social networks (Chen et al., 2019, 2020), and spend more time unengaged in preschool (Wong and Kasari, 2012; Kuutti et al., 2021), compared to peers without SEN in ECEC. Other studies have shown that SLL children tend to display more behavior problems and lower levels of engagement in preschool activities (Finnman et al., 2021; Langeloo et al., 2021). Still, SLL children tend to receive less special support from teachers than non-SLL children (Almqvist et al., 2018).

In most of the reviewed studies of activities in preschool, the results are averaged across individuals in categorical groups (e.g., children with disabilities) which tend to neglect variation between children. This variable-based approach often leads to results that are valid for some, but not for all children in the study (Bergman et al., 2003). When a group is heterogenous, as with children with SEN, many interaction effects on participation are likely, leading to different outcomes for children belonging to the same categorical group. The variable-based approach also tends to focus on single outcome variables or analyzing them one by one. Considering patterns of variable values is instead preferred to explore child participation in preschool activities (Pinto et al., 2019; Gustafsson et al., 2021; Langeloo et al., 2021; Schnitzler et al., 2021). Studying child participation as an outcome of inclusive ECEC might therefore be better investigated with a person-oriented approach.

Cluster analysis is a person-oriented method that puts the subject (child) in focus and allows the exploration of homogenous structures or patterns of values in selected variables among a sample of individuals (Bergman et al., 2003). By using a person-oriented approach, a more detailed picture of child participation could be revealed. *Participation* is commonly defined by the International Classification of Functioning, Disability, and Health (ICF) as a person's involvement in

a life situation (World Health Organization, 2001). Recent suggestions state that participation should be assessed with at least two dimensions: (a) attendance, i.e., being there, and (b) involvement, i.e., the experience while being there (Imms et al., 2017; Maxwell et al., 2018). Attendance concerns the frequency and duration of being present in the preschool. The involvement dimension includes elements of engagement, which concerns the individual's focus or effort while being there (Imms et al., 2017). Usually, the participation of children is reported as a summary score (Adair et al., 2018), although participation might be better described as a pattern with variations dependent on the environmental setting.

Free play is characterized by a high degree of peer interactions and pretend play (Storli and Hansen Sandseter, 2019; Coelho et al., 2021; Åström et al., 2022). Pretend play is a special form of play beneficial for children's development of cognitive and social skills (Lillard et al., 2013; Weisberg, 2015; Goldstein and Lerner, 2018). Positive peer interactions have been found important for children's preschool engagement (Sjöman, 2018) and suggestions have been made to incorporate social participation into the ICF definition of participation (Piškur et al., 2014). Children's social belongingness has also been stressed as an important outcome of inclusion (Odom et al., 2011; Bartolo et al., 2021). Focusing on children's presence in social interactions and pretend play therefore appears central when assessing participation in free play.

Attending an activity is not enough to experience participation. Children need also to be active and focused on the free play activities, i.e., to be engaged. Children's observed engagement can be viewed as an indicator of proximal processes (Ponitz et al., 2009) that are the drivers of development in the bioecological theory (Bronfenbrenner and Morris, 2006; Merçon-Vargas et al., 2020). Children's engagement in ECEC and school activities have been found to predict achievement (Ladd and Dinella, 2009; Aydogan, 2012; Lei et al., 2018; Langeloo et al., 2020) to be a mediator in the association between teacher–child relationship status and child achievement (Roorda et al., 2017) and to be related to child well-being (Pietarinen et al., 2014). Children's engagement in preschool has moreover been shown to influence teacher responsiveness (Sjöman, 2018; Finnman et al., 2021), suggesting a role for child engagement in shaping the process quality of the preschool.

Providing support for children's participation is key in inclusive ECEC (Odom et al., 2011) and extends to free play activities. The role of teachers in children's play is much discussed (e.g., Rogers, 2010; Weisberg et al., 2013; Pramling et al., 2019), and there is an agreement that teacher involvement depends on the situation. To decide whether and how to enter children's play, teachers need to be close to the children and be responsive (Pramling et al., 2019). Empirical studies on teachers' proximity to children report both positive and negative effects on children's play (e.g., Legendre and Munchenbach, 2011; Kendrick et al., 2012; Test and Cornelius-White, 2013; Singer et al., 2014; Sam et al., 2016; Acar et al., 2017; Tajik and Singer, 2021). This indicates that the impact of having a teacher nearby is highly variable and likely related to both situational factors and individual child characteristics. Looking at children's proximity to teachers in a person-oriented study of child participation in free play can be an eye-opener for teachers to be attentive to children who might need teachers nearby to facilitate participation.

The purpose of the current study is first to explore the observed patterns of participation in preschool free play activities of a sample of 3–5-year-old Swedish preschool children using cluster analysis. The exploration will be based on four observed participation-related variables, namely, (a) children's attendance in *pretend play*, where roles are being enacted, scenarios are being developed, and play resolves around a specific theme, (b) children's attendance in *associative and cooperative interactions*, i.e., sharing material and interacting with others with or without a clear goal, rules, or organization, (c) the child's *level of engagement*, i.e., how focused and absorbed the child is, and finally, (d) the child's *proximity*, i.e., being within 1–3 meters, to a small group including teachers. Note that we use 'preschool teachers' to refer to all preschool staff caring for the children, i.e., including child-minders without a preschool teacher education. Second, the characteristics of the resulting clusters in terms of child and preschool unit characteristics will be examined.

Materials and methods

Participants

For the current study, 453 children participated. The children came from 56 different preschool units (35 public and 21 private non-profit) located in 12 municipalities. One municipality dominated the sample (43.27%). Participant characteristics are described in Table 1.

Children with SEN included both formally identified children (e.g., by diagnosis, $n = 16$) and informally identified children (i.e., teacher considering that the child either needed special support to function in preschool, or that the child had apparent to severe problems relating to developmental delay, disability, emotions, concentration, behaviors, or interaction with people, $n = 36$). Twelve children (2.65% of the sample) had both SEN and SLL status. For children observed at two timepoints (see the data collection section), an identification of SEN in either or both timepoints resulted in SEN status. No data were collected on the socioeconomic status of the families of participating children. As Swedish preschools are universal and children came from different municipalities, socioeconomic diversity was expected in the sample.

TABLE 1 Participant characteristics.

	n	%	*M* (*SD*)	Range
Child-level				
Boys/girls[a]	219/231	48.67/51.33	–	–
Mean age months (SD)	–	–	55.52 (9.69)	36 to 77
SEN status[b]	52	11.50	–	–
SLL status[a]	49	10.90	–	–
TUTI/PEPI project	41/412	9.05/90.95	–	–
Preschool unit-level				
Children in the unit[c]	–	–	19.84 (3.93)	10 to 42[d]
Preschool teachers[c]	–	–	3.81 (0.88)	2 to 7
Teacher-child ratio[c]	–	–	1:5	1:3 to 1:8[d]
Children with SEN status[c]	–	–	0.42 (0.69)	0 to 2
Children with SLL status[c]	–	–	2.02 (3.40)	0 to 21
Resource (extra) staff [c]	–	–	0.49 (0.66)	0 to 2

[a] N = 450. [b] N = 451. [c] N = 443.
[d] The unit with 42 children and 8 teachers combined children and teachers from two units; an approach called "storarbetslag" or large work team.

Materials

The child observation in preschool (COP)

An adapted version (Coelho et al., 2021; Åström et al., 2022) of the COP (Farran and Anthony, 2014) was used to assess children's attendance in pretend play, attendance in associative/cooperative interactions, children's level of engagement, and their proximity to a small group including teachers in Swedish preschools. The COP is a systematic observation instrument developed for the U.S. preprimary preschool contexts, utilizing a time sampling procedure. Each child is observed for 3 s, directly followed by coding of several categories on a tablet with the FileMaker Pro software. The goal is to observe and code each child for about 20 times (sweeps) spread evenly across the preschool day. Specifically, the observer starts by identifying each child to be observed with the help of the teacher and notes a brief description (e.g., clothing) in the observation protocol. Then, the first child on the list is observed and coded, followed by the second child, the third child, etc. The procedure is repeated until all children have been observed and coded once (one sweep). The observer then starts again with the first child on the list and continues in the list order until the end of the preschool day.

The focus of the COP is on academic learning activities in a broad sense. It assesses the current activity or behavior and engagement level of the individual in terms of nine categories. Eight categories are behavior counts where the observer uses definitions in the COP manual (Farran and Anthony, 2014) to identify the type of behavior or activity occurring. The codes can be used to calculate frequency counts of specified behaviors or activity characteristics, e.g., frequency of attendance. Frequency counts of combinations of codes are also possible, e.g., frequency of associative interactions when in free play. The ninth category, level of engagement, is measured by a rating scale. The COP categories focus on the following: (a) children's listening and verbal behaviors (b) to whom the verbal/listening behavior is directed), (c) activity setting (e.g., small groups led by teachers, indoor free play), (d) children's proximity to others, i.e., being within 1 meter to someone (e.g., a single child, a small group including teachers), (e) interaction state (e.g., parallel, associative), (f) type task, (g) material (e.g., toys and games, art), (h) learning focus (e.g., literacy, pretend play), and (i) level of engagement, i.e., how focused and absorbed the child is, from *Low* = 1 to *High* = 5. Each observation category has various coding alternatives, but codes are mutually exclusive.

The COP with minor adaptations (Coelho et al., 2021; Åström et al., 2022) has shown relevance for use in Swedish preschool settings and evidenced high inter-rater reliability for most categories. In brief, the adaptations involved performing observations also in the outdoor preschool environment; extending the definition of proximity to up to 3 meters outdoors; adding more examples for outdoor observations; and allowing a higher engagement level than low to be coded when the child was involved in an essentially social interaction, i.e., no learning-related interaction.

In the current study, only observations where the activity setting was coded as indoor or outdoor free play were used. Free play was coded when at least 75% of the children in the group were considered having free play opportunities. This was indicated by teachers declaring free play to the children or when no other activity was announced or obvious to the observers (e.g., no teacher-led activity, no transitioning to other activity). Variables from four of the COP categories (proximity, interaction state, focus, and level of engagement)

were used to form participation patterns. The exact inter-rater agreements (%) and Cohen's kappa (κ) for the categories used in the current study were the following: proximity: 84.79 %, κ = 81.1; interaction: 78.80 %, κ = 72.1; and focus: 73.73 %, κ = 61.4. The five-level engagement scale was collapsed to a three-level scale to increase inter-rater reliability (1 = *Low/Medium Low*, 2 = *Medium*, 3 = *Medium High/High*). The exact agreement of the three-level engagement scale was 72.69 %, κ = 53.3. The intra-class correlation was 0.84.

Child characteristics

Information on child characteristics, i.e., gender, age, SEN status, and SLL status was collected from a teacher-reported questionnaire on children's general behaviors in preschool that was part of the larger projects. Completed questionnaires were available for all children in the current study as this was a requirement (see the data analysis section). Child characteristics are described in Table 1.

Preschool unit characteristics

Preschool unit characteristics were provided by preschool directors/principals through a short questionnaire as part of the larger projects, including the enrolled number of children and teachers, the number of children identified with SEN, the number of SLL children, and the number of resource/extra staff. Preschool directors provided characteristics for 52 of the 56 preschool units to which the participating children belonged. Preschool unit characteristics of the participating children are described in Table 1.

Procedure

The current study builds on data from two projects sharing a focus on the participation and engagement of children with and without SEN in preschool, which also covers the aim of the current study. The project Participation and Engagement in Preschool International (PEPI, 2015—ongoing) focuses on the participation of children in preschool settings in different countries, and its relation to participation in the home environment. The project Early Detection-Early Intervention (TUTI, 2014–2018) focused on the detection of preschool children who might later develop mental illness and what support is provided to these children in Swedish preschools. The projects were approved by the Regional Ethical Review Board in Linkoping, Reference No 2014/479-31, and 2012/199-31, respectively.

Recruitment and sampling

Children in the study were recruited through their preschools, which were selected by non-probability sampling. Municipality preschools and non-profit private preschools located in the southeast region of Sweden targeting children aged 3–5 years and at least one child with a disability were prioritized.

Data collection

The preschool observations were conducted by three trained project-employed observers (one in each unit), all women with university degrees. The approach to data collection differed somewhat in the two projects. In the TUTI project, only one timepoint of data with a maximum number of 20 individual observations was available. In the PEPI project, two time points of data (∼6 months apart) with a maximum of 30 individual observations were available for each time point. The data collection occurred in the fall season of 2014 (September–December) in TUTI, the fall season of 2015 (September to December), and the spring of 2016 (April–June) in PEPI. Observational snapshots of children using the COP were performed continuously for a full preschool day, ∼7 h (8 am to 3.30 pm) and up to 2 days for PEPI. Observers took a short lunch break when the children had their lunch.

Questionnaires on child characteristics were handed to teachers at the time of the observations and were collected personally by the preschool observers about a month later. Preschool directors provided preschool unit characteristics by filling in questionnaires by e-mail/post at the beginning of the respective fall season.

Data analysis

The study had a combined person-oriented explorative design with a subsequent variable-oriented comparative design. Preparation of the analytic variables was done in IBM SPSS Statistics 27. Observational data and questionnaire data were merged into the same dataset to enable the analyses. The analytic variables representing children's observed patterns of participation in free play were the following: (a) mean level of engagement, (b) proportion of attendance in pretend play, and (c) proportion of attendance in associative/cooperative interactions (where associative interactions almost exclusively made up this variable). The analytic variable indicating proximity to a teacher in free play was (d) the proportion of being in proximity to a small group including teachers in free play. This variable was chosen based on a previous study (Åström et al., 2022) showing that children in Swedish preschools were seldom close to a single teacher.

Child observational data were summarized across indoor and outdoor free play observations, timepoints (for PEPI), and projects to allow for enough observational sweeps on individual children. Comparative analyses showed no significant

differences in the relevant variables across the two timepoints and informed a combined use. All the observational variables, except the level of engagement, were computed as proportions of observations in which the target activity occurred, out of the total number of free play observations per child. For the level of engagement, the COP data structure implied initial frequency calculations of the low, medium, and high engagement in free play, respectively, rather than a single overall rating. The frequencies were multiplied by its respective engagement value (i.e., *low* = 1, *medium* = 2, and *high* = 3) to provide scores. The summarized scores were divided by the total number of observations in free play to provide the average level of engagement in free play for each child.

Some restrictions were applied to the sample. First, only children with teacher questionnaire data for timepoint 1 (or timepoint 2 if a child was observed only at timepoint 2) were included in the sample to allow for subsequent comparative analyses of the clusters. Second, only children with a minimum of five observational sweeps were included. Finally, recognizing the focus on associative and cooperative interactions in the current study, the sample was restricted to children with a minimum age of 36 months. The restrictions resulted in 482 children being eligible for the study (a further reduction of the sample to 453 children is described below).

To conduct the person-oriented analyses, the data were exported from SPSS to ROPstat statistical software, a professional version, freely available after contact with the creators (Vargha et al., 2015). The cluster analytical steps provided by Vargha et al. (2015) were followed. Pearson's *r* was first used to examine associations and potential multicollinearity among cluster variables (see Table 2). No multicollinearity was evident, and no missing values existed in the cluster variables. As part of the cluster analyses, a residual analysis with the targeted cluster variables was performed to identify and remove outliers. Technically, participants with extreme data (outliers) can create bias in the cluster structure, and theoretically, all cases cannot fit into a relatively small number of homogenous clusters (Bergman et al., 2003, p. 58). Outliers were defined as cases with an averaged-squared Euclidean distance (ASED) of 0.2 from its first nearest neighbor, resulting in 29 cases (6 %) of the original sample being excluded. The reduced analytical sample after the removal of residuals consisted of 453 children. The mean number of individual child observations was 19.50 ($SD = 8.40$).

Having no expectation of the number of resulting clusters, an agglomerative hierarchical cluster analysis with Ward's method was used as a starting point. This analysis was followed by several additional cluster analyses with a specified number of clusters (i.e., 7, 8, 9), with both the original and the reduced samples, and with and without K-means relocation of cases, to compare different clustering solutions. The aim was to arrive at a solution that was optimal in terms of the following: maximizing the differences between clusters, and maximizing the similarity within clusters (Bergman et al., 2003, p. 61), with homogeneity coefficients of the clusters being well below 1 (Vargha et al., 2015), reaching a percentage of explained error sums of squares (EESS%) around 67 % (Bergman et al., 2003, p. 99) and by providing interpretable or meaningful clusters (Bergman and Wångby, 2014). All cluster variables were standardized to allow equal contribution to the cluster solution. Post-analyses were performed to further assess the stability of the cluster structure. A stable cluster structure means that a similar pattern or value combinations remain even if some children change cluster membership in the different cluster analyses, or are dropped from the analysis, i.e., the generalizability of the cluster structure is strengthened.

TABLE 2 Pearson correlations among cluster variables ($n = 482$).

Variable	1	2	3	4
1. Level of engagement	–			
2. Pretend play	0.44*	–		
3. Associative/Cooperative interaction	0.34*	0.31*	–	
4. Proximity to a small group including teachers	−0.18*	0.30*	−0.16*	–

* $p < 0.01$.

Comparisons of child and preschool characteristics by clusters were made using the Chi-square test of independence for nominal data, and the Kruskal–Wallis *H* test adjusted for ties for scale-level data because of evidence of non-normality. Both with critical $p = 0.05$. *Post-hoc* pairwise comparisons were made using the Chi-Square test of independence with Bonferroni correction for nominal data, and the Dunn–Bonferroni test for scale-level data.

Results

Patterns of observed child participation and proximity to a small group including teachers in Swedish preschool free play

Based on stated criteria and a thorough examination of several cluster solutions, we identified eight patterns with respect to children's observed level of engagement, their proportion of pretend play, the proportion of associative/cooperative interactions, and their proportion of proximity to a small group including teachers in free play. The patterns were based on an eight-cluster solution after relocation ($n = 453$). All pre-specified criteria were reached: the explained variance (EESS%) of this solution was 66.33%; the point-biserial correlation was 0.34; the Silhouette coefficient was 0.55; the mean homogeneity coefficient (HC) was 0.69; and the HC range was 0.46–0.86.

TABLE 3 Patterns of observed level of engagement, pretend play, associative/cooperative interactions, and proximity to a small group including teachers in preschool free play ($N = 453$).

i	Cluster label	Engagement level	Pretend play	Associative/cooperative	Proximity SGT	*n*	HC
1	Very high participation	H+	H+ + +	H+	L	46	0.83
2	Average+	(H)	H+	A	A	68	0.86
3	More socially complex	A	A	H+	A	73	0.61
4	High proximity to SGT	A	A	A	H++	52	0.73
5	Engaged, less socially complex	H	(L)	L–	A	47	0.78
6	Average–	L	(L)	A	A	92	0.46
7	Low participation, high proximity to SGT	L–	L	L–	H+	56	0.65
8	Very low participation, low proximity to SGT	L—	L	L–	L–	19	0.83

H, High; L, Low; A, Average; SGT, Small group including teachers; HC, Homogeneity Coefficient.
A = z – +/– 0.439.
(H/L) = +/– 0.440 <= |z| <= +/– 0.674 (p: 25–33%).
H/L = +/– 0.675 <= |z| <= +/– 1.000 (p: 16–25%).
+/– = +/– 1.001 <= |z| <= +/– 1.404 (p: 8–16%).
++/– = +/– 1.405 <= |z| <= +/– 1.644 (p: 5–8%).
+ + +/— — = +/– 1.645 <= |z| <= +/– 2.044 (p: 2–5%).
+ + ++/— = +/– 2.045 <= |z| (p: 0–2%).

Cluster labels were provided based on the most signifying mean/s in each cluster. The patterns are presented in Table 3.

Based on the pattern of the standardized means for three of the variables (level of engagement, pretend play, and associative/cooperative interactions), the clusters indicated different degrees of child participation and could be ranked from very high to very low observed participation. Most notable were two clusters that indicated low participation (clusters 7 and 8 in Table 3). Specifically, in cluster 7 labeled *Low participation and high proximity to a small group including teachers*, children displayed a very low average level of engagement, a very low proportion of associative/cooperative interactions (more than 1 *SD* below the mean for both), and below average in pretend play. Children in this cluster had a very high proportion of proximity to a small group including teachers (more than 1 *SD* above the mean). In cluster 8, labeled *Very low participation and low proximity to a small group including teachers*, children revealed an exceptionally low average level of engagement (between 1.6 and 2 *SDs* below the mean), a very low proportion of associative/cooperative interactions (between 1.4 and 1.6 *SDs* below the mean), and below average engagement in pretend play. Children in this cluster had a very low proportion of proximity to a small group including teachers (below 1 *SD* of the mean).

Contrary to the clusters indicating low observed participation, four of the clusters indicated average to very high participation (clusters 1–4 in Table 3). Specifically, cluster 1 labeled *Very high participation* displayed an exceptionally high proportion of pretend play (between 1.6 and 2 *SDs* above the mean), a very high average level of engagement, and a very high proportion of associative/cooperative interactions (more than 1 *SD* above the mean for both). Children in this cluster were below the mean in their proximity to a small group including teachers. Cluster 2 labeled *Average+* displayed a very high proportion of pretend play (more than 1 *SD* above the mean), a tendency for a high average level of engagement, and an average proportion of associative/cooperative interactions. An average proportion of proximity to a small group including teachers was noted for children in this cluster. Cluster 3, labeled *More socially complex*, was characterized by a very high proportion of associative/cooperative interactions (above 1 *SD* of the mean), an average proportion of pretend play, and an average engagement level. Children in this cluster were at an average rate in their proximity to a small group including teachers. Cluster 4 labeled *High proximity to a small group including teachers*, displayed the highest rate of proximity to a small group including teachers across the clusters (between 1.4 and 1.6 *SDs* above the mean), and average rates in the level

of engagement, proportion of pretend play, and proportion of associative/cooperative interactions.

Cluster 5, labeled *Engaged, less socially complex*, was the only cluster that revealed a mixture of high and low participation variables, with a high average level of engagement, a very low proportion of associative/cooperative interactions (below 1 *SD* of the mean), and a tendency for a low proportion of pretend play. Children in this cluster had an average proportion of proximity to a small group including teachers. Finally, cluster 6, labeled *Average-* displayed an average proportion of associative/cooperative interactions, a low level of engagement, and a tendency toward a low proportion of pretend play. Children's proportion of proximity to a small group including teachers was at an average rate in this cluster.

The postanalyses showed that the resulting cluster solution had identical to highly similar centroids, i.e., the multidimensional averages, for five clusters (clusters 3, 4, 5, 7, 8 in Table 3) compared to the clusters in the eight-cluster solution using the original sample. The remaining three clusters (cluster 1, 2, and 6 in Table 3) displayed similarities to clusters using the original sample but with differences in level. This shows that the two clusters indicating low participation had among the most stable cluster structures. The "Very high participation" cluster appeared the most dissimilar compared to the 8-cluster solution with the original sample.

Characteristics of children in the clusters

Teacher-reported child characteristics were used to compare clusters. The results are summarized in Table 4. Significant differences between the clusters were noted in child age and in the number of SLLs. The cluster More socially complex had on average a significantly higher child age compared to the Average+ cluster (corresponding to about 6 months). The Very low participation and low proximity to a small group including teachers cluster had on average a significantly higher number of SLL compared to the More socially complex cluster. A marginally significant difference was noted in the number of children with SEN in the clusters. None of the pairwise comparisons approached significance. Notably, there was a low number of children with SEN in the cluster called Very low participation and low proximity to a small group including teachers.

Characteristics of preschool units in the clusters

Director-informed preschool unit characteristics were used to compare clusters. The analyses are summarized in Table 4. Significant differences were noted between the clusters in the average number of children, resource (extra) staff, and SLL on the unit level. Specifically, cluster 3, More socially complex, and cluster 6, Average-, had more children coming from units with a significantly larger number of children, compared to cluster 4, High proximity to a small group including teachers (corresponding to about two to three children more). Cluster 8, Very low participation and low proximity to a small group including teachers, had more children coming from units with a significantly higher number of resource (extra) staff than the four clusters: the High participation, Average+, High proximity to a small group including teachers, and Low participation, high proximity to a small group including teachers cluster (corresponding to about half a resource staff more). Cluster 7, Low participation and high proximity to a small group including teachers, had more children coming from units with significantly more SLL compared to cluster 1, High participation, and cluster 3, More socially complex (corresponding to about three additional SLL). Although not significantly different from the other clusters (perhaps related to the small cluster size), cluster 8, Very low participation and low proximity to a small group including teachers, had the highest number of children coming from units with more SLL. Notably, the children in the Very low participation and low proximity to a small group including teachers cluster did not come from the same preschool units. In other words, they did not share the same preschool environment. Instead, the largest representation of preschool units was noted in this cluster with almost one unique preschool unit per child. The smallest representation of preschool units appeared in the largest cluster, Average-, with about 25 % of the children coming from two preschool units.

Discussion

In the current study, we used a person-oriented approach to provide a detailed picture of children's observed patterns of participation and proximity to a small group including teachers in free play for a sample of 3–5-year-old children in a Swedish preschool for all. We also examined the characteristics of the resulting clusters in terms of child and preschool unit characteristics. The cluster analysis resulted in eight distinctive and meaningful patterns that could be rank ordered from very high to very low observed participation.

Children in cluster 1 indicated a very high observed participation with low proximity to a small group including teachers, suggesting these children were high functioning and quite independent. Children in clusters 2 and 3 indicated a rather high observed participation. The children in cluster 2 displayed more participation in pretend play while the children in cluster 3 had more associative/cooperative interactions. Both clusters showed average proximity to a small group including teachers, and the children were probably well functioning in the

TABLE 4 Differences in child and preschool unit characteristics by clusters ($N = 453$).

	High participation ($n = 46$)	Average+ ($n = 68$)	More socially complex ($n = 73$)	High proximity to SGT ($n = 52$)	Engaged, less socially complex ($n = 47$)	Average– ($n = 92$)	Low partici pation, high proximity to SGT ($n = 56$)	Very low participation, low proximity to SGT ($n = 19$)	$\chi 2/H(7)$	p	Significant pairwise comparisons ($i > i$) [d]
i	1	2	3	4	5	6	7	8			
Child											
Girls *n* (%)	26 (56.52)	36 (53.73)	30 (41.10)	27 (51.92)	27 (58.70)	39 (42.39)	24 (43.64)	10 (52.63)	7.70 [a]	0.360	–
Age months *M* (*SD*)	55.65 (8.49)	51.78 (9.34)	58.11 (7.95)	56.74 (10.24)	56.55 (10.91)	55.76 (9.94)	55.52 (10.54)	51.48 (7.55)	19.35	0.007*	3 > 2
SEN *n* (%)	2 (4.35)	6 (8.82)	5 (6.85)	9 (17.65)	6 (12.77)	9 (9.89)	13 (23.21)	2 (10.53)	14.08 [b]	0.050	No sign.
SLL *n* (%)	3 (6.52)	5 (7.35)	4 (5.48)	5 (9.80)	7 (14.89)	8 (8.79)	11 (20.00)	6 (31.56)	18.32 [a]	0.010*	8 > 3
Preschool unit											
Teachers *M* (*SD*)	3.67 (0.79)	3.75 (0.98)	3.92 (0.81)	3.76 (0.78)	3.62 (0.81)	4.03 (0.86)	3.74 (0.96)	3.65 (1.06)	16.74 [c]	0.019*	–
Children *M* (*SD*)	19.80 (3.51)	19.70 (3.36)	20.92 (3.92)	18.42 (4.08)	19.64 (3.20)	20.66 (3.83)	18.78 (3.78)	19.65 (6.85)	22.56 [c]	0.002*	3 > 4 and 6 > 4
Children per teacher *M* (*SD*)	5.52 (1.03)	5.45 (1.08)	5.49 (1.27)	5.02 (1.23)	5.59 (1.12)	5.31 (1.31)	5.28 (1.53)	5.38 (0.83)	8.48 [c]	0.293	–
Resource staff *M* (*SD*)	0.39 (0.61)	0.44 (0.64)	0.55 (0.73)	0.31 (0.61)	0.53 (0.66)	0.52 (0.60)	0.44 (0.63)	1.01 (0.75)	19.89 [c]	0.006*	8 > 1, 2, 4, 7
SEN *M* (*SD*)	0.50 (0.78)	0.68 (0.83)	0.38 (0.70)	0.25 (0.59)	0.49 (0.70)	0.30 (0.57)	0.43 (0.63)	0.59 (0.71)	11.14 [c]	0.133	–
SLL *M* (*SD*)	0.89 (1.52)	1.42 (1.97)	1.40 (2.70)	1.46 (2.32)	2.38 (3.39)	2.21 (3.39)	3.80 (4.99)	4.12 (6.65)	20.60 [c]	0.004*	7 > 1, 3

SEN, special educational need; SLL, second language learner.
[a] N = 450. [b] N = 451. [c] N = 443. [d] Bonferroni adjusted P-values.
* P < 0.05.

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preschool group. Children in cluster 4 revealed an interesting pattern with very high proximity to a small group including teachers and an average rate of observed participation. Children in this cluster tended to come from units with a lower number of children in the group and less resource staff. The very high proximity to a small group including teachers could potentially reflect an ambition of the preschool teachers to be active in children's play. An Australian study (Devi et al., 2018) showed that the beliefs of preschool teachers about their role in the play were related to their proximity to children in play. The high proximity could also be related to the physical space of the preschools serving children in this cluster, which can vary from large preschool facilities to apartments (Åström et al., 2022). Cluster 5 was the only cluster that revealed a mixture of high and low in the observed participation variables, with children displaying a high level of engagement but low associative/cooperative interactions and pretend play. The cluster had an average rate of proximity to a small group including teachers and did not stand out in any other respect. Children in cluster 6 indicated a less than average observed participation and had an average rate of proximity to a small group including teachers. It was the largest cluster, but the children came from few preschool units indicating highly shared preschool environments. Children in the final clusters 7 and 8 seemed to struggle with participation in free play and will therefore be discussed more in-depth.

Children in cluster 7, Low participation and high proximity to a small group including teachers, were infrequently observed in pretend play activities, rarely observed in associative/cooperative interactions, and had a low average engagement level. The children were, however, often observed in proximity to a small group including teachers. This cluster was characterized by children coming from preschool units with a higher number of SLL. Similarly, a study in the US (Early et al., 2010) found that children in classrooms with proportionally more children of another ethnicity (Latino and African American) or in classrooms serving children from lower socioeconomic backgrounds were observed in less stimulating activities in preschool, i.e., less free play, less learning-related activities, indicating that second language and socioeconomic background might play a part in the lower observed participation in this cluster. It is also known that preschools in areas characterized by many SLL and low socioeconomic status experience problems in recruiting educated preschool teachers (Persson, 2012) which may weaken the process quality of the preschool and could impact negatively on children's participation. Unfortunately, the current study did not collect data on the number of educated and certified preschool teachers in the preschool units so this assumption could not be explored.

What is clear is that the higher proximity to a small group including teachers for children in cluster 7 did not seem to translate into sufficient support for children's participation. Unfortunately, the current study cannot determine who initiated the proximity to a small group including teachers, but it might be that more children in this cluster were shadowed or followed by teachers. Shadowing children has been identified as a teacher strategy to handle children with behavior difficulties in Swedish preschools (Almqvist et al., 2018). The same study showed that these children often received attention in terms of teachers responding to children's negative behaviors, a strategy not ideal for promoting positive behaviors, such as engagement, and decreasing disruptive behaviors of children (Leijten et al., 2019). On the other hand, it could also be that children in this cluster sought proximity to a small group including teachers more frequently. Considering children's indication of low observed participation, this could suggest that children felt too insecure to explore and engage in free play activities, despite proximity to a small group including teachers. Research has stressed that the teacher–child interactions of children characterized by dependency and shyness are generally less researched compared to the teacher–child interactions of children displaying externalizing or functional behaviors in preschool (Verschueren and Koomen, 2021) and deserves more research attention.

It is important to note that having many SLL children in the preschool unit is challenging for all parties. Verbal communication is important in most preschool activities and not sharing the same first language can make interactions between children more fragile and difficult, especially in free play, and children need intentional support from preschool teachers (Björk-Willén, 2018). The Swedish Schools Inspectorate (2017) examined preschool teachers' daily work with language support in a random sample of preschools and found that 25 % of the preschools did not provide sufficient support in Swedish to SLL children. Observations from these preschools were characterized by teachers communicating less with SLL children, mainly providing behavior reminders and prompts, and refraining from inviting them into communication. In interviews, it became clear that these preschools lacked strategies for multi-language development and support from the preschool director/principal. The challenges are likely increased when the SLL children speak several different first languages that cannot be matched to the languages of preschool teachers, although this can be identified as a success factor for the language development of SLL children (Swedish Schools Inspectorate, 2017). It is also known that the possibility to learn Swedish as a second language decreases as the proportion of children with different first languages increases in preschool settings (Cekaite and Björk-Willén, 2020) and that children with the same first language sometimes are encouraged by preschool teachers to speak their mother tongue, which can lead to the exclusion of other children (Puskás and Björk-Willén, 2017). The challenges of having many SLL children in the preschool unit extend to the collaboration with caregivers of SLL children. When the caregivers cannot communicate in Swedish, the necessary

communication between the home and the preschool might be absent (Swedish Schools Inspectorate, 2017) and could impact negatively on children's preschool participation. Involving caregivers in children's preschool education is important for children's development and well-being and especially in areas of low socioeconomic status where caregiver involvement can compensate for a lower educational level (see Persson, 2015). Without educated preschool teachers, strategies, collaboration with caregivers, and enough resources, children in units with many SLLs might experience lower participation in free play. This situation could also reproduce and reinforce segregation and social inequality contrary to the ambition of Swedish preschools (Persson, 2015).

Cluster 8, Very low participation and low proximity to a small group including teachers had children who were seldom observed in pretend play, very infrequently observed in associative/cooperative interactions, and displayed exceptionally low engagement levels. The children were also infrequently observed in proximity to a small group including teachers. These children were among the youngest ones in the sample, were more often SLLs, and tended to come from preschool units with more SLL children. This finding is similar to a study (Langeloo et al., 2021) where SLL children in Dutch kindergarten (4–6-year-old) were overrepresented in profiles with lower behavioral engagement. The generally lower age, higher SLL status, and coming from unique preschool units could indicate that these children are language novices (Blum-Kulka and Gorbatt, 2014) who tend to be silent and observe for a shorter or longer preschool period when they cannot interact using their first language. These children might not have achieved the language level needed to enter social play (Blum-Kulka and Gorbatt, 2014; Skaremyr, 2014; Cekaite and Evaldsson, 2017) and need a lot of language support from preschool teachers. Notably, despite the children's indication of very low observed participation, few children were considered by teachers to have SEN. These findings are in line with a previous study (Almqvist et al., 2018) showing that SLL children and children with low engagement in Swedish preschools seldom get special support from teachers. The lower participation in terms of pretend play and associative/cooperative interactions is especially worrisome for SLL children as access to pretend play activities with other children is important for their language development and social belongingness (Rydland et al., 2014; Cekaite and Björk-Willén, 2020). It could be that children in this cluster tend to be invisible to preschool teachers. Swedish preschool studies (Sjöman, 2018; Finnman et al., 2021) have shown that teacher responsiveness is related to children's general level of engagement, but also that children's general level of engagement is related to teachers' responsiveness. This means that if children tend to be less engaged, then teachers might be less responsive toward them, and the children risk being neglected. A Finnish preschool observational study (Syrjämäki et al., 2019) also found that when children provided non-verbal initiatives, especially children with SEN, it was more often ignored by preschool teachers. The risk of neglect is perhaps increased in preschools where teachers focus more on the child group rather than on individual children (Ginner Hau et al., 2020). Or similarly, if preschools have an organizational perspective in relation to children with SEN, where definitions are related to the demands on the organization, rather than to the child's needs and characteristics (Sandberg and Eriksson, 2010). Preschools with an organizational perspective would perhaps favor the identification of children showing externalizing behavior and disturbing the group activities, rather than children who tend to be passive and unengaged, although this remains to be confirmed. It can also be that preschool teachers have an over-reliance on the potential of free play for children's language and social development, not realizing that children need a basic level of Swedish before they can be invited into social play and that they need support from the preschool teachers to achieve a basic language level and learn the preschool norms (Cekaite and Björk-Willén, 2020).

Interestingly, there was no significant difference in the number of children with SEN across the clusters, although more children with SEN tended to appear in clusters indicating low to average observed participation, and less so in clusters indicating high observed participation. Children with SEN were, however, represented in all clusters. This relatively large spread in the observed participation among children with SEN is in line with other person-oriented studies, where children or youth with disabilities or impairments have shown a large variation in participation and functioning (e.g., Almqvist, 2006; Castro and Pinto, 2015; Andersson et al., 2017; Lygnegård et al., 2019). This stresses the importance of taking a broader non-categorical perspective when examining child participation. Utilizing a person-oriented approach in the current study allowed a diverse picture to be seen of children's observed participation in free play in Swedish preschools. It also allowed for the identification of children showing low participation in free play that might otherwise remain unnoticed using a variable-based approach.

Whatever the reasons, displaying low observed participation in free play is worrying as free play constitutes a major part of the Swedish preschool microsystem (Åström et al., 2022). If some children rarely become engaged in activities with other children or adults, objects, or symbols, on a regular basis over long periods of time, less proximal processes will occur, leading to a negative impact on child development (Bronfenbrenner and Morris, 2006; Merçon-Vargas et al., 2020). Children's health and well-being will probably also suffer as these outcomes are closely related to participation (e.g., Augustine et al., 2022). A recent Swedish longitudinal preschool study using cluster analysis (Gustafsson et al., 2021) showed that children displaying more extreme behavioral patterns (e.g., highly favorable or unfavorable) tend to display similar patterns over time, while children in clusters close to the mean tend to change patterns more often. Gustafsson et al. (2021) discussed that the more

extreme behavioral patterns were likely related to a higher number of risk- or protective factors, both on the individual child level and on the environmental level. These factors may work to stabilize children's behavioral patterns, similar to other findings (e.g., Wille et al., 2008). If the low observed participation patterns found in the current study remain stable across the preschool years, more efforts are needed to identify these children early. Preschool teachers need knowledge and resources to identify children who display low participation behaviors in free play and to reflect on how participation is best supported for each child. Such an approach is needed to ensure that the Swedish preschool is truly inclusive in the sense that it is meeting the social and educational needs of all children (Nilholm and Göransson, 2017).

Limitations

The current study has some limitations to consider when interpreting the findings. First, the preschool children were selected by non-probability sampling, which strongly restricts the generalization that can be made to Swedish 3–5-year-old preschool children in general. Yet, the relatively large number of participating children and preschool units provided a level of variability worthy to explore.

Second, the data in this study were collected some years ago and might not be a perfect reflection of the current preschool situation. Since the time of the data collection the number of SLL children in Swedish preschools has increased (Swedish National Agency for Education, 2019). Considering that the design of the current study is rare in Swedish preschool contexts, the study was still deemed informative.

Third, the data in the current study was based on children's free play activities across 1 or 2 days and might not be representative of how individual children generally behave in free play (McWilliam and Ware, 1994). Children were also observed in varying frequencies ($M = 19.50$, $SD = 8.40$) because of differences in the data collection procedures, some children spending fewer hours in preschool, and the extent of free play offered to children on the observational day/s. This might have introduced variation among children in the representativeness of the observations. On the other hand, the relevance of representativeness depends on the nature of the observed analytic variables, more specifically, where they can be placed on the continuum of behaviors: from context-based to generalized behavioral tendencies (Yoder et al., 2018). For more context-based variables, like the analytical variables in the current study, representativeness is not essential (Yoder et al., 2018). Even so, the careful analyses with comparisons of several cluster solutions and analyses of structural stability indicated a rather stable cluster structure and strengthens the external validity of the findings.

Fourth, the current study was based on cross-sectional data and the extent to which individual children change their observed participation patterns across their preschool years could not be examined. To examine the stability of individual children's observed participation patterns, more studies with longitudinal person-oriented approaches are needed.

Fifth, it must be recognized that two of the variables used to explore the observed participation patterns in the current study give weight to more developmentally complex behaviors, i.e., amount of pretend play, and amount of associative/cooperative interactions, and might then tap on children's development more than on observed participation (as also indicated by the statistical difference in age for some of the clusters). The situation highlights the importance of distinguishing participation outcomes from developmental outcomes (Elbaum, 2020) in future theoretical and intervention work. Nonetheless, the current study provides an indication of observed child participation in a normative sense.

Conclusion

This person-oriented study provides a unique and much-needed picture of children's observed participation in Swedish preschool free play for a sample of 3–5-year-olds. The results indicated that several clusters of children in this sample had average to very high observed participation in Swedish preschool free play, but that there were two clusters of children who had low to very low observed participation. Children in one of the clusters seemed to be noticed by preschool teachers, while children in the other cluster appeared unnoticed. SLL children and children from preschool units with more SLL were more common in these clusters.

Although the study findings cannot be generalized to all children in Swedish preschools, and the stability of the pattern for individual children across the preschool years needs further investigation, there is reason to worry. Preschool teachers should be aware that some children need intentional and promotive support by teachers to participate in free play. Teachers need to identify children who participate less in preschool activities and who might benefit from more teacher proximity. Teachers also need to reflect on how their proximity impacts the participation of children differently and on the type of support they provide when being close to the children. This seems especially important for SLL children and for children in preschools with many SLLs. Providing this support likely demands increased knowledge among preschool teachers, as well as adequate resources. This is important to fully realize the Swedish preschool vision of a universal preschool meeting the needs of all children.

Finally, the person-oriented approach in this study helped to display children who appeared to have lower participation in free play that would likely remain invisible using a variable-based approach, as neither SLL nor SEN status could fully characterize the clusters. Adopting a person-oriented approach in the study of children's participation in ECEC, therefore,

appears useful. More studies are however needed to understand why the two clusters of children appeared to have lower observed participation in free play and how it can be counteracted. Children's own perspectives on preschool participation would also be highly valuable.

Data availability statement

The datasets presented in this article are not readily available because the data includes personal and sensitive information protected by the GDPR. Metadata is available in Swedish National Data Service (SND) https://doi.org/10.57817/cavz-p910. Requests to access the datasets should be directed to SND.

Ethics statement

The studies involving human participants were reviewed and approved by the Regional Ethical Review Board in Linkoping, Sweden, Reference No 2014/479-31, and 2012/199-31. Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin. Children were informed about the study aim and could decline to be observed.

Author contributions

FÅ and LA formulated the research idea together. FÅ was part of the project's data collection team, performed the data analysis and writing of the results, in discussion with LA, wrote the first draft of the article, and received input by LA on all parts. LA suggested the choice of design and analysis. All authors have read and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

The handling editor VC declared a past collaboration with the authors FA, LA.

Publisher's note

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Exploring classroom practices associated with greater student engagement that may benefit low-income students in the early grades

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Previous research has identified specific classroom practices that are associated with greater academic and self-regulation gains for students in prekindergarten (PreK) and kindergarten (K) classrooms. These practices include reducing time in transition, more time in sequential activities, more opportunities for associative and cooperative interactions, more math, teachers' using higher levels of instruction, positive classroom climate, and more teacher listening to children. This cross-sectional study aims to determine whether these specific classroom practices are associated with higher student engagement. A secondary goal was to examine whether economically disadvantaged (ED) students in more engaged classrooms scored higher on measures of math, language, and literacy. Researchers collected individual student assessment data in math, language, and literacy for a sample of 407 PreK and K students and conducted day-long observations in their classrooms. In addition to collecting behavioral count data on the focal classroom practices, observers rated students' engagement across the day. Results revealed that students who experienced more of the beneficial classroom practices also showed higher engagement. Covariate-adjusted standardized mean difference effect sizes showed the greatest differences for transition time, sequential activities, associative and cooperative interactions, teachers' listening, the amount of instruction, behavior approvals, and teacher tone, indicating that students experiencing more of these practices were more engaged than students experiencing fewer of these practices. To address our secondary goal of exploring between-group differences on assessments, we created groups based on ED status and engagement (operationalized using a median split for student engagement). While assessment scores were higher for non-ED students than ED students, regardless of their level of engagement, based on the literature researchers expected that ED students who were more engaged would have higher scores on assessments than their less engaged counterparts. Contrary to this hypothesis, there were few differences across groups. The largest positive effect sizes were for math and vocabulary. ED students with higher engagement had *lower,* not higher, scores on measures of literacy and passage comprehension. However,

the magnitude of these effect sizes was small. Results provide preliminary evidence that these specific classroom practices are associated with greater student engagement.

KEYWORDS

student engagement, economic disadvantage, low-income students, high quality instruction, early education

Introduction

A confluence of evidence suggests that lower achievement in early grades predicts lower achievement in subsequent grades (e.g., Duncan et al., 2020). A host of school readiness indicators such as pre-academic and socioemotional skills at age four have predicted later academic outcomes through Grade 5 (Ricciardi et al., 2021). Across six large-scale longitudinal studies, math, reading, and attention skills at school entry were the strongest predictors of later achievement (Duncan et al., 2007). Early math emerged as the most powerful predictor of later academic success. In another study that focused on math specifically, children who exhibited a low-level developmental trajectory of number knowledge in early childhood (i.e., ages 4-7) continued to have low mathematic achievement in second and fourth grades (Garon-Carrier et al., 2018). In fact, children in the low-level group fell about two years behind children in the higher trajectory groups. Thus, existing research consistently emphasizes the importance of early skill attainment for later achievement.

Risk factors for lower achievement in early childhood

Several risk factors for lower achievement emerge in the early childhood years. Early attention difficulties have also been found to significantly increase children's risk for reading difficulties and overall achievement (Rabiner et al., 2016). Similarly, growing evidence emphasizes the importance of socioemotional skills for achievement, independent of cognitive readiness skills (Cerda et al., 2014; Davies et al., 2016). Children with poor socioemotional skills, such as high levels of challenging behavior, face heightened risk of negative academic outcomes (Hamre and Pianta, 2001).

One of the most documented risk factors for lower academic performance in the early years is economic disadvantage (Halle et al., 2009; Pratt et al., 2016). Children from economically disadvantaged backgrounds enter school with lower academic skills compared to their higher-income peers (Lee and Burkham, 2002; Dotterer et al., 2012), and this difference persists through the middle (Liu et al., 2016) and high school years (Duncan et al., 2019). A study of reading achievement found that economically disadvantaged children in the low ability reading group in early elementary had a low probability of transitioning to the higher ability group through grade 8 (Liu et al., 2016). Children from low-income households also face challenges in long-term achievement, such as applying to and enrolling in post-secondary opportunities (Hardy and Marcotte, 2022).

One of the reasons for the strong, negative relationship between economic disadvantage and achievement is that children from low-income backgrounds are disproportionately exposed to adverse conditions such as living in neighborhoods with higher rates of crime and violence (Kasehagen et al., 2018), which has been found to predict chronic absenteeism and poorer achievement (Liu et al., 2013). At the same time, there are contextual factors, such as access to family-centered healthcare, that mitigate the negative effects of economic disadvantage on achievement (e.g., Bethell et al., 2014). Moreover, research has found that robust academic and socioemotional skill development prior to kindergarten can act as a protective factor minimizing the effects of economic disadvantage (Quirk et al., 2013).

Student engagement predicts achievement

Engagement has been identified as a key learning process in early childhood that predicts achievement during PreK (Lindström et al., 2021) and through eighth grade (Hamre and Pianta, 2001). Engagement in early childhood settings has been broadly defined as children's developmentally appropriate interactions across multiple activity types and contexts in the learning environment (McWilliam and Casey, 2008). More specifically, researchers have characterized engagement as orientation to and involvement in instruction and instructional activities, materials, and tasks (Zimmerman et al., 2017, 2020). A helpful theoretical framework to describe the relation between engagement and achievement is the performance-based model of instruction (Greenwood, 1996). This model theorizes that engagement is the path between instruction and child outcomes. Children must engage with high-quality instruction and activities to experience enhanced outcomes. The model

suggests that children's access to learning opportunities through direct instruction, interactions during child-led activities, or observational learning increases as their engagement level increases.

Children's connectedness with teachers also influences their achievement (Hamre and Pianta, 2001). The emotional connection and high-quality interactions between teachers and children is fundamental for young children's adaptation to and engagement with the school environment, which in turn relates to academic performance (Birch and Ladd, 1997). One indicator of high-quality interactions with teachers is prolonged conversations: more frequent complex language exchanges with teachers have been related to children's gains in language skills, a critical competence for school success (Burchinal et al., 2021). Positive teacher-child relationships also play an important role in the formation of social competencies that support positive adjustment to the school environment, such as initiating and sustaining interactions with peers (Hemmeter et al., 2021).

Risk factors for lower engagement

Structural factors that affect young children may also contribute to lower classroom engagement. According to the bioecological theory of human development, multiple and overlapping systems (e.g., home, school, and community) in which children interact influence their development (Bronfenbrenner and Morris, 2006). One such microsystem is the family unit. Low cognitive stimulation in the home, such as lack of learning materials and stimulating activities, are risk factors for academic achievement difficulties (Duncan et al., 1994) and decreased self-regulation (Downer and Pianta, 2006). Low cognitive stimulation outside of school may contribute to low classroom engagement because children have fewer opportunities to engage with learning activities that require paying attention and regulating behaviors, both of which support higher engagement in classroom activities. Economically disadvantaged children are significantly more likely to experience low cognitive stimulation in the home as family resources are restricted (Evans, 2004).

Acknowledging that economic disadvantage puts students at risk of being less engaged at school, several studies focus specifically on low-income studies to explore potential practices to help promote greater engagement (e.g., Lee and Bierman, 2015; Archambault et al., 2020). For example, Lee and Bierman (2015) identified classroom climate as being particularly important for students' engagement in a sample of kindergarten students transitioning from Head Start to elementary school. They then suggest future research should test the degree to which aspects of classroom climate are malleable and design interventions to promote improvement in climate.

Beyond the larger structural influences on engagement, such as early experiences of low cognitive stimulation and poor classroom climate, there is evidence that engagement may be a direct result of the quality of instruction children receive and the classroom activity settings they experience at school. For example, when teachers dominate the linguistic environment and leave little room for child talk, children's engagement suffers (Hindman et al., 2019). Moreover, specific parts of the day are more challenging for promoting high levels of engagement. Transitions have been associated with less positive engagement with teachers and tasks (Vitiello et al., 2012). In addition, children's level of engagement is often lowest during teacher-directed activities like whole-group instruction (Coelho et al., 2020).

Classroom practices that promote engagement

In contrast, activity settings that provide children with more choice (e.g., free choice centers) have been associated with more positive engagement with tasks and peers (Vitiello et al., 2012) and higher levels of involvement in learning activities (Coelho et al., 2020). A study of child behaviors and classroom settings across the day found that children who spent less time in whole group activities showed greater gains in language skills (Burchinal et al., 2021), indicating a higher degree of engagement and thus learning when more time was spent in smaller, more flexible groupings. Furthermore, child-managed experiences, such as play and activities in which children are active participants, have been associated with increased interactions and greater engagement (Markova, 2017). Child engagement is also related to teachers' communication-facilitating behaviors, such as listening, waiting for children to initiate, and being at the children's physical level to encourage child talk (Girolametto and Weitzman, 2002; Piasta et al., 2012). Further, when teachers foster a more positive classroom climate through positive student-student and student-teacher interactions, students are more engaged (Williford et al., 2014; Khalfaoui et al., 2021). This cluster of studies emphasizes the importance of specific characteristics of instructional interactions and types of activity settings for fostering high levels of engagement and subsequent learning. While some studies (e.g., Lekwa et al., 2019) have examined the relationship between broad domains of classroom practices and student engagement, no existing studies that we know of have examined which specific classroom factors are related to higher engagement for economically disadvantaged students specifically.

Classroom practices associated with student achievement

Recent research has focused on identifying classroom practices that are most predictive of students' academic and self-regulatory gains across the PreK (Farran et al., 2017) and K (Christopher and Farran, 2020) years. Using a classroom observation tool that focuses on collecting behavioral count data, the first study established a set of specific instructional practices that were predictive of students' gains across measures of math, language, literacy, and self-regulation over the school year. These practices include reducing time in transition, more time in sequential activities (i.e., activities that require planning, and doing things in a particular order), more opportunities for associative and cooperative interactions (i.e., activities that require back-and-forth communication between children toward a shared goal, such as taking turns playing a game), more math, higher levels of instruction (e.g., teachers asking inferential questions), positive classroom climate, more teacher listening to children, and higher student engagement. After the first year of the study, researchers continued to collect data on additional cohorts of students and their teachers in PreK classrooms, replicating the initial findings. Using the same observation protocol and individual student assessments, a subsequent study replicated these findings in a sample of K classrooms (Christopher and Farran, 2020), bolstering support for these practices as being important to promoting high quality instruction for young children. Although there is evidence of the benefits of these practices for children *regardless* of income status, it is likely that these practices may be particularly beneficial for students at high risk of being less engaged and, in turn, lower achieving: low-income students.

Current study

Our guiding framework (see **Figure 1**) is that specific classroom practices are more or less likely to promote student engagement, and that higher engagement is associated with higher achievement. Identifying practices that promote engagement for low-income students is particularly important given the ample evidence that these students are at greater risk of falling behind their peers (e.g., Brooks-Gunn and Duncan, 1997), and previous evidence indicates that student engagement is a strong predictor of achievement across all students, regardless of risk factors (Appleton et al., 2008). The current study aims to determine whether specific classroom practices that have been found to promote academic gains for young children (Farran et al., 2017; Christopher and Farran, 2020) are associated with higher student engagement for low-income students.

Given extant research, we expect to find that student engagement is associated with these key classroom practices, and we expect that ED students in classrooms with higher engagement will experience other beneficial classroom practices. In addition to our primary focus on associations between classroom practices and student engagement, as an exploratory analysis, we will examine students' assessment scores to see if ED students who are in more highly engaged classrooms also have higher scores on measures of math, language, and literacy.

Methods

In fall 2019, researchers collected individual student assessment data for a sample of 407 PreK and K students and conducted day-long observations in their classrooms (49 classrooms in total, 25 PreK and 24 K). Ten students in each classroom were randomly selected for individual assessments, but observation data were collected on all students present on the day of an observation. In total, 795 students were present for observations. Assessment data were not included in analyses if (1) data were incomplete due to the child indicating they did not want to finish any of the assessments or (2) we were unable to acquire students' economic disadvantage status. In addition to collecting behavioral count data on the focal classroom practices, observers rated students' engagement across the day.

Sample

Twenty-five schools were selected across Tennessee that house PreK, kindergarten, 1st, and 2nd grade classrooms as part of a larger study, focused on investigating the quality and alignment of classroom practices across the early grades. For the purposes of this study, we use data from PreK and kindergarten students and classrooms. Some of the schools had multiple classrooms for a given grade, so we randomly selected which classroom to enroll in the study with a few caveats: We wanted to avoid enrolling classrooms with teachers who were (1) new to teaching or (2) had recently switched from teaching one grade to another. In addition to the above eligibility criteria set for classrooms/teachers, we set parameters for schools' eligibility. We chose schools representative of each region of the state (West, Middle, East), representative of urban, suburban, town, and rural areas (based on the CDC 2005-2006 locale classification), and representative in terms of percentage of students who are economically disadvantaged and the percentage of black and Hispanic students. The study sample schools were randomly selected from the list of 437 schools that met eligibility criteria.

Two classrooms per school are included in the study sample: one from PreK and one from K. One classroom teacher opted out shortly after the study began. Thus, in fall 2019, researchers conducted day-long classroom observations and administered individual student assessments of math, language,

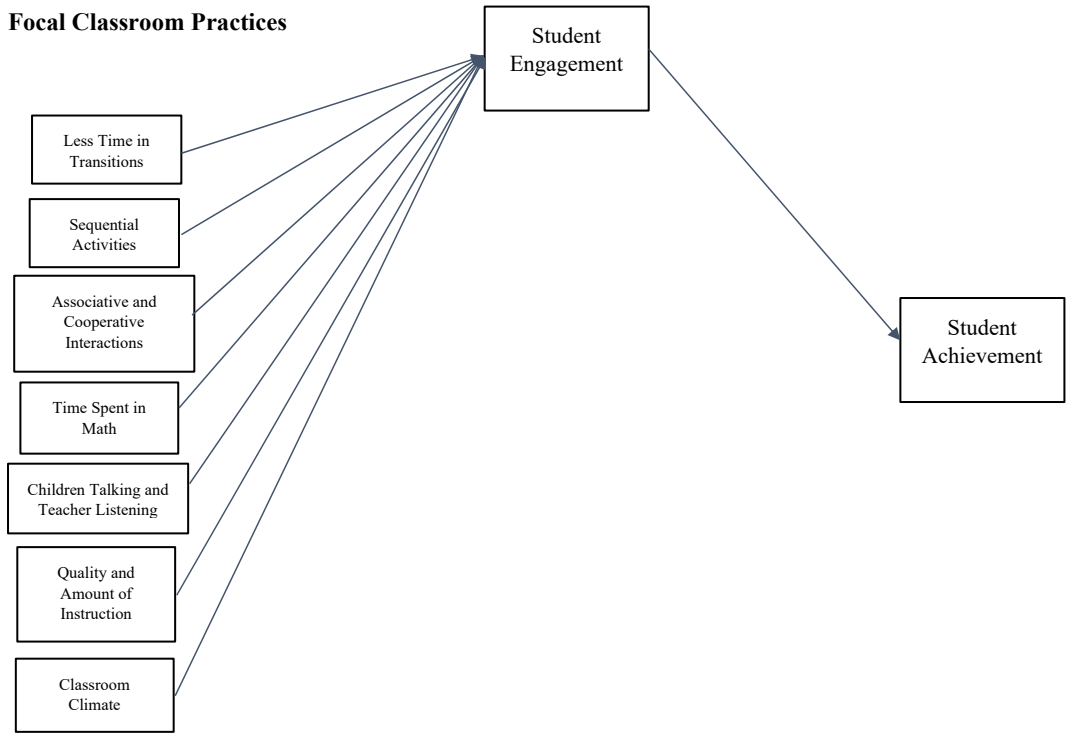

FIGURE 1
Guiding framework.

literacy, and self-regulation for a sample of 407 PreK and K students and conducted day-long observations in their classrooms (49 classrooms in total, 25 PreK and 24 K). In the fall of 2019, we conducted day-long observations and individual student assessments.

Observations

The *Child Observation in Primary Grades* (COPG) (Farran and Anthony, 2014) protocol was used to measure observable aspects of child behaviors in PreK and kindergarten. The COPG was completed in tandem with the *Teacher Observation in Primary Grades* (TOPG) (Bilbrey et al., 2007), which was used to measure observable aspects of PreK and kindergarten teachers' classroom behaviors. COPG/TOPG codes are quantified as either behavioral counts or ratings.

For each of 20-26 rounds of coding ("sweeps"), observers first coded the teacher followed by each individual child in the classroom before returning to the teacher to start another round of the observation and coding process. All children present during the observation day were observed and their behaviors were coded. For each sweep, a classroom member was located and then observed for approximately 3 s, after which the observer immediately coded nine areas of behaviors. Taken together, this collection of snapshots provided a picture of how individuals spent their time in the classrooms. Coding was done continuously throughout the day, with the exception of outdoor recess, indoor gym, and naptime.

COPG variables

The following categories of behavioral count variables were collected in the COPG instrument: verbal/to whom, schedule, interaction state, type of task, and content focus. Verbal and to whom codes were used to capture whether children were talking or listening and to whom they were speaking or listening. The schedule codes were used to document which learning setting the student was in during that specific sweep (e.g., transitions, whole group activities, small groups, centers, etc.). Interaction state captures whether children are alone, parallel (i.e., doing the same activity as another child without interacting), associative, cooperative, or unoccupied. The learning demands of the task and the child's behavior with the activity determine the type of task coded. Examples include fantasy/drama, passive instruction, and sequential activities (i.e., activities that require active participation and planning on the part of the child). Lastly, observers collected information on content focus to see not just what content teachers were presenting, but rather the actual content in which each child was engaged.

Variables from behavior counts were computed as a proportion of sweeps in which the behavior occurred out of the total number of sweeps observed. We used conditional probability looping syntax to create variables that capture the proportion of sweeps in which a particular code was chosen. With this method, a count/sum variable is created as the syntax directs the statistical software to search through a group of variables of the same category (e.g., content focus) and sums the amount of instances in which a certain code was used (e.g., math). After that count variable is created, we calculate a proportion in which the count variable is the numerator while the total number of times any content focus code was recorded is treated as the denominator (e.g., sum of math sweeps/sum of all content focus sweeps).

Student engagement

In addition to collecting behavioral count data on the focal classroom practices, observers rated students' engagement across the day on a 5-point scale from: low, medium-low, medium, medium-high, and highly engaged. For example, if a student is in an activity and looks away from time to time but returns to the activity, they would be rated as medium. If they are intensely focused on an activity and seem oblivious to noises around them, they would be rated high. And if it is clear that a child is off task (e.g., fiddling with another child's hair), they would be rated as low. Each classroom's average engagement was based on approximately 360 ratings, with the observer providing a rating of level of engagement each time they 'swept' a child.

TOPG variables

The following categories of variables were collected in the TOPG instrument: verbal/to whom, schedule, content focus, teacher task, level of instruction, and teacher tone. The verbal/to whom, schedule, and content focus codes used in TOPG are the same as those from COPG (described above). Teacher task captures the task or activity in which the teacher is engaged and is coded independently of what children are doing. Some examples are instructing, behavior approving, and behavior disapproving. The latter two codes make up part of the classroom climate element of a key quality practice. The level of instruction describes the instruction that is occurring during a specific sweep. It is a rating that ranges from 0 (none) to 4 (high inferential learning). When instruction occurred it was rated on a scale ranging from 1 (interaction with child and activity) to 4 (high inferential instruction). A rating of 2.0 signified basic instruction (e.g., "What color is this? What letter is this?"). Finally, the tone code reflects the positive or negative feel of the classroom. When observers code the teacher tone, they are examining the affect the teacher is displaying in that moment. Variables from ratings were computed as averages across all sweeps observed for each child for COPG variables or each teacher for TOPG variables. The PreK classrooms had one lead teacher and an assistant teacher, and the kindergarten classrooms had only one teacher, no assistants. For continuity across grades, we present TOP data based on the lead teacher in PreK classrooms and the only teacher in K.

For the purposes of this study, not all of the possible codes were used. Rather, we focused on the codes that contribute to the key quality variables identified in PreK (Farran et al., 2017) and kindergarten (Christopher and Farran, 2020): transition time, sequential activities, associative and cooperative interactions, time spent in math, children talking and teacher listening, quality and amount of instruction, and classroom climate.

Observer training and reliability

To achieve certification, observers attend a two-day training followed by classroom observations completed in tandem with an anchor observer to achieve reliability. We defined acceptable reliability as 80% exact agreement on codes within each of the seven areas of behaviors. Observers have up to three attempts to achieve reliability. All observers achieved interrater reliability with an experienced anchor observer. Exact percent agreement and Cohen's κ were computed and presented adequate values. Kappa coefficients for COPG interrater reliability ranged from.83 to.96. TOPG interrater reliability Kappa coefficients ranged from.80 to.91. For the COPG and TOPG variables based on rating scales, we defined interrator reliability as 70% exact agreement. Kappa coefficients for interrator reliability on ratings were as follows:0.74 for student engagement, 0.82 for teacher tone, and.89 for level of instruction.

Assessments

Language and literacy

Peabody Picture Vocabulary Test (PPVT-4; Dunn and Dunn, 2007) The PPVT requires children to point to one of four pictures that represent orally-presented words including nouns, adjectives, verbs, and adverbs.

Additional measures of language and literacy were drawn from the *Woodcock Johnson III Tests of Achievement* (WJIII; Woodcock et al., 2001).

The Letter-Word Identification subtest assesses children's knowledge of upper- and lower-case letters, as well as sight words.

Oral Comprehension assesses children's oral comprehension. During this subtest, the child listens to a short passage read aloud by the assessor and then must supply a word missing from the end of the passage.

Passage Comprehension assesses children's reading comprehension. During this subtest, the child first matches images with symbols then with short phrases. If the child is successful with these tasks, the child then begins reading sentences on their own and filling in missing words as appropriate.

Mathematics

We administered two subtests from WJIII to measure math. *Applied Problems* asks children to solve verbally presented mathematics problems, which are often accompanied by pictures of objects.

Quantitative Concepts assesses children's ability to recognize and name shapes, compare quantities or size of items, and manipulate the number line.

Demographic data

We received demographic data from each school at the beginning of the study including age (date of birth), race/ethnicity, home language, IEP status, gender, and economic disadvantage status (ED), which was defined as qualifying for free or reduced price lunch.

Analytic approach

Using the model presented in **Figure 1** as our guiding framework, we examined associations between specific classroom practices and student engagement. Then, we looked at whether and how student engagement was associated with measures of math, language, and literacy.

Observation data

The goal of our analyses was to provide a detailed description of the instructional practices, academic content, and types of activities and opportunities for student interactions that students experienced during the day-long classroom observations and compare those experiences for for students with higher and lower levels of engagement (operationalized using a median split for student engagement). We chose to use the median split to increase the interpretability of our findings. As DeCoster et al. (2011) note, "When trying to interpret a variable, it is much easier to consider differences between a limited number of groups than it is to consider differences along a continuum. It is often not clear how important specific numeric differences are (p. 199)." We compared students with lower engagement to students with higher engagement in terms of the focal classroom practices.

To further explore between-group differences based on a key risk factor for reduced student achievement, students' level of engagement, participants were split into groups based on ED status and their average level of engagement in learning. Then we compared ED-Low Engagement (i.e., ED students with lower engagement ratings) with ED-High Engagement in terms of the students' assessment scores. Similarly, we compared *non* ED-Low Engagement and *non* ED-High Engagement on assessments.

We conducted multilevel analyses of COPG (student-level data) to account for children nested in classrooms. We first calculated covariate-adjusted means derived from the multilevel models and then calculated Cohen's *d* standardized mean difference effect sizes (MDES) to quantify the magnitude of differences across groups. MDES for TOPG, classroom-level data, were calculated based on classroom-level covariate-adjusted means.

For models focusing on the association of student engagement with the other key classroom practices (described below and presented in **Table 4**), we included proportion of the class that was ED, had an IEP, were ELL, gender (male = 1), average age, and ethnic minority status (minority = 1).

Models examining students' assessment scores in relation to economic disadvantage and engagement used the student-level ED designation, which was linked to their individual scores (described below and presented in **Table 5**). The variable used to create the median split on engagement for the groups was at the classroom level. This is because while we collected observation data on all students in the classroom, we only collected assessments on 10 randomly selected children, and we did not track and link those students with their individual observation data. Thus, the way the data were collected, it was not possible to match a student's individual assessment score to their individual engagement rating.

Assessment data

We calculated age-adjusted standard scores based on students' fall 2019 assessments in math, language, and literacy. We then compared students' assessments across groups, calculating MDES based on covariate-adjusted means.

Results

Observations

Descriptive statistics revealed that students in our 49 classrooms spent, on average, 38% of their school day in transitions, with one student in transitions for 75% of their sweeps. Students were in sequential activities, tasks that require students to plan and follow steps, for 21% of the day on average. Associative and cooperative interactions were rare, with children engaging in these types of interactions 5% of the day. While the average amount of time in math was just 7%, there was one student that spent 35% of time in math. The average level of engagement was 1.95 (medium-low), with a range of 1.00 to 3.38. Children spent an average of 18% of sweeps talking, but 50 students in the sample were never observed talking.

Teachers listened, on average, 9%. However, there was substantial variation, with a range from 0% to the high of

25%, and a large standard deviation (7%) relative to the mean. While the average amount of time in instruction was over 30%, the average level of instruction was 1.85, indicating that teachers were engaging in basic skills instruction, which typically focuses on things like basic recall, letter and number recognition and asking known-answer questions. Classroom climate was fairly positive, with teachers showing a neutral to positive tone, and several classrooms in which very little disapproving was observed. However, there were 13 classrooms in which no behavior approvals were observed, meaning children were not receiving positive feedback from the teacher. Descriptive statistics for observation and assessment data are presented in Tables 1, 2.

Table 3 shows correlations among the indicators of the key classroom practices. The amount of time spent in transitions was negatively correlated with all other key practices, with the highest correlation between transitions and sequential activities (r = -0.60***) and student engagement (r = -0.73***). Sequential activities were significantly correlated with six of the 11 classroom practices Exceptions included associative and cooperative interactions, teacher listening, behavior disapproving, and teacher tone. The strongest associations were with a greater focus on math (r = 0.75***) and greater student engagement (r = 0.63***). In addition to the correlations among math and sequential activities, the amount of sweeps in which children were focusing on math was highly correlated with the amount and level of instruction (r = 0.44**,0.47***), student engagement (r = 0.37***), and tone (r = 0.34*). Interestingly, while engagement was significantly correlated with children talking, teaching listening, and the amount of instruction, it was not significantly correlated with the level of instruction (r = 0.16, n.s.) or any indicators of classroom climate. This may be reflective of the fact that there was relatively little variation in the level of instruction.

Other noteworthy correlations were among teacher listening and teacher tone (r = 0.49***), amount of instruction and teacher tone (r = 0.38***), and associative and cooperative interactions with teacher tone (r = 0.40**). Surprisingly, there were no significant correlations among the indicators of classroom climate. Moreover, teacher listening and child talking were not significantly correlated.

Comparing classroom practices occurring in classrooms with lower versus higher student engagement ratings

Next, we designated students as having lower versus higher average engagement by creating a median-split variable derived from all students' engagement ratings. Using covariate-adjusted means, we calculated effect sizes to quantify differences across groups. Results of these analyses, presented in Table 4, revealed substantial differences in the amount of time students in each group spent in transitions, the amount and level of instruction, sequential activities, math content, and the amount of teacher listening to children. Being more engaged was associated with less time in transitions (d = -0.52), more time in instruction (d = 0.64), more behavior approving (d = 0.49), more positive teacher tone (d = 0.75), more teacher listening and child talking (d = 0.43, 0.42), more time in sequential activities (d = 0.77), more associative and cooperative interactions (d = 0.43), and more time spent in math (d = 0.33). The effect size difference across groups on level of instruction approached zero (d = 0.03). And while the magnitude of the effect was minimal, those in the high engagement group experienced less behavior disapproving (d = −0.07).

Assessments

Students in our sample scored at the national average (100) for PPVT, and just under the average for WJ-III Applied Problems (99.75), but they scored lower on average than the national average on the other math, language, and literacy measures (see Table 2). Scores on WJ-III Quantitative Concepts, which measures students' quantitative reasoning and math knowledge, were lower than for other assessments, with age-adjusted standard scores of ED students averaging under 90.

Exploratory analysis comparing assessment scores of students who were in more versus less engaged classrooms

While the timing of data collection (i.e., a single timepoint during which observations and assessments were conducted) prohibits us from conducting prediction models to examine whether engagement *leads* to higher achievement, as an exploratory analysis, we examined assessment scores of students who were more versus less engaged. MDES were modest between high and lower engaged students, regardless of ED status, on all measures with the exception of Passage Comprehension. While assessment scores were higher for non-ED students than ED students, regardless of their classroom's average level of engagement, the scores for ED students with higher engagement were higher on Quantitative Concepts (d = 0.15) and on PPVT (d = 0.09). Interestingly, ED-High Engagement students had lower scores on Letter-Word Identification (d = −0.12), Oral Comprehension (d = −0.09), and on Passage Comprehension (d = −0.26). These results are presented in Table 5.

Non-ED students with higher engagement scored higher on all measures except Applied Problems (d = −0.12). Effect sizes were positive but very small on Letter-Word Identification (d = 0.06), Oral Comprehension (d = 0.04), and Quantitative Concepts (d = 0.07). There was a slightly larger positive effect on PPVT (d = 0.14). Non-ED students with higher engagement scored higher on Passage Comprehension (d = 0.35). This was the largest effect across all groups. It should be noted, however, that the Passage Comprehension measure is not administered in

TABLE 1 Descriptive information on key classroom practices observed.

		N classrooms = 49, *N* students = 795			
COPG variables	***N*[3]**	***M*[4]**	***SD***	**Min**	**Max**
Practice 1: Transitions					
Transitions[1]	793	38%	12%	14%	75%
Practice 2: Sequential Activities					
Sequential[1]	760	21%	12%	3%	70%
Practice 3: Peer Social Interactions					
Associative and Cooperative[1]	452	5%	6%	3%	35%
Practice 4: Time spent in Math					
Math Focus[1]	538	7%	8%	3%	35%
Practice 5: Children's Engagement					
Average Engagement (1-5 rating)[1]	795	1.95	0.34	1.00	3.38
Children Talking[1,5]	745	18%	10%	3%	54%
TOPG Variables	*N*[3]	*M*[4]	*SD*	Min	Max
Practice 6: Teachers Listening to Children					
Listening to Children[2]	40	9%	7%	2%	25%
Practice 7: Quality and Amount of Instruction					
Teacher – Amount of Instruction[2]	49	31%	12%	8%	66%
Teacher - Level of Instruction (1-4)[2]	49	1.85	0.21	1.00	2.11
Practice 8: Classroom Emotional Climate					
Teacher - Behavior Disapproving[2]	37	5%	5%	2%	19%
Teacher - Behavior Approving[2]	36	4%	4%	2%	18%
Teacher – Tone (1-5 rating)[2]	49	3.27	0.25	2.95	3.83

Variables created with COPG are based on all children present in the classroom on observation days; not just the students who were assessed. [1]All variables represent the proportion of sweeps a given variable was observed except for Level of Instruction, Teacher's Tone, and Children's Level of Involvement which are Likert-type scores. [2]Variable from Child Observation Protocol, df adjusted for nesting of children within the classroom. [3]Variable from the Teacher Observation Protocol. [4]For COPG variables, the N is based on the number of children who were observed doing a given behavior. For TOPG variables, the N is based on the number of teachers observed doing a given variable. The means *do* take into account the fact that a participant might have been observed in a given behavior 0% of their sweeps. [5]Practice 6, Teachers Listening to Children, is operationalized using one variable from TOPG (teacher listening) and one variable from COPG (children listening).

TABLE 2 Means and standard deviations for student assessment standard scores.

Outcome	**Full sample** ***N* = 407**	**Not economically disadvantaged** ***N* = 177**	**Economically disadvantaged** ***N* = 230**
	M (SD)	***M (SD)***	***M (SD)***
WJ-III Letter-Word Identification			
Standard Score	95.95 (12.71)	98.06 (12.60)	94.33 (12.58)
WJ-III Oral Comprehension			
Standard Score	95.12 (14.49)	97.22 (15.31)	93.50 (13.65)
WJ-III Applied Problems			
Standard Score	99.75 (14.05)	102.10 (13.71)	97.94 (14.07)
WJ-III Quantitative Concepts			
Standard Score	91.41 (12.40)	94.13 (12.06)	89.34 (12.28)
Peabody Picture Vocabulary			
Standard Score	100.21 (15.89)	103.27 (16.22)	97.87 (15.27)
WJ-III Passage Comprehension[a]			
Standard Score	95.31 (11.46)	96.28 (11.23)	94.04 (11.71)

[a]WJ-III Passage Comprehension is only administered to students K and up (N = 197) as opposed to the full sample including PreK students (N = 407). Standard scores are normed and age-adjusted. Intraclass correlations (ICCs) for each assessment are as follows: Letter-Word 0.14, Oral Comprehension 0.09, Applied Problems 0.10, Quantitative Concepts 0.14, PPVT 0.06, Passage Comprehension 0.07.

PreK and, thus, the effect size is calculated from a sample size that is half that of the other assessments (ED Low Engagement N = 51, ED High Engagement N = 34; Non-ED Low Engagement N = 38, and non-ED High Engagement N = 74).

Discussion

By using day-long classroom observations, the present study identified specific, measurable factors that are associated with

TABLE 3 Correlations among indicators of the key classroom practices.

COPG variables	1	2	3	4	5	6	7	8	9	10
Transitions										
Sequential Activities	−0.60***									
Associative/Cooperative Interactions	−0.30*	−0.14								
Math Focus	−0.35*	0.75***	−0.24†							
Average Engagement	−0.73***	0.63***	0.36*	0.37**						
Children Talking	−0.23	0.29*	0.26†	0.21	0.37**					
TOPG Variables										
Teacher Listening	−0.25†	0.08	0.15	0.01	0.32*	−0.04				
Amount of Instruction	−0.31*	0.43**	0.25†	0.44**	0.37**	0.21	0.16			
Level of Instruction	−0.10	0.35*	−0.19	0.47***	0.16	0.01	0.14	0.32*		
Behavior Disapproving	−0.10	0.12	−0.07	−0.01	−0.01	−0.09	−0.07	−0.17	0.02	
Behavior Approving	−0.09	0.29*	−0.26†	0.16	0.16	−0.24	−0.30*	0.09	0.21	0.05

†$p < 0.10$. *$p < 0.05$. **$p < 0.01$. ***$p < 0.001$. Correlations are based on observation data from 49 classrooms.

TABLE 4 Effect size differences, comparing classroom practices occurring in classrooms with lower engagement versus higher ratings of student engagement.

		Low engagement			High engagement			
	Measures	*N*	*Mean*	*SD*	*N*	*Mean*	*SD*	MDES
COPG Classroom Practices								
Transitions	Time in Transitions[2]	395	39%	10%	400	34%	12%	−0.52
Sequential Activities	Sequential[2]	395	17%	9%	400	25%	12%	0.77
Peer Interactions	Associative/Cooperative Interactions[2]	395	4%	5%	400	7%	6%	0.43
Time spent in Math	Math Focus[2]	395	6%	6%	400	8%	8%	0.33
Children Talking	Children Talking[2]	395	15%	10%	400	20%	11%	0.42
TOPG Classroom Practices								
Teachers Listening to Children	Teacher Listening[3]	25	7%	6%	24	10%	8%	0.43
Quality and Amount of Instruction	Amount of Instruction[3]	25	28%	10%	24	35%	13%	0.64
	Level of Instruction[3]	25	1.84	0.24	24	1.85	0.18	0.03
Classroom Emotional Climate	Behavior Disapproving[3]	25	6%	5%	24	5%	5%	−0.07
	Behavior Approving[3]	25	3%	2%	24	4%	4%	0.49
	Teacher Tone[3]	25	3.18	0.21	24	3.36	0.26	0.75

All Cohen's D standardized mean difference effect sizes (MDES) from COPG are estimated from the covariate-adjusted means derived from multi-level models to account for clustering of students within classrooms. MDES based on TOPG variables estimated from covariate-adjusted means from single-level models. Covariates include: percentage of children within a classroom identified as an ethnic minority, classified as experiencing economic disadvantage, percentage of male students, English Language Learners, percentage with an independent education plan, and for average age. [1]All variables represent the proportion of sweeps a given variable was observed except for Level of Instruction, Teacher's Tone, and Children's Level of Involvement which are Likert-type scores. [2]Variable from Child Observation Protocol. [3]Variable from the Teacher Observation Protocol.

greater student engagement, which is critical to student learning. We chose to focus on classroom practices that previous studies have found to be predictive of student achievement in PreK and K. Some of the practices are composed of more than one variable, with the majority quantified using behavioral count data. Three variables–level of instruction, teacher tone, and level of engagement– are based on ratings with behavioral anchors where interrator reliability was achieved. We operationalized classroom climate as a combination of factors including behavior approving, disapproving and teacher tone. Quality of instruction was defined as a combination of the level and amount of instruction. Finally, the amount of teacher listening and children talking were used to capture teachers' providing students with opportunities to talk during interactions. For one of these practices based on a combination of variables, more child talking, both components were significantly related to higher student engagement. None of the components of classroom climate were related to student engagement. While only one component of quality of instruction (amount of instruction, not level of instruction) was associated with student engagement.

The majority of the focal classroom practices are related to student engagement

In examining the associations between our focal classroom practices and student engagement, we found several significant relationships. First, and not surprisingly, students spending

TABLE 5 Means and standard deviations for ED student assessments with lower versus higher engagement.

	Economically disadvantaged students		
	Low engagement[1] (*N* = 121)	High engagement (*N* = 109)	
	M (SD)	*M (SD)*	MDES
Outcome			
WJ Letter-Word Identification	94.13 (13.22)	92.62 (11.85)	−0.12
WJ Oral Comprehension	94.06 (13.94)	92.88 (13.37)	−0.09
WJ Applied Problems	97.08 (13.52)	99.08 (14.75)	−0.01
WJ Quantitative Concepts	87.95 (11.89)	91.18 (12.60)	0.15
PPVT	96.72 (14.97)	99.37 (15.60)	0.09
WJ Passage Comprehension[2]	94.98 (11.17)	92.62 (12.51)	−0.26
	Non-economically disadvantaged students		
	Low engagement (*N* = 68)	**High engagement (*N* = 109)**	
	M (SD)	*M (SD)*	MDES
Outcome			
WJ Letter-Word Identification	97.89 (10.91)	98.67 (13.59)	0.06
WJ Oral Comprehension	97.32 (16.06)	97.87 (14.83)	0.04
WJ Applied Problems	103.67 (13.88)	101.98 (13.65)	−0.12
WJ Quantitative Concepts	93.96 (12.65)	94.85 (11.71)	0.07
PPVT	102.01 (18.47)	104.23 (14.51)	0.14
WJ Passage Comprehension[2]	93.80 (8.09)	97.73 (12.55)	0.35

All Cohen's D standardized mean difference effect sizes (MDES) from student data are estimated from the covariate-adjusted means derived from multi-level models to account for clustering of students within classrooms. [1]Engagement median split was based on classroom-level average engagement as students' observation data were not linked to their assessment data. [2]The WJ-III Passage Comprehension is administered beginning in kindergarten, so the sample size is half that of the other measures (*N* = 85 in the ED group and *N* = 112 in the Non-ED group).

more time in transitions had lower student engagement. Transitions are necessary throughout the school day – students must move from one activity to the next. When classrooms have transitions that last longer, however, it may be due to disorganization and a lack of students' internalizing the flow of the day. For example, in our observations, we noted that transitions were often due to students waiting while teachers gathered materials, waiting in line to wash hands, or stopping an activity while the teacher pauses to manage student behavior. During these transitions, students miss out on learning opportunities that are associated with higher engagement. This point is underscored by the fact that we found a strong positive relationship between the amount of time in instruction and engagement.

We also saw significant relationships between the amount of teacher listening and child talking with engagement. When teachers asked questions and provided space for children to respond, children tended to be more engaged. This mirrors research indicating that students benefit from extended wait-time during teacher-student interactions (McKay, 1988), and that teacher listening promotes greater student involvement (Cadima et al., 2015).

Similarly, we found that classrooms where there were more frequent associative and cooperative interactions had higher average student engagement. This is consistent with previous research indicating that children that have more opportunities to interact with one another, they exhibit higher engagement in learning (Coolahan et al., 2000; Morales-Murillo et al., 2020).

Moreover, students that spent more time in sequential tasks had higher student engagement. This is not surprising given that sequential tasks, by definition, require planning. Thus, to carry out a sequential activity, a student would need to have some level of engagement. Similarly, children in classrooms with more math content showed higher average engagement. In our sample, sequential activities and math were highly correlated. This is likely because many early math skills are sequential in nature, requiring planning (e.g., patterns, measurement). This planning, in turn, requires that a student be engaged. For example, a child creating a pattern with interlocking cubes would need to engage their working memory skills as they hold

the alternating colors in their mind and search for the correct color to extend the pattern.

Contrary to what we expected, none of the components of classroom climate were significantly correlated with students' engagement. However, when we examined the experiences of higher and lower engaged students, we found strong effects of behavior approving and tone, suggesting students who experienced a more positive climate tended to be more engaged. Several studies suggest that classroom climate contributes to student engagement (e.g., Khalfaoui et al., 2021). It is possible the non-significant correlations are at least in part due to there being little variation in teachers' use of behavior approving and disapproving, with data skewed toward zero. And, similarly, little variation in teachers' tone. More research on the contributions of the components of classroom climate is needed to gauge the relative importance for student engagement.

Lower engagement is related to poorer instructional practices

Using a median split on our indicator of child-level engagement, we compared two groups of students– those with higher engagement and lower engagement– in terms of the other focal practices they experienced. This allowed us to determine whether students in each group differed in terms of how their day is organized, the quality of instruction they received, the types of interactions they had, and the climate they experienced. Our findings suggest that being less engaged comes with a host of other issues including: having more transitions, less time in instruction, a more negative classroom climate, fewer opportunities for children to talk, fewer sequential activities, fewer associative and cooperative interactions, and less time in math content. Although each practice may uniquely contribute to lower engagement, it is likely that a combination of these problems makes it particularly difficult to be engaged.

At odds with previous research (Bundick et al., 2014; Spivak and Farran, 2016), we found that classrooms with higher engagement did not differ in their level of instruction. It may be that teachers in classrooms with lower student engagement are aware that their students are less engaged, and they are choosing to use, open-ended questioning, for example, in an effort to engage their students. Indeed, there is evidence that teachers are accurate at estimating the level of engagement of their students (Lee and Reeve, 2012), which informs their instruction.

There are also questions about the direction of effects for the associations born out in our results. Just as students react to teachers' behaviors, teachers react to students. One of our findings was that teacher tone was higher with more highly engaged students. When teachers' perceive their students are highly engaged, they may have fewer issues with behavior management and experience less stress. In this scenario, it seems plausible that teachers' tone is influenced by students' engagement. In support of this, previous research has found that teachers' emotions are highly influenced by their interactions with students and student behaviors, including student engagement (e.g., Hagenauer et al., 2015). Teachers often report that positive interactions with students ("seeing a breakthrough in learning") elicit feelings of joy and satisfaction (Hargreaves, 2000). Conversely, teachers report experiences of anger and frustration – which would affect a tone rating– in response to higher rates of student misbehavior (Chang, 2013).

Similarly, we found that teachers of highly engaged students spend more time instructing and listen more. But that may be due to the influence of student engagement on teachers' behaviors, rather than the reverse. For example, if students are less engaged in learning activities (e.g., book reading), they may be less likely to engage in discussion or answer questions, which, in turn, means teachers do not have the opportunity to listen to them. If students are less engaged, teachers also may spend less time in instruction due to the need to focus on behavior management.

Economically disadvantaged students in highly engaged classrooms show little difference in assessment scores

As an exploratory analysis, we also compared the assessment scores of low-income and higher income students from classrooms characterized as more highly engaged versus those with lower engagement. Contrary to what we expected given the previous literature, we found that low-income students in highly engaged classrooms only scored higher on one of the math measures and one on vocabulary; however, our concurrent data collection prohibits us from making causal attributions. If we had post-test assessments, it is possible that we might find that there are no associations between pre-test assessments and engagement, but that students in more highly engaged classrooms have higher scores by post-test (or more growth, controlling for pre-test scores) as compared to students in less engaged classrooms.

We found no meaningful differences in terms of low-income students' knowledge of letters and sight words and on oral comprehension. Moreover, we found that low-income students in classrooms with lower engagement actually scored higher on the measure of reading comprehension than those in more engaged classrooms. One explanation for this finding may be that more time spent in contexts associated with lower engagement, such as whole group activities, is not necessarily detrimental to all types of learning. In early childhood classrooms, one of the most common activities that occurs during whole group time is book reading. In our sample, students spent almost a quarter of the day in whole group activities, with students in classrooms with a higher proportion of ED students experiencing more time in whole group than

students in classrooms with a lower proportion of ED students. However, again, because we cannot investigate causality, we are merely speculating as to why we might see higher scores on reading comprehension for low-income students exhibiting lower engagement.

We do know from the literature that low-income students especially benefit from expository comments that give or explain information during book readings (Gerde and Powell, 2009; Barnes et al., 2017), whereas children with higher initial language skills, who tend to be from higher income backgrounds, benefit more from abstract discussion during book readings (Reese and Cox, 1999). In terms of measuring engagement, book readings that feature more teacher comments and fewer interactive discussions may lead to lower classroom engagement, on average. However, given evidence that knowledge-building comments are especially helpful for developing low-income students' narrative understanding, it's plausible that low-income students in low-engagement classrooms may score higher on reading comprehension due to more time spent in whole-group book readings that tend to be less engaging.

Non ED students in more highly engaged classrooms, however, scored higher on all measures except Applied Problems. While it is possible that student engagement, and the other beneficial classroom practices that are associated with higher engagement, are associated with higher scores, we found little evidence of this in the present study. It is important to acknowledge that the majority of the effect sizes describing group differences on assessment scores were small in magnitude. Moreover, as we have cautioned above, is possible that the timing of the data collection explains the lack of association. For example, if we had collected observation data early in the year and assessment data both at the beginning and end of the year, we might have seen that engagement had a positive effect on assessment scores. With cross-sectional data, we are limited to looking at associations from a single timepoint.

Though we cannot test this with our data, it is possible that the direction of some of the relationships between practices and assessments is the reverse of our framework (i.e., key classroom practices lead to higher engagement, which leads to higher achievement). For example, teachers' practices may be influenced by student characteristics such as the teachers' perception of their students' entering skill level and students' own behaviors. Indeed, research suggests that teachers' perceptions of students' ability within a class differ (Timmermans and Rubie-Davies, 2018), and that different expectations influence both teachers' instruction (Rubie-Davies et al., 2015) and students' subsequent achievement (Timmermans and Rubie-Davies, 2018).

It is also possible that many of these relationships are bi-directional. For example, it may be that teachers with students that have higher entering skills give them more opportunities to talk because students are more advanced in their vocabulary and are better able to answer open-ended questions. This, in turn, could lead to greater engagement.

Implications

Findings from the present study, particularly associations between student engagement and teacher practices, point to important topics for teacher training and professional development that are often overlooked. In early childhood classrooms, activity settings that provide more choice, like play and open centers, increase children's engagement (Vitiello et al., 2012; Coelho et al., 2020). Our finding on the relation between more frequent associative and cooperative interactions and higher student engagement offers a potential explanation for why activity settings like centers support engagement. During centers, children exercise greater choice over the types of materials they play with, how they play, and the peers with whom they interact. Associative and cooperative interactions occur when children are talking, working with shared materials, and co-constructing ideas together. Thus, one of the pathways between higher engagement and activity setting may be the presence of social learning interactions like the ones identified in this study. It takes considerable teacher skills to foster successful associative and cooperative interactions during centers. Some of these include previewing engaging materials and how to use them, modeling and pre-teaching cooperative games, and supporting social emotional skills like initiating play with peers and problem-solving. Yet PreK and early grades professional development efforts often focus on specific, content-based practices (e.g., how to teach discrete literacy skills), especially when PreK classrooms reside in elementary schools. Professional development and coaching efforts designed for early childhood classrooms that help teachers organize centers with interesting materials and facilitate peer interactions around shared topics will be necessary to increase occurrences of associative and cooperative interactions and thus bolster engagement.

A second focal area for professional development based on these findings is teacher-child discourse. Despite evidence that teacher language patterns are difficult to change (Dickinson, 2011; Mendive et al., 2016), targeted interventions with coaching demonstrate more success than comprehensive literacy and language professional development programs (Wasik and Hindman, 2011). The current finding on the importance of elevating teacher listening and child talk for increasing engagement supports prior research (e.g., Girolametto and Weitzman, 2002; Piasta et al., 2012) and provides a targeted area for coaching and teacher growth. In this study, the prevalence of teacher listening and child talk was linked to engagement, as opposed to the content or subject-matter of discussions, for example. Therefore, coaching efforts that support growth in teachers' listening behaviors, such as how often they position

their body at eye-level with children and look at children with a positive or interested expression to encourage child talk, could have a considerable impact on engagement.

Many practices identified in this study that were associated with engagement may be especially beneficial for students at risk for lower engagement and achievement, though our findings were inconclusive. Childhood poverty has been consistently linked to lower engagement and achievement due to multiple factors that tend to coincide in low-income households, such as low cognitive stimulation in the home and elevated parental harshness (Evans, 2004; Karreman et al., 2006; Pratt et al., 2016) that influence children's developing self-regulation (Blair and Raver, 2012). Self-regulation, in turn, affects children's ability to adapt to the school environment and engage in learning tasks at school in ways that support achievement (Blair and Razza, 2007).

Limitations and future directions

It is important to note the limitations of the cross-sectional design for the current study. The study was initially designed as longitudinal, with researchers planning to collect additional classroom observations in Spring 2020 and end-of-year student assessments. This would have allowed us to explore causal relationships. Unfortunately, with the onset of COVID-19, we had to suspend data collection and explore descriptive analyses and associations of classroom practices and students' assessment scores rather than testing causal relationships. While the cross-sectional nature of the data does not allow us to make causal attributions or examine student engagement as a mediator (**Figure 1**) of the relationship of key classroom practices and student achievement (i.e., due to the temporal order of data collection required), this study provides evidence that these specific classroom practices are associated with greater student engagement. We found only minimal evidence that engagement was associated with higher scores on measures of math, language, and literacy, regardless of economic disadvantage. Future research using a longitudinal design involving the collection of multiple time points of observation and assessment data is needed to determine whether these practices are the cause of increased engagement for ED students, and whether implementing these specific practices leads to greater pre-post gains.

Data availability statement

The datasets presented in this article are not readily available because the dataset produced from this study is kept by the Principal Investigator for internal use. The PI will review data requests on a case-by-case basis prior to making the data available. Requests to access the datasets should be directed to CC, caroline.h.christopher@vanderbilt.edu.

Ethics statement

The studies involving human participants were reviewed and approved by Vanderbilt University Institutional Review Board. Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin.

Author contributions

CC and KN contributed to the writing of this manuscript, with KN primarily focusing on the introduction and discussion. CC directed the data collection, conducted the data analysis, and created the tables presented as part of this manuscript. Both authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

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Does attending preschool in an economically advantaged or disadvantaged neighborhood moderate the effects of the preschool edition of promoting alternative thinking strategies®?

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Early interventions that foster the participation, engagement, and development of children attending preschools, including those in economically disadvantaged (low-income) neighborhoods, are of high priority. One such intervention is a universal socioemotional learning (SEL) program called Promoting Alternative Thinking Strategies (PATHS®) which aims to promote social emotional competence and positive adjustment in children, in general, and may have unique benefits for children attending preschool in low incomes areas. In the SEL field, areas in need of exploration include the possible role that neighborhood income level (i.e., all residents' income in a postal code that a preschool is located in) could have for children's social emotional competence and positive adjustment and how neighborhood income level may relate to benefits of an intervention such as PATHS. The study aims were to investigate 1) the baseline group differences in social emotional competence and adjustment depending on the neighborhood income level and 2) to determine if neighborhood income level moderated the effects of PATHS on children's social emotional competence and adjustment from pre to posttest. Participants were 275 children aged four to five years old, from the preschools randomized into an immediate intervention (n = 145 children) or a wait-list control group (n = 130 children). Overall, 42.9% (n = 118) of the children attended preschools in economically disadvantaged neighborhoods and 57.1% (n = 157) of the children attended preschools in economically advantaged neighborhoods. Children's social emotional competence and adjustment were assessed through child tasks, child observations and teacher reports. The moderation of intervention effects by the preschools' neighborhood income was tested in a series of just-identified structural equation models (SEM) that explored interaction effects

(income*PATHS interactions). At baseline, relative to children attending preschool in economically advantaged preschools, children attending preschool in economically disadvantaged neighborhoods showed lower levels of inhibitory control, working memory, task orientation and higher levels of inattention. Children attending preschools in economically disadvantaged neighborhoods participating in PATHS also showed reductions in inattention, social withdrawal and anxiety compared to control group children also attending preschool in disadvantaged neighborhoods. Additionally, PATHS children from advantaged neighborhoods improved their prosocial behavior, but not their social independence, relative to control group children who also attended preschool in advantaged neighborhoods. Offering PATHS as an SEL intervention in early childhood education and care settings could help to reduce disparities among children in a number of key outcomes.

KEYWORDS

PATHS, intervention, children, preschool, social emotional competence, adjustment

Introduction

Universal school-based interventions that promote social emotional learning (SEL) are increasingly implemented to promote healthy development among young children (Taylor et al., 2017). The idea is that such an intervention would provide an added boost to naturally occurring efforts within preschools to help children develop competencies such as positive socialization and emotional regulation (e.g., Domitrovich et al., 2007), which in turn would be of importance to children's engagement and participation in early childhood education and care settings (ECEC), such as in preschool. In the United States (U.S.), SEL-interventions are often implemented in neighborhoods and schools that are in neighborhoods in which economic disadvantage is widespread (e.g., Fishbein et al., 2016) and ECEC quality can be variable. One rationale for such an effort is to provide additional resources that can boost competencies among children with access to few resources (e.g., material, experiential, relational resources). The role that neighborhood economic level (i.e., economic disadvantage or advantage of residents living in the particular locality) has on the effects of an SEL-intervention's ability to foster children's social emotional competence is however rarely explored in the research literature. In this study, we investigated whether a SEL preschool intervention entitled: Promoting Alternative THinking Strategies (PATHS® Kusché and Greenberg, 1994) had differential intervention-related effects on social emotional competence and indicators of adjustment in children attending preschool in economically disadvantaged and advantaged Swedish urban and suburban neighborhoods.

Inclusive education in ECEC provides opportunities to improve achievement and positive development for each child (European Agency for Special Needs and Inclusive Education, 2014). In educational settings, one of the key aspects for quality of inclusion is child engagement in learning and school activities, defined as the amount of time a child interacts with the environment in a way that is developmentally and contextually adequate (McWilliam and Bailey, 1995; McWilliam and Casey, 2008). Indeed, child engagement is considered an indicator of positive functioning in the early years and is thus central for the study of early childhood education (Castro et al., 2017). In that sense, child engagement plays an important role for supporting children's school readiness (e.g., Williford et al., 2013; Aydoğan et al., 2015).

From the perspective of ECEC and inclusive education as suggested by the European Agency for Special Needs and Inclusive Education (2014), interventions that promote participation and engagement of children could be highly relevant in terms of school readiness (Morrissey and Vinopal, 2018). Skills such as positive socialization, social support and equitable social status can be regarded as critical for positive engagement and optimal development. These are all skills (also in some cases referred to as competencies) that are facilitated by SEL interventions and practices (Ryan et al., 2019), which focus on building internal and external assets in terms of enhancing social emotional competence as a goal in its own right, rather than having a sole or primary focus on reducing risk by targeting problems directly as a part of an intervention (Brackett and Rivers, 2014).

According to the Affective-Behavioral-Cognitive-Dynamic Model of Development (ABCD-model; Greenberg and Kusche, 1993), social emotional competence includes the developmental integration of affective, cognitive, and behavioral systems and can be further conceptualized as two interrelated domains:

intrapersonal and interpersonal (Collaborative for Academic, Social, and Emotional Learning [CASEL], 2013; Domitrovich et al., 2017). Intrapersonal competence includes skills such as self-control and emotional regulation, as well as being able to shift attention from one task to another, plan tasks, and utilize working memory (Collaborative for Academic, Social, and Emotional Learning [CASEL], 2013). Such intrapersonal skills are also encompassed with the concept of executive functioning (EF). EF is the ability necessary for goal-directed activity which may involve (a) an intention to inhibit a response (i.e., inhibition control), (b) ability to resist distracting stimuli (i.e., interference control), and (c) temporary mental representation of the task (i.e., working memory) (Pennington and Ozonoff, 1996; Collaborative for Academic, Social, and Emotional Learning [CASEL], 2013). The interpersonal competence domain includes skills that are needed to interact with others, such as communication, perspective taking, and social problem solving (Collaborative for Academic, Social, and Emotional Learning [CASEL], 2013; Domitrovich et al., 2017).

The early social emotional skills encompassed within the intrapersonal and interpersonal competence domains are regarded as fundamental for healthy development, including mental health (Greenberg et al., 2001; Taylor et al., 2017), lower risk for criminal violence, and drug use (Durlak et al., 2010), as well as success in the labor market (Heckman and Kautz, 2012). Given the critical role that social emotional competence plays in terms of life expectancies, investing in SEL interventions is key (Taylor et al., 2017). Indeed, SEL interventions seem to have long-term beneficial impact on child aggressive behaviors and aggressive problem solving (Crean and Johnson, 2013), executive functioning and grades (Watts et al., 2018), social emotional and self-regulation skills (Welsh et al., 2020), adolescent conduct problems, emotional symptoms, and peer problems (Bierman et al., 2021), as well as overall, social emotional difficulties (McCoy et al., 2018).

Moreover, recent meta-analysis based on 82 intervention studies showed significant positive impacts of SEL interventions on children's social emotional competence, attitudes, and academic performance compared with children in control conditions (Taylor et al., 2017). These effects were sustained on average 3.75 years following program participation, with the strongest follow-up effects among children who received the intervention during early childhood (ages five to 10 years old). In other words, children's social emotional learning and development is well suited to intervention efforts as early as preschool age. Preschool also represents an important opportunity for SEL interventions given the whole child ethos and mission of many ECEC settings in various parts of the world (e.g., Ferrer-Wreder et al., 2021).

Child engagement includes at least three components, i.e., behavioral, emotional, and cognitive engagement components (Fredricks et al., 2004) which is why these processes could be intrinsically linked. Indeed, the association between social emotional competencies and engagement has been evidenced in several studies (Durlak et al., 2011; Korpershoek et al., 2016; Yang et al., 2018; Salmela-Aro and Upadyaya, 2020) suggesting that SEL interventions and practices can be linked to higher child and student engagement across different levels of educational contexts. For example, teaching of intrapersonal skills (such as moral reasoning and self-discipline) and interpersonal skills (such as resolving conflicts, considering others' perspectives) has been associated with higher levels of engagement, including cognitive-behavioral as well as emotional engagement, particularly in young children (Yang et al., 2018). In that sense, providing children with opportunities to enhance their social emotional skills could pave the path for enhanced engagement and possibilities for developmental growth.

Promoting Alternative Thinking Strategies (PATHS®) is a universal SEL intervention that is designed to promote children's social emotional competence (Domitrovich et al., 2007). Goals within the PATHS conceptual model are, for example, to support children's ability to self-regulate, understand emotions and behaviors, as well as to prevent or reduce behavioral and emotional problems. PATHS has a significant focus on aspects of the child's daily context, namely the preschool and classroom contexts, which on a microsystem level, along with the home context, play a large role in shaping children's development. There are different PATHS editions for preschool, primary and secondary school. The preschool version is designed for weekly or bi- weekly implementation across the school year by trained classroom teachers (Domitrovich et al., 2007). The program modalities are guided by a curriculum containing 33 lessons, which are interactive and consist of activities such as self-calming techniques, giving and receiving compliments, and take-home activities. Each lesson lasts 10–15 min and can take place during circle-time. In addition to the lessons, PATHS is also integrated in everyday practice. For a description of the PATHS logic model, see the EPISCenter (2011). Indeed, the recent effectiveness trial of PATHS® among Swedish preschool children (Eninger et al., 2021) showed several benefits in children's social emotional competencies (emotional knowledge, working memory and prosocial play) and an unexpected intervention-related increase in hyperactive/impulsive behavior from pre to posttest. This trial (Eninger et al., 2021) utilized the same dataset that is analyzed in this article. The original intervention trial (Eninger et al., 2021) focused primarily on intervention-related main effects and moderated intervention effects by children's gender. This study demonstrated largely consistent findings with the wider intervention efficacy and effectiveness research literature on preschool PATHS in the U.S. and other nations.

More specifically, other U.S. based studies have shown intervention-related benefits in child emotional knowledge skills, social interactions, and reductions in social withdrawal (Domitrovich et al., 2007), as well as indicators of executive functioning, such as improvements in inhibitory control and

task orientation one year later (Bierman et al., 2008). However, as the preschool is a part of and interacts with the neighborhood where it is situated, the economic resources offered in the neighborhood context could be critical in terms of the effect of such an intervention has on children's social emotional development. Indeed, an evaluation of preschool PATHS in high-poverty U.S. neighborhoods revealed that children who received PATHS showed improvements in various aspects of social competence and behavioral problems one year later (Fishbein et al., 2016). These effects were sustained over time (Calhoun et al., 2020). To date, no prior preschool PATHS intervention study has investigated whether or not the neighborhood income level in which preschools are located as a potential moderating factor on the effects that preschool PATHS possibly confers on children's social emotional competence and behavior/adjustment. This is the knowledge gap addressed in the current study.

Neighborhood income level plays an important, but less explored role in children's development (Vinopal and Morrissey, 2020). Neighborhoods are defined in various ways in a global research context (e.g., from a registry data standpoint, census tract in the U.S., postal code in Sweden). In addition, the aspects/facets of the neighborhood that are important to child development and behavior are also examined from a number of different standpoints in the international research literature (e.g., built environmental features, green spaces, residents' income and educational background). This study focused on all residents' income at the postal code level, which represents the respective neighborhoods in which preschools, in this trial of preschool PATHS were located.

For the sake of brevity, in the remainder of this article, all residents' income at the postal code/neighborhood/preschool level is referred to as neighborhood income level. Neighborhood income level is notably connected to where a cohort of children attend preschool, although their homes may or may not be located in this neighborhood. Indeed, the neighborhood income level in which schools are located could be critical in terms of the quality of ECEC as reflected in preschools (Leventhal and Brooks-Gunn, 2000; Cloney et al., 2016) as well as have direct bearing on children's social emotional competence and behavior/adjustment, due to daily exposure to people and resources within the immediate context around children's preschool. Thus, more attention to the role of neighborhood income level as a contextual feature of possible importance for the development of children in ECEC is warranted (Vinopal and Morrissey, 2020). Moreover, universal school based SEL interventions are increasingly implemented to promote healthy development among young children (Taylor et al., 2017); and what role the neighborhood income that schools are located in and how that relates to intervention benefits of SEL interventions is however yet to be widely explored. In this article, we investigated whether a SEL preschool intervention (i.e., PATHS; Domitrovich et al., 2007) had differential intervention-related effects on social emotional competence and indicators of child behavior/adjustment among children attending preschools in economically disadvantaged and advantaged Swedish neighborhoods (urban and suburban areas).

According to ecological systems theory (Bronfenbrenner, 1979; Bronfenbrenner and Morris, 2006) children are co-influential actors with dynamic interrelated proximal contexts of development. In that sense, child development is in part inherently rooted in the social contexts that children live in on a daily basis. Accordingly, these contexts include immediate settings, called microsystems, which include for example a child's direct interactions with parents, peers, schools, and neighborhoods. These microsystems are in turn rooted and connected to several distal systems and processes, which are important to child development. The economic status of a neighborhood (i.e., neighborhood income level) plays a role both in terms of resident norms and collective efficacy (e.g., to address crime, disobedience) and institutional resources such as availability of schools and health care (e.g., Leventhal and Brooks-Gunn, 2000) which may be important to child development. Indeed, children living in economically disadvantaged (i.e., low-income) neighborhoods have evidenced poorer mental health (Riina et al., 2014) and cognitive development (Dean et al., 2018) including development of skills such as verbal and language proficiency (Kohen et al., 2009) and other skills critical for emotional and stress regulation (e.g., Lipina and Evers, 2017) relative to children living in economically advantaged (i.e., high-income) neighborhoods. Also, children in more economically advantaged neighborhoods in some cases have evidenced elevated positive development of cognitive skills such as reading and mathematics achievement in comparison to children living in economically disadvantaged neighborhoods (e.g., Sastry and Pebley, 2010).

The links between neighborhood context and aspects of child development could be explained through the impact of different structural or social mechanisms. Lack of safety, poor social cohesion, and the quality and structure of the family environment play an important role for development of cognitive, emotional, and behavioral skills (Minh et al., 2017). Often, these mechanisms accumulate which may overwhelm child physiological stress response systems and their physiological, emotional and attentional reactivity to stimulation (Brown and Ackerman, 2011). For example, in the context of unpredictability and absence of promotive resources that could be found in the neighborhood and/or family environment, stress exposure seems to shape brain development in ways that impedes development of executive function, including attention and emotional regulation skills (Blair et al., 2011). In that sense, instead of engaging in reflective and problem-oriented responses to stimulation, children exposed to disadvantageous environments rather can engage in defensive and reactive responses to stimulation (Blair and Raver, 2016).

In addition, the link between neighborhood context and child development may at least partially be explained by the quality of childcare institutions (Minh et al., 2017).

For example, a Swedish cross-sectional study with children four to six years old (a subset of children in the present study) showed that those children attending preschools in economically advantaged areas had elevated letter recognition and more rapid naming of objects (i.e., indicators of linguistic and reading development), in comparison to children attending preschool in disadvantaged areas (Herkner et al., 2021). In addition, a recent Swedish report suggests that the proportion of children who are eligible for high school at 16 years of age, as well as those who complete a high school education with a degree are higher among children who live in economically advantaged neighborhoods relative to children living in economically disadvantaged areas (Delegationen mot segregation, 2022). In that sense, high-quality ECEC settings could particularly be beneficial for children living in economically disadvantaged neighborhoods (e.g., Duncan and Sojourner, 2013).

Given the need to examine neighborhood income level and children's social emotional competence and behavior/adjustment, the following hypotheses were posed and guided this study:

H1. At baseline (or pretest), the level of social emotional competence and behavior/adjustment will significantly differ between children attending preschools in economically advantaged relative to economically disadvantaged neighborhoods. Guided by theory (e.g., Bronfenbrenner, 1979) and earlier research (e.g., Morrissey and Vinopal, 2018; Vinopal and Morrissey, 2020), we expected that children attending preschool in economically disadvantaged neighborhoods, would have significantly lower emotional knowledge/awareness, social problem solving and executive functioning (indexed by inhibitory control and working memory) (also referred to as primary outcomes, based on distinction between primary, secondary and distal outcomes in other PATHS intervention trials, e.g., Domitrovich et al., 2007), than children attending preschool in economically advantaged neighborhoods. For secondary outcomes, i.e., prosocial skills, task orientation, social cooperation, social interactions and social independence, we also expected children attending preschool in economically disadvantaged neighborhoods to score significantly lower relative to children attending preschool in economically advantaged neighborhoods. Children attending preschool in economically disadvantaged, relative to economically advantaged neighborhoods, would show higher levels of internalizing (social withdrawal and anxiety) and externalizing behaviors (aggression), inattention and hyperactivity (distal outcomes).

H2. Neighborhood income level will moderate the effects of PATHS on children's social emotional competence and indicators of behavior/adjustment from pre to posttest (please see **Figure 1** for a conceptual model). Based on the earlier research on the substantial value added to implementing preschool PATHS with children living in poor neighborhoods (e.g., Fishbein et al., 2016), we expected that, relative to children in the control condition who attended preschool in an economically disadvantaged neighborhood, those children attending preschools in economically disadvantaged neighborhoods who participated in PATHS would show unique intervention-related benefits in several aspects of social emotional competence and behavior/adjustment.

Materials and methods

Sample

Participants were 275 children aged four to five years old at baseline (M = 4.44 years old, SD = 6 months; 50.9% girls) attending 26 preschools in three municipalities in the Stockholm area. Preschools were randomly assigned to PATHS intervention (n = 145 children) or a wait-list control condition (n = 130 children) with normal classroom activities during the study. Overall, 42.9% (n = 118) children attended preschools in economically disadvantaged neighborhoods and 57.1% (n = 157) children attended preschools in economically advantaged neighborhoods (see **Table 1** for further description of the groups).

Procedure

Prior to the intervention study described here, two years of formative studies were carried out in order to culturally adapt PATHS to a Swedish preschool context. This was done according to a cultural adaptation process called the Planned Intervention Adaptation (PIA) protocol (Ferrer-Wreder et al., 2021). After the cultural adaptation process, a two-wave pre-posttest cluster randomized controlled trial of PATHS was conducted. Preschools from three municipalities, representing a broad variation in average household income were included in the trial. The recruitment process involved receiving assent from education administrators to recruit schools at the municipal level, and thereafter recruiting school principals and teachers with pupils aged four to five years old. Recruited schools were then randomly assigned to study condition (intervention or wait-list control) within the three municipalities, with intervention teachers taking part in a two-day training by a certified PATHS trainer, followed by a 1-day booster training. Members from the research group regularly visited the intervention teachers during the school year to support them in their progress with the curriculum. PATHS was implemented over the course of a school year, i.e., August-May. During this period of time the participating preschools aimed to complete

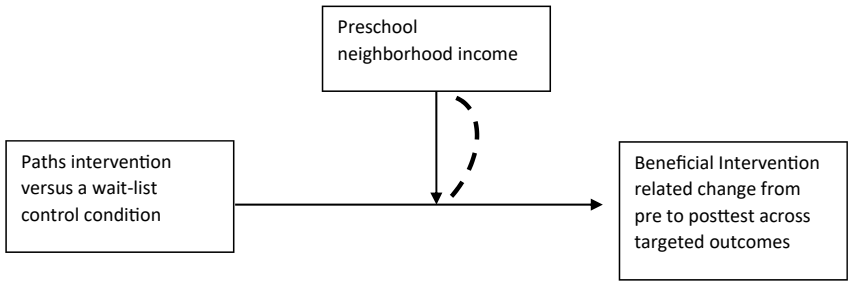

FIGURE 1
Conceptual model with neighborhood income as a moderator of the effects of PATHS. This figure is an adaptation of Howe's (2019) figure to display an effect moderation conceptually. Dashed line represents possible confounding variables for a moderated effect (Howe, 2019). Hypothesis 2 in this study examines this conceptual model. In practical terms, this conceptual model was examined one outcome at a time and the dashed line which represents possible confounding variables that were included as control variables in the analyses were: children's age at pretest, wave/cohort (data collection in the trial is spread out across two data collection waves) and preschool neighborhood income level.

TABLE 1 Allocation of preschools and children divided by economically disadvantaged and advantaged neighborhood groups.

	EDN			EAN		
	Paths% (*n*)	**Control% (*n*)**	**Total% (*n*)**	**Paths% (*n*)**	**Control% (*n*)**	**Total% (*n*)**
Preschools	8	3	11	6	9	15
Children	94	24	118	157	51	157

EDN, economically disadvantaged neighborhood; EAN, economically advantaged neighborhood.

the 33-lesson curriculum. Both lessons and extension activities (e.g., PATHS game or project) were implemented once a week and lessons took place during circle-time for about 15–20 min. Attendance for individual children was not monitored. Instead, dosage on classroom level was estimated based on the teachers report of how many lessons they had implemented. Pretest assessments were carried out at the beginning of the school year and posttest assessments were conducted at the end of the school year. This was done similarly in both intervention and wait-list control schools.

Children individually participated in the child tasks administered by trained research assistants during preschool visits. Teacher ratings of participating children were collected, and teachers and participating classroom received incentives for study participation such as movie vouchers/gift card of a nominal amount. Parents provided written consent for child participation and children provided verbal assent regarding their study participation. Implementation data were collected, and observer ratings of fidelity were carried out during the school year for intervention schools. This study was approved by a regional ethics review panel (dnr. 2012/1714-31/5). The protocol was registered at ClinicalTrials.gov (NCT04512157) after the trial was completed. As noted, the overview of the PATHS program including details concerning the topics and dosage, as well as the results of the main outcome evaluation for this trial of PATHS and moderation analyses by gender has been reported elsewhere (Eninger et al., 2021; Ferrer-Wreder et al., 2021).

Materials

The measures are described in the order of the hypothesized outcomes (primary, secondary, and distal) for this intervention trial that were based on the results of prior studies of preschool PATHS in the U.S. (i.e., Domitrovich et al., 2007; Bierman et al., 2008) at the time this trial was conducted.

Primary outcome measures were all child tasks and included: The Assessment of Children's Emotional Skills (ACES; Schultz et al., 2004) measuring emotional knowledge, the Challenging Situations Task (CST; Denham et al., 1994) measuring emotional awareness and social problem solving, as well as three indicators of children's executive functioning, namely motor inhibitory control (Knock and Tap task; Korkman et al., 1998), interference control (adapted Day-Night task; Gerstadt et al., 1994), and working memory (Word Span Task; Tillman et al., 2008).

For the ACES (Schultz et al., 2004) a standard protocol was followed in which children were shown a series of 14 pictures (one at a time). Each picture was of a child showing one of one of basic emotions (happy, sad, angry, sacred) or a mixed emotional expression. For those 10 faces with only one of the basic emotions, children's responses that correctly identified the facial expression were scored one for correct and zero for incorrect. After viewing each face, children were read in a fixed response format the names of the four basic emotions and also had the option to say that the face they saw showed no feeling. The ACES scale score (ACES-emotional knowledge) represents

the sum of the 10 faces that were correctly identified, and scores on this scale could range from 0 to 10. The internal consistency of the items was very good and evidenced Cronbach's alpha of 0.87.

For the Challenging Situations Task (CST; Denham et al., 1994) children were read four stories about a child who had an interaction with a peer who was not behaving in a prosocial manner and children were asked after each story (in an open-ended format, with standardized prompts) about how they would handle such a situation. For the CST scores, raters scored children's responses to the CST stories/prompts into four possible categories: CST-emotional awareness, CST-competent, CST-aggressive, and CST-inept. The CST scale scores are the sum of the responses across all four stories in each of these four types of responses. A child's response to a story could contain a score in more than one of these categories. The scale scores for the CST ranged from good [0.73 (Inept) 0.77 (Competent)] to excellent [0.91 (Emotional awareness) 0.97 (Aggressive)] interrater reliability using Intraclass Correlation Coefficients.

The three other child tasks in the primary outcomes are indicators of different aspects of executive functioning. All tasks followed a standardized protocol. For the Knock and Tap task (Korkman et al., 1998; IC1) and the adapted Day Night task (Gerstadt et al., 1994; IC2) the main interest was to provide different indicators of inhibitory control. Knock and Tap concerns motor inhibition and children are instructed to either knock or tap with their hand depending on the researcher's movement. Correct responses in which the directions are followed, and a dominant response is inhibited by the child yields a score of one. The Knock and Tap score was the sum of all correct responses and the possible score for a child ranged from zero to 30. Children's performance on the first and second subtasks are significantly associated with one another (r = 0.22; p = 0.002). The adapted Day-Night task (Gerstadt et al., 1994) provides an indicator of interference control. The task in this case is presented to the child as a series of images on a computer tablet and the images are timed with a presentation that becomes faster from the first to the last part of the task (from 1,500 to 1,000 milliseconds in subtest 1 and 2 of this task). When presented with an image, children are instructed to say the opposite of the image that they see in the picture. For example, if the child is shown a downward pointing arrow, the correct response from the child would be to say up. Correct responses were scored as one, and the possible scores for this task across two subtasks ranged from zero to 48. In a prior study with Swedish children, this task evidenced very good test-retest reliability with scores over time positively and significantly associated with one another (Thorell and Wåhlstedt, 2006).

The final indicator of executive functioning was a standardized Word Span task which was designed to provide an indicator of working memory (WM; Tillman et al., 2008). In this task, the protocol involves children hearing a series of words (could be two in a row and up to six in row in some trials) and children are asked to repeat back the words. The words are either one or two syllable words and when children repeat them back, they should be in the same order in which they were spoken. The Word Span task score represents the sum of the number of correct responses, which would be the number of correctly spoken words repeated back from the child across a series of trials. The possible score on this task can range from zero to 30 and for this sample the internal consistency reliability was acceptable at 0.63.

The remainder of the outcome measures were either observer (researcher) or teacher reports of children's social competence (secondary outcomes) or behavior/adjustment (distal outcomes). For the secondary outcomes, teacher reported scales included the Social Competence Scale (SCS; Sorensen and Dodge, 2016). Twenty-three items (rated on a 4-point scale) of the SCS were used in the present study. The SCS provides an indicator of children's teacher's view of their ability to be prosocial and communicate with others, as well ability to self-regulate emotions and the child's academic ability. The 23 items can be averaged into three scale scores namely, prosocial/communication skills, emotional self-regulation, and academic skills. The internal consistency of the scale scores, in this study were excellent and ranged from 0.92 (academic skills) and 0.93 prosocial/communication skills to 0.94 (emotional self-regulation).

The other teacher reported hypothesized secondary outcomes were three scale scores from the Preschool and Kindergarten Behavior Scales (PKBS; Merrell, 1996) which were designed to provide an indication of children's ability to cooperate, interact, and show independence in social situations. Across these scale scores (which are averaged scores), there are a total of 31 items that are rated by teachers on a four-point scale. These scale score's internal consistency reliability was very good [(0.86 social independence) (0.89 social interaction)] to excellent (0.90 social cooperation).

For observer reported scales among the hypothesized secondary outcomes, a scale of the SCS (Sorensen and Dodge, 2016) was used as well as a Task Orientation scale (Smith-Donald et al., 2007). The SCS was rated by two observers of participating children in a play situation and the Task Orientation scale was the rating of a single observer who was the interviewer of the child during the child tasks (described in the primary outcomes). At the end of the child tasks, the interviewer then made a rating of how the child performed while completing these tasks.

For the SCS items used in the play observation, in this case, only the scale score on prosocial/communication skills was used (and not all three scales within the SCS) and seven items (and not six items as in the teacher report for this scale) were used. Further, the response options also differed from the teacher reported SCS and for the play observation ratings, the SCS (prosocial/communication skills item) response options were added to in number of responses possible and were from

1 = Not at All to 5 = Very Well, with an added response option called did not observe, which was scored as missing). This modified SCS prosocial/communication scale was used by two observers who rated children's behavior in two standardized play situations with a large toy to be shared and played with by three children participating in the study (i.e., the Mobile Country Farm and the Marble Run Play Set). Observers made a separate rating for each of the three children during the play situation. The observers' inter-rater reliability was excellent and ranged from 0.92 to 0.93 (across toys; intraclass correlation coefficients). For the Task Orientation scale (Smith-Donald et al., 2007), the nine items of this scale concerned children's level and quality of attention during the child tasks and were rated by observers from 0 = Not True At All to 4 = Very True, and the internal consistency reliability (Cronbach alpha) of this scale was excellent at 0.94.

For the distal outcomes, all scales were teacher rating of children's behavior and adjustment. In this case, additional scales from the PKBS (Merrell, 1996) were used to provide an indicator of internalizing and externalizing behavior. Specifically, three scales from the PKBS were used to provide a teacher rating of children's social withdrawal, anxiety/somatic symptoms, and aggression (total of 22 items across these three scales) rated on four-point scale. Internal consistency reliability of these scales was very good [(0.86 social withdrawal) (0.87 anxiety/somatic)] to excellent (0.94 aggression).

The other teacher rated scales measuring distal outcomes were from the ADHD Rating Scale–IV (DuPaul et al., 1998). In this case, this instrument provided two scale scores (rated on a four-point scale and 16 items in total) that were indicators of children's inattentive and hyperactive/impulsive behaviors. The two scale scores were average scores across seven (inattention scale) and nine items (hyperactivity/impulsivity scale). The internal consistency reliability of these two scales were excellent, both scales at 0.93 (Cronbach's alpha).

Neighborhood level income indicator

First, we categorized preschools in economically disadvantaged and advantaged neighborhoods by comparing all resident incomes (e.g., monthly average income before taxes) for the postal code in which participating preschools were situated in during the intervention trial. This information came from registry data collected by Statistics Sweden. This amount was then compared against the average income for the entire region in which these postal codes were located during the time period of the intervention trial, which was 533, 475 Swedish crowns in year 2014, and 580, 675 Swedish crowns in year 2016. This comparison resulted in a categorization of either advantaged (above the regional average income) or disadvantaged (below the regional average income) resident income that was dummy coded into one of two possible categories and this represents the neighborhood income level that was then used in the hypothesis related analyses.

Data analysis

The H1 analyses involved an examination of possible average group differences in baseline level of social emotional competence and behavior/adjustment between children attending schools in economically disadvantaged neighborhoods in comparison to children attending schools in economically advantaged neighborhoods with a series of independent sample t-tests. We controlled family wise (primary, secondary, distal outcomes) error with a correction for the interpretation of a significant group difference by using a modified Holm-Bonferroni method which address the increased risk of Type I error due to multiple t-tests conducted.

The H2 related analyses consisted of a series of just-identified two-wave structural equation models (SEM) to test the possibility of the moderation of intervention effects on child level outcomes, by neighborhood income level. We used one model for each outcome variable. Each model included the posttest (called T2) outcome as the response variable and the same set of predictor variables. The predictors of the T2 outcome were PATHS (1 = intervention, 0 = comparison), age, cohort (1 = cohort 1, 2 = cohort 2), income (1 = above average, 0 = below average), and an interaction term (PATHS*income; Jaccard and Turrisi, 2003). The path coefficients (b) for the interaction terms provided estimates of the interaction between PATHS and income, holding constant the predictors. The significance tests for these path coefficients were tests of the null hypothesis that there was no interaction between PATHS and neighborhood income level.

Mplus 8.6 (Muthén and Muthén, 1998–2021) was the statistical software used to conduct the SEM models. Data across primary, secondary, and distal outcomes (child task, child observation, teacher reports) evidenced missing data from a low of 12–36%. Missing data were addressed in several steps such as the generation of 50 imputed data sets (which were pooled and provide the basis of the results reported here) with a Bayesian approach (Asparouhov and Muthén, 2021). Further, nesting of data by school building were addressed with the TYPE = COMPLEX command in Mplus (i.e., the use of Huber-White adjustment).

Results

H1: Possible differences in child outcomes by neighborhood income level, at baseline

Table 2 shows means and standard deviations in the child level outcomes at baseline. In terms of primary outcomes, children attending preschool in economically disadvantaged neighborhoods showed lower levels of inhibitory control ($t = 4.79$ $p < 0.001$), interference control ($t = 3.03$, $p = 0.002$) and

working memory (t = 2.70, p = 0.007) than children attending schools in economically advantaged neighborhoods. In terms of secondary outcomes there were no significant group differences. In terms of distal outcomes, children attending preschool in economically disadvantaged neighborhoods showed greater teacher-rated inattention (t = 3.12, p = 0.002) in comparison to children attending preschools in economically advantaged neighborhoods.

H2: Intervention moderation analysis

To examine H2 (i.e., did children attending preschools in economically disadvantaged neighborhoods differentially benefit from the intervention in terms of improvements in their social emotional competence and behavior/adjustment), we conducted a series of covariate adjusted SEM models with the interaction term (PATHS*income) predicting post-test outcomes. This creates a comparison between four subgroups of children, those in the intervention condition attending preschools in advantaged or disadvantaged neighborhoods, as well as those in the control condition attending preschools in advantaged and disadvantaged neighborhoods. Table 3 shows the standardized interaction parameter estimates from the tested SEM models, and Table 4 shows the observed subgroup mean and standard deviations. The cut off for the interpretation of a substantive difference between subgroups was set as: (1) a standardized parameter estimate of an absolute value of ±0.20 or higher based on the benchmarks developed earlier intervention studies (e.g., Taylor et al., 2017; Eninger et al., 2021) and (2) the interaction effect should be within the range of the confidence intervals. Using this criterion and analysis approach, we found three interaction effects between PATHS (intervention/control) and preschool neighborhood income (advantaged/disadvantaged) with significant differences between the subgroups. Results indicated that for hypothesis 2 (moderation of intervention effects by subgroups with unique intervention related benefits for children attending preschool in disadvantaged neighborhoods), there were no significant subgroup differences for the primary outcome measures.

TABLE 2 Means and standard deviations at baseline.

	Pre-test	EDN		EAN	
	Min-max	M	SD	M	SD
Primary outcomes					
ACES-emotional knowledge	1–10	6.83	1.95	7.05	1.64
CST-emotional awareness	0–11	4.31	1.51	4.21	1.81
CST-SPS: competent	0–8	2.32	2.31	2.61	2.21
CST-SPS: aggressive	0–9	0.94	1.56	0.62	1.27
CST-SPS: inept	0–7	0.57	1.03	0.55	1.14
IC1: knock and tap task	6–30	22.37	6.95	26.01	4.60
IC2: day-night task	0–47	24.90	14.56	30.56	12.70
WM: word span task	0–23	10.02	4.51	11.56	4.38
Secondary outcomes					
Prosoc/communication	0.67–4	2.85	0.81	3.00	0.94
Prosocial skills (observer)	1–5	3.55	0.73	3.65	0.72
Task orientation	0.44–4	2.76	0.90	3.03	0.82
Social cooperation	1.18–3	2.60	0.43	2.65	0.44
Social interaction	0.10–3	2.32	0.58	2.44	0.53
Social independence	0.50–3	2.63	0.44	2.68	0.38
Distal outcomes					
Social withdrawal	0–2.29	0.61	0.60	0.61	0.61
Anxiety/somatic symptoms	0–2.71	0.45	0.59	0.48	0.54
Aggression	0–2.88	0.43	0.62	0.47	0.71
Inattention	0–3	0.92	0.80	0.60	0.72
Hyperactivity/impulsivity	0–3	0.81	0.80	0.60	0.65

EDA, economically disadvantaged neighborhood; EAA, economically advantaged neighborhood.

However, there were two significant interaction effects for the secondary outcomes, and three significant interaction effects for the distal outcomes.

First, there was a PATHS*income interaction effect on observer rated prosocial skills (a hypothesized secondary outcome), b = 0.615 [0.006, 1.225], p = 0.097. The difference between the intervention and control group was positive among children attending preschool in economically advantaged neighborhoods, b = 0.751 [0.244, 0.772], p = 0.002. Examination of the subgroup means and standard deviations showed that children in economically advantaged neighborhoods who were in PATHS increased in prosocial skills from pre-test (M = 3.43, SD = 0.72) to post-test (M = 4.20, SD = 0.55) while children in economically advantaged neighborhoods who were in control group decreased in prosocial skills from pre-test (M = 3.74, SD = 0.70) to post-test (M = 3.60, SD = 0.59). For this analysis, the difference between PATHS and control group children attending preschool in economically disadvantaged neighborhoods was negligible (thus below 0.20). Thus, there were unique benefits among children attending preschool in advantaged neighborhoods on this secondary outcome (observer rated prosocial/communication skills as measured by during a play observation; SCS-observer). This result was not hypothesized.

Next, we found a PATHS*income interaction on teacher rated social independence (secondary outcome), b = –0.491 [–0.934, –0.049], p = 0.068. The estimate was negative in children attending schools in economically advantaged areas, b = –0.298 [–0.245, 0.008], p = 0.110. The difference between the PATHS children and children in control group in economically disadvantaged neighborhoods was negligible (thus below 0.20). PATHS children in economically advantaged neighborhoods showed a slight increase in social independence from pre-test (M = 2.65, SD = 0.38) to post-test (M = 2.66, SD = 0.42), while children in economically advantaged neighborhoods who were in control group showed more of an increase in social independence from pre-test (M = 2.71, SD = 0.28) to post-test

TABLE 3 Standardized interaction parameter estimates, $N = 275$.

Outcomes	Predictors	St. estimate	*P*	95% CI	St. errors
Primary outcomes					
ACES-emotional knowledge	Paths*income	−0.164	0.542	[−0.607,0.279]	0.269
	Paths low income	0.489	0.012	[0.170,0.807]	0.193
	Paths high income	0.324	0.098	[0.002,0.647]	0.196
CST-emotional awareness	Paths*income	0.440	0.103	[−0.004,0.884]	0.270
	Paths low income	−0.293	0.091	[−0.579, −0.008]	0.174
	Paths high income	0.147	0.573	[−0.282,0.575]	0.260
CST-SPS: competent	Paths*income	0.196	0.622	[−0.458,0.849]	0.397
	Paths low income	0.060	0.866	[−0.524,0.643]	0.355
	Paths high income	0.256	0.178	[−0.057,0.568]	0.190
CST-SPS: aggressive	Paths*income	0.438	0.166	[−0.082,0.958]	0.316
	Paths low income	−0.309	0.283	[−0.783,0.164]	0.288
	Paths high income	0.128	0.500	[−0.184,0.441]	0.190
CST-SPS: inept	Paths*income	−0.146	0.728	[−0.837,0.545]	0.420
	Paths low income	0.402	0.218	[−0.135,0.939]	0.326
	Paths high income	0.256	0.290	[−0.142,0.654]	0.242
IC1: knock and tap task	Paths*income	−0.455	0.147	[−0.972,0.061]	0.314
	Paths low income	0.418	0.149	[−0.059,0.894]	0.290
	Paths high income	−0.038	0.840	[−0.345,0.269]	0.187
IC2: day-night task	Paths*income	0.271	0.238	[−0.107,0.650]	0.230
	Paths low income	−0.251	0.186	[−0.564,0.061]	0.190
	Paths high income	0.020	0.896	[−0.229,0.269]	0.151
WM: word span task	Paths*income	0.085	0.771	[−0.394,0.564]	0.291
	Paths low income	0.322	0.134	[−0.031,0.675]	0.215
	Paths high income	0.406	0.070	[0.037,0.776]	0.225
Secondary outcomes					
Prosocial/communication skills	Paths*income	−0.113	0.684	[−0.571,0.344]	0.278
	Paths low income	−0.219	0.389	[−0.638,0.199]	0.255
	Paths high income	−0.332	0.052	[−0.773, −0.051]	0.171
Prosocial skills (observer	Paths*income	0.615	0.097	[0.006, 1.225]	0.371
	Paths low income	0.136	0.675	[−0.398,0.670]	0.324
	Paths high income	0.751	0.002	[0.244,0.772]	0.241
Task orientation	Paths*income	0.268	0.374	[−0.229,0.766]	0.302
	Paths low income	−0.015	0.950	[−0.399,0.370]	0.234
	Paths high income	0.254	0.221	[−0.087,0.594]	0.207
Social cooperation	Paths*income	−0.355	0.128	[−0.738,0.029]	0.233
	Paths low income	0.190	0.364	[−0.154,0.534]	0.209
	Paths high income	−0.165	0.244	[−0.399,0.068]	0.142
Social interaction	Paths*income	−0.452	0.122	[−0.471,0.018]	0.292
	Paths low income	0.214	0.440	[−0.123,0.337]	0.277
	Paths high income	−0.238	0.123	[−0.249,0.009]	0.155
Social independence	Paths*income	−0.491	0.068	[−0.934, −0.049]	0.269
	Paths low income	0.193	0.387	[−0.174,0.561]	0.224
	Paths high income	−0.298	0.110	[−0.245,0.008]	0.187
Distal outcomes					
Social withdrawal anxiety/somatic symptoms	Paths*income	0.549	0.047	[0.094, 1.00]	0.276
	Paths low income	−0.389	0.079	[−0.750, −0.028]	0.219
	Paths high income	0.160	0.484	[0.216,0.536]	0.229
	Paths*income	0.618	0.089	[0.020, 1.216]	0.363

(Continued)

TABLE 3 (Continued)

Outcomes	Predictors	St. estimate	*P*	95% CI	St. errors
	Paths low income	−0.566	0.082	[−1.101, −0.031]	0.325
	Paths high income	0.052	0.813	[−0.309,0.413]	0.219
Aggression	Paths*income	−0.336	0.153	[−0.722,0.051]	0.235
	Paths low income	−0.136	0.503	[−0.470,0.198]	0.203
	Paths high income	0.200	0.213	[−0.064,0.463]	0.160
Inattention	Paths*income	0.619	0.068	[0.062, 1.176]	0.339
	Paths low income	−0.367	0.242	[−0.882,0.149]	0.313
	Paths high income	0.252	0.159	[−0.043,0.547]	0.179
Hyperactivity/impulsivity	Paths*income	−0.103	0.722	[−0.579,0.373]	0.289
	Paths low income	0.234	0.373	[−0.198,0.666]	0.262
	Paths high income	0.131	0.405	[−0.128,0.390]	0.157

*Connotes interaction term.

TABLE 4 Subgroup means and standard deviations.

	EDN								EAN							
	Paths				Control				Paths				Control			
	Pre-test		Post-test		Pre-test		Post-test		Pre-test		Post-test		Pre-test		Post-test	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Primary outcomes																
ACES-emotional knowledge	7.06	1.89	7.81	1.29	5.95	1.96	7.13	1.24	6.80	1.85	7.66	1.42	7.16	1.52	7.48	1.42
CST-emotional awareness	4.24	1.45	4.42	1.37	4.54	1.74	5.00	1.66	3.74	1.40	4.29	1.19	4.41	1.93	4.29	1.34
CST-SPS: competent	2.52	2.35	2.93	2.35	1.54	2.04	2.23	2.40	2.40	2.31	3.12	2.35	2.70	2.17	2.89	2.18
CST-SPS: aggressive	0.94	1.51	0.48	0.92	0.95	1.76	1.09	2.24	0.86	1.77	0.54	1.36	0.52	0.98	0.65	1.46
CST-SPS: inept	0.54	0.99	0.54	1.15	0.68	1.17	0.81	1.46	0.67	1.39	0.58	1.07	0.50	1.01	0.41	0.87
IC1: knock and tap task	23.64	6.33	26.02	5.74	16.91	7.03	22.21	7.85	26.85	3.97	25.80	4.82	25.76	4.84	26.18	4.76
IC2: day-night task	27.24	12.23	31.86	13.30	15.79	16.25	29.71	15.03	30.55	12.47	36.72	11.78	30.57	12.87	35.85	10.74
WM: word span task	10.49	4.37	13.17	4.41	8.09	4.63	10.27	4.04	11.43	4.76	14.45	4.30	11.61	4.21	11.91	4.71
Secondary outcomes																
Prosoc/communication	2.90	0.80	3.08	0.81	2.45	0.79	2.88	0.99	3.01	1.04	3.12	0.73	2.98	0.89	3.17	0.79
Prosocial skills (observer)	3.68	0.70	3.69	0.68	3.10	0.67	3.34	0.60	3.43	0.72	4.20	0.55	3.74	0.70	3.60	0.59
Task orientation	2.90	0.83	2.90	0.79	2.22	0.95	2.54	1.06	2.97	0.82	3.37	0.83	3.06	0.82	3.08	0.76
Social cooperation	2.64	0.41	2.61	0.56	2.30	0.45	2.28	0.69	2.64	0.49	2.63	0.41	2.66	0.40	2.73	0.35
Social interaction	2.32	0.60	2.48	0.55	2.33	0.44	2.27	0.63	2.31	0.56	2.45	0.44	2.54	0.49	2.67	0.38
Social independence	2.64	0.44	2.70	0.46	2.54	0.42	2.49	0.37	2.65	0.38	2.66	0.42	2.71	0.28	2.80	0.28
Distal outcomes																
Social withdrawal	0.55	0.60	0.49	0.59	1.01	0.38	1.05	0.64	0.49	0.50	0.50	0.50	0.68	0.65	0.54	0.56
Anxiety/somatic symptoms	0.40	0.53	0.32	0.44	0.80	0.86	0.92	0.97	0.39	0.44	0.40	0.38	0.53	0.58	0.51	0.54
Aggression	0.41	0.63	0.54	0.74	0.54	0.55	0.77	1.03	0.51	0.86	0.45	0.65	0.46	0.62	0.41	0.63
Inattention	0.89	0.79	0.73	0.78	1.19	0.83	1.35	1.00	0.60	0.66	0.60	0.63	0.59	0.76	0.47	0.59
Hyperactivity/impulsivity	0.71	0.74	0.87	0.93	1.59	0.86	1.37	1.09	0.71	0.64	0.62	0.69	0.54	0.65	0.54	0.64

EDN, economically disadvantaged neighborhood; EAN, economically advantaged neighborhood.

(M = 2.80, SD = 0.28). The difference between PATHS and control group children attending preschools in disadvantaged neighborhoods was negligible (below 0.20). In contrast, children in the control group in advantaged neighborhoods showed more gains in terms of social independence than PATHS children in advantaged neighborhoods. This result was not hypothesized.

Furthermore, there was a PATHS*income interaction effect on three of the examined distal outcomes, namely teacher

rated social withdrawal, anxiety symptoms and inattention. The interaction effect for social withdrawal was b = 0.549 [0.094, 1.00], p = 0.047. Among children attending preschool in economically disadvantaged neighborhoods, the difference between the intervention and control group was negative, b = –0.389 [–0.750, –0.028], p = 0.079, while the estimate for children attending schools in economically advantaged neighborhoods did not meet the cut off value. Examination of the subgroup means, and standard deviations showed that children attending preschool in economically disadvantaged neighborhoods, who were in PATHS decreased in social withdrawal from pre-test (M = 0.55, SD = 0.60) to post-test (M = 0.49, SD = 0.59) while children in economically disadvantaged neighborhoods who were in control group slightly increased in social withdrawal from pre-test (M = 1.01, SD = 0.38) to post-test (M = 1.05, SD = 0.64). This subgroup difference was supportive of hypothesis 2 with a unique intervention benefit for children attending preschool in disadvantaged areas. Thus PATHS children attending schools in economically disadvantaged neighborhoods showed more a decline in social withdrawal relative to children in control group also attending preschool in disadvantage neighborhoods.

Also, within the examined distal outcomes, we found a PATHS*income interaction on anxiety symptoms, b = 0.618 [0.020, 1.216], p = 0.089. Among children attending preschool in economically disadvantaged neighborhoods, the difference between the intervention and control group was negative, b = –0.566 [–1.101, –0.031], p = 0.082. The estimate did not meet the cut off for children attending schools in economically advantaged neighborhoods. Further analyses showed that children attending preschool in economically disadvantaged neighborhoods who were in PATHS decreased in anxiety from pre-test (M = 0.40, SD = 0.53) to post-test (M = 0.32, SD = 0.44) while children in economically disadvantaged neighborhoods who were in control group increased in anxiety from pre-test (M = 0.80, SD = 0.86) to post-test (M = 0.92, SD = 0.97). Intervention change was as hypothesized (hypothesis 2) meaning that PATHS children attending preschool in economically disadvantaged neighborhoods showed greater a decrease in anxiety relative to children in control group who were also attending preschool in disadvantaged neighborhoods.

Finally, we found a PATHS*income interaction on inattention (distal outcome), b = 0.619 [0.062, 1.176], p = 0.068 showing that among children attending preschools in economically disadvantaged neighborhoods the difference between the intervention and control group was negative, b = –0.367 [–0.882, 0.149], p = 0.242, while the estimate was positive in children attending schools in economically advantaged neighborhoods, b = 0.252 [–0.043, 0.547], p = 0.159. Children in economically disadvantaged neighborhoods who were in PATHS decreased in inattention from pre-test (M = 0.89, SD = 0.79) to post-test (M = 0.73, SD = 0.78) while children in economically disadvantaged neighborhoods who were in control group increased in inattention from pre-test (M = 1.19, SD = 0.83) to post-test (M = 1.35, SD = 1.00). Moreover, PATHS children in economically advantaged neighborhoods were relatively stable in inattention from pre-test (M = 0.60, SD = 0.66) to post-test (M = 60, SD = 0.63), while children in economically advantaged neighborhoods who were in control group showed a decrease in inattention from pre-test (M = 0.59, SD = 0.76) to post-test (M = 0.47, SD = 0.59). Intervention change was as hypothesized (hypothesis 2) meaning that PATHS children attending preschool in economically disadvantaged neighborhoods showed a decrease in inattention relative to children in control group who were also attending preschool in disadvantaged neighborhoods. The finding for this outcome for the economically advantaged subgroups was not hypothesized.

Discussion

Promoting the use of evidence-based SEL interventions in ECEC settings may enable engagement and participation and boost the psychosocial development of a diversity of children. However, not all children live in optimal or even sufficient conditions in order to achieve the best possible development and growth. The economic level of the neighborhood context has important implications in terms of the quality of ECEC (Cloney et al., 2016) and in turn child development (Vinopal and Morrissey, 2020). In that sense, it is possible that the effects of SEL-interventions on social emotional development of children may differ depending on the economic level of the neighborhood where the ECEC institutions are situated. In this study, we wanted to understand whether the effects of PATHS on child social emotional competence and adjustment might have differed depending on the resident incomes of those people living in the neighborhoods where participating children's preschools were located (i.e., economically disadvantaged and advantaged neighborhoods, relative to the rest of the local region).

The overall goal with the PATHS conceptual model is to support children's ability to self-regulate emotions and behaviors as well as to prevent or reduce behavioral and emotional problems. From an earlier study with the same dataset (Eninger et al., 2021), it is clear that the PATHS intervention was beneficial in terms of the development of child social emotional competence and adjustment, including for example higher emotional knowledge and lower anxiety in children four to five years of age.

However, the present study indicated that there are some important baseline differences in participating children's social emotional competence and adjustment. Indeed, our results showed that at baseline, children attending preschools in economically disadvantaged neighborhoods, relative to children attending preschool in advantaged neighborhoods, showed

lower levels on a number of measured outcomes such as inhibitory control, working memory, task orientation as well as higher levels of inattention. This is in line with the theoretical assumptions of the importance of neighborhood contexts for child development (e.g., Bronfenbrenner, 1979; Bronfenbrenner and Morris, 2006) and a growing body of evidence which indicates that economic disadvantage may affect cognitive function in a variety of ways (Dean et al., 2018) including limitations in the development of self-regulation skills including skills associated with cognitive, emotional and stress regulation (e.g., Lipina and Evers, 2017). Put briefly, economic disparities could have adverse effects on child development.

To address such possible disparities in the opportunities for children's social emotional competencies to develop, ECEC with emphasis on social emotional development is key. The implementation of SEL-interventions in ECEC in economically disadvantaged neighborhoods in particular, has been suggested as key preventive effort in terms of child developmental disparities (Domitrovich et al., 2007; Ryan et al., 2019). Our findings suggested that preschool PATHS seemed to uniquely benefit children attending preschool in economically disadvantaged neighborhoods in terms of improvements in inattention, such that children in the economically disadvantaged group who participated in PATHS showed significantly greater reductions in inattention compared to children in the control group from economically disadvantaged neighborhoods. Pretest group comparisons by neighborhood income level showed that the children attending preschool in disadvantaged neighborhoods were higher on this construct at pretest than children attending preschool in advantaged neighborhoods, speaking to the need for intervention on this outcome in particular. These findings regarding inattention (in H1 and H2) are particularly important given that childhood inattention has been identified as a core risk factor for poor academic achievement (Lundervold et al., 2017a,b). Inattention could also be understood as a risk factor for child engagement putting barriers on child active involvement in activities and interactions with the environment (Castro et al., 2017). The findings in our study suggest that PATHS may provide an important boost for the group that appears to enter PATHS with less access to resources (at the school neighborhood level) and in that sense enhance the potential for increased engagement.

Similarly, in economically disadvantaged neighborhoods, children participating in PATHS showed reductions in social withdrawal and anxiety compared to control group children. Although children attending preschool in economically disadvantaged neighborhoods did not differ in these outcomes at entry into PATHS (H1 results), the group from economically disadvantaged neighborhoods appeared to benefit more in these outcomes from PATHS when compared to control group children. This is an important finding as these outcomes have been found to be concurrently and predictively associated with an increased risk of a range of negative adjustment outcomes, including social-emotional difficulties (Rubin et al., 2009; Damelang and Kloss, 2013). Taken together, the PATHS program may provide an important boost for this subgroup of children (attending preschool in disadvantaged neighborhoods).

The beneficial effects of PATHS on the development of social emotional skills and adjustment in children in economically disadvantaged neighborhoods could however be tempered with the findings that PATHS children from advantaged neighborhoods also appeared to improve in their teacher rated prosocial behavior, but not their social independence, when compared to control group children also attending preschool in advantaged neighborhoods. Possibly, such a finding may be indicative of a maintenance of disparity between the advantaged and disadvantaged groups, in that children from both advantaged and disadvantaged groups entered the project with similar levels of these outcomes.

In this study, we could not investigate the potential linking mechanisms to the associations between PATHS and child outcomes which could provide some explanations to the results in this study. Based on the research from earlier studies, one potential mechanism to these links could be the family-level variables, such as parenting practices (Minh et al., 2017) or family instability (Brown et al., 2013). When parents are faced with stressful conditions, such as high neighborhood violence and economic problems, parents are at risk of becoming less sensitive to child needs which in turn may have adverse impact on their cognitive development (Blair and Raver, 2016). Another potential mechanism could be rather structural; the quality of formal and informal institutional resources, including ECEC could either promote or impede children's social emotional development (Cloney et al., 2016).

In Sweden, ECEC is publicly subsidized and thus affordable for many parents. Consequently, more than 95% of children four to five years old attend ECEC on a daily basis (Swedish National Agency for Education, 2018). The quality of Swedish ECEC is highly ranked in international comparisons (OECD, 2017). Even so, there is a considerable local variation in the quality of ECEC in Swedish municipalities. Well documented differences between ECEC institutions in Sweden are variations in class group-size, child-teacher ratio, teacher practices, and the proportion of teachers with a university degree (Swedish Teacher Union, 2018). These differences could potentially play a role in children's engagement in school and opportunities to grow (e.g., Blatchford et al., 2011; Pedler et al., 2020). In that sense, the risk of poorer psychosocial functioning evident in children attending schools in economically disadvantaged areas could, at least in part, be a product of a lack of adequate resources in preschools. In addition to efforts to reduce disparities in the quality of ECEC settings throughout all neighborhoods in Sweden, the results in the present study implicate that prioritizing support for universal interventions such as PATHS, or other evidence based SEL interventions and

practices, could be a key measure to impede the disparities among children being cared for and educated in ECEC.

Limitations and strengths

There are several study limitations that are important to note. We measured only one facet of the neighborhood context, namely mean level of all residents' income in a postal code (an administrative registry-based neighborhood demarcation), to address the neighborhood economic advantage/disadvantage. Other facets, such as physical characteristics and possibilities for social and economic development, including business reforms in the neighborhood could be important to more holistically capture economic advantage/disadvantage in neighborhoods, as well as resident perceptions of neighborhood boundaries and economic advantage/disadvantage.

Moreover, teachers who rated participating children and observers of children's play (in the play task) were not blind to study condition. As we lack measurements of the quality of preschools in the projects, we assume that the quality of ECEC is, at least in part, based on the economic level of the neighborhood context (Leventhal and Brooks-Gunn, 2000). Such an assumption is based on the criticism from OECD (2017) stating that Swedish municipalities do not always reallocate resources to schools with vulnerable group of students, such as in schools in economically disadvantaged neighborhoods, which could also be the case in preschools in our project.

Even though parents are important socializing agents in their children's development (Bronfenbrenner, 1979), we did not assess parent-child relationships and parent involvement in child social emotional development or parental social and economic status variables (family income or parents' education). Future studies should investigate the role of parent involvement when studying the effects of social interventions aimed at children. As noted, information about family socioeconomic status (SES) was not collected as part of this study and can therefore not address important questions such as whether children's family level SES differed significantly across neighborhood income level, and whether there are significant associations between neighborhood and family level income and other indicators of SES, like parental education.

Other limitations include the overall relatively small sample in the study, particularly in economically disadvantaged group, which could potentially be a risk for a type II error (Jones et al., 2003). We also lacked the ability to test statistically (due to limited power) if intervention fidelity at the school level differed among preschools in low income relative to high income neighborhoods (i.e., a limited number of schools participated in the PATHS intervention). While this is a limitation of the present study, this could be an important focus (i.e., PATHS implementation variation based on contextual resources) for future PATHS trials in diverse communities with varying economic resources.

Despite these limitations, there are several strengths to be noted. This study is to our knowledge, the first study to investigate the possibility of moderated intervention-related effects of PATHS with the preschool neighborhood context as one of the key moderators examined, with the use of registry data on income for all inhabitants' living within the immediate neighborhoods in which children's preschools are located. Moreover, the beneficial effects of the intervention delivered in the proximal context of ECEC, as evidenced in this study, provide an important basis for development of high-quality ECEC particularly in economically disadvantaged neighborhoods in Sweden, as a means to reduce possible disparities in societal opportunities for children to develop their social emotional competence in equitable and optimal ways.

The overall implications of the study findings for the future implementation of PATHS in settings in which children experience less economic resources are provisional and require additional examination in further similar Swedish trials to come away with firm conclusions for a Swedish context in particular. Past studies in lower income areas with preschool PATHS have primarily been conducted in the U.S. where income distribution and social welfare system is different than in Sweden. Thus, we are cautious in interpreting the future implications of the study findings for Swedish settings until further Swedish studies with preschool PATHS are conducted. In future Swedish trials, it would be important to test the relative importance and benefits of PATHS implemented for one versus two years (with the same cohort of children). Such an approach could help to determine if PATHS would be associated with even more profound benefits if it is conducted over a longer period of time in order to achieve a very broad array of intended outcomes across a range of social emotional competence domains, in children in general and for children attending preschool in lower resourced neighborhoods as well.

Conclusions

Our study showed that there are some disparities in social and emotional competence and adjustment among children attending preschools in economically disadvantaged and advantaged neighborhoods (see results for H1), some of which could be reduced with the inclusive educational program focusing on socioemotional learning (SEL interventions and practices). Children in preschools in economically advantaged neighborhoods involved in PATHS showed improvements in their prosocial skills, but not social independence in comparison to children in control group also attending preschool in advantaged neighborhoods. In addition, children attending schools in economically disadvantaged neighborhoods, who took part in PATHS showed reduced levels of inattention, social

withdrawal, and anxiety relative to children in control group who also attend preschool in disadvantaged neighborhoods. Given that inattention (e.g., Lundervold et al., 2017a,b), as well deficits in other social and emotional skills (e.g., Damelang and Kloss, 2013) are critical risk factors for academic achievement and adjustment, offering PATHS as an early intervention in ECEC, particularly in preschools in economically disadvantaged areas, could be a key societal measure to impede disparities among children and to promote the best possible development. As PATHS endorses child engagement, including appropriate interactions between children and their environment, such as teachers and peers, a social and emotional learning (SEL) preschool curriculum may be an important tool for teachers who work with preschool children. Finally, evidence based universal SEL interventions such as PATHS could be regarded as potentially powerful tool for achieving inclusion in terms of engagement for each child.

Data availability statement

The datasets presented in this article are not readily available because this study's ethical review does not allow for study data to be in a public repository. Requests to access the datasets should be directed to SK.

Ethics statement

The studies involving human participants were reviewed and approved by The Stockholm Regional Ethics Review Board (dnr. 2012/1714-31/5). Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin.

Author contributions

SK, HG, and LF-W: manuscript conceptualization and writing. SK and KE: data analysis. LF-W, HG, KE, TO, and LE: funding acquisition. All authors: writing. All authors approved the final draft of the manuscript and are accountable for attesting to the accuracy of the work represented in this manuscript.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Dynamics of the interaction between adults and a preschool child with autism: Transition from segregated to inclusive settings

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This study explores the dynamics of the interaction between the engagement of a preschool child with autism spectrum disorder and the participation of adults, notably during the child's transition from a segregated to inclusive setting. Nine classroom sessions were filmed over an 8-month period with a focus on two types of activities: free play and adult-led gross motor activities. Our results showed that the interactions evolved differently over time for the two activities. During gross motor activities, the active engagement of the child associated with the passive participation of adults, which increased in the segregated setting, continued to develop in the inclusive setting leading to the emergence of active engagement with peers at the end of the school year. During free-play, the child engagement progressed in the segregated setting. Though initially in a state of passive observation, the child became independently active, either with or without the guidance of adults. The transition from the segregated setting to the inclusive setting without adult participation leads to a momentary drop in the child's active engagement before the reemergence of independent active engagement. The results of this study question the methods used and the resources invested in preschools to favor the inclusion of young children with autism. They highlight the importance of adults' participation during the transition between segregated and inclusive settings. In addition, they encourage adults to accept the temporary regression in child engagement in order to attain desirable outcomes such as independent engagement at a later time.

KEYWORDS

inclusion, early childhood education, child engagement, autism spectrum disorder, dynamics, adult participation

Introduction

The Salamanca Statement on special needs education states that mainstream schools can provide effective education for the majority of children (UNESCO, 1994). Over the past 25 years, many countries have adopted more inclusive laws to encourage mainstream schools to include children with disabilities from the youngest age (Ruijs and Peetsma, 2009). In inclusive education, children with disabilities are supported alongside their peers with typical development (TD) and encouraged to take an active part in all classroom activities in order to maximize their developmental potential (Booth and Ainscow, 2000; Ainscow, 2005; Nilholm and Göransson, 2017). The full participation of children with disabilities involves their engagement in learning tasks as well as their positive social interactions with peers and adults. However, this remains a major challenge for education professionals. Previous research showed that simply placing children with special needs, especially autism spectrum disorder (ASD), in preschools is not beneficial in itself (Reszka et al., 2012; Odom, 2019). Despite the potential benefits of inclusive center-based programs for children with ASD, there are many difficulties associated with the inclusion of these children in programs designed for TD children (Kishida and Kemp, 2009; Odom et al., 2021). Children with ASD have persistent deficits in social communication and social interaction and have restricted, repetitive patterns of behavior, interests, or activities (American Psychiatric Association, 2013; Sharma et al., 2018). For example, they usually display deficits in social-emotional reciprocity and in nonverbal communicative behaviors used for social interaction. They could also display stereotyped or repetitive motor movements and inflexible adherence to routines. Without the appropriate support, children with ASD are likely to be socially isolated from their peers and to engage in repetitive behaviors (Anderson et al., 2004; Sam et al., 2016; Brodzeller et al., 2018).

In France, more and more children with ASD do attend preschool autism teaching units (*unités d'enseignement en maternelle*, UEMA) which were set up in 2015. These units, limited to a maximum of seven children with ASD, are located in inclusive preschools. Their aim is to enable young children with ASD to progressively benefit from schooling in an inclusive setting in an adapted manner. Children with ASD are usually grouped together in the UEMA and taught by a specialized team that prepares them for their inclusion in an inclusive classroom. Throughout the school year, some of the children are then included in the inclusive setting. The transition from segregated to inclusive settings thus represents a crucial phase. It therefore seems interesting to explore the evolution of child engagement and social interactions with peers and adults during this key phase of transition from segregated to inclusive settings.

Many studies use child engagement as a key indicator of the quality of inclusion during early childhood (e.g., McWilliam and Bailey, 1995; Kishida and Kemp, 2009; André et al., 2016, 2019a; Sam et al., 2016). Engagement in early childhood settings such as preschools was broadly defined as the child's involvement with the material and people (McWilliam and Ware, 1994; Kontos and Keyes, 1999). More specifically, it refers to the amount of time that children spend interacting with their environment (with adults, children, or objects) in a manner that is developmentally appropriate (McWilliam et al., 1985). Promoting child engagement is a major goal for early childhood education professionals, because this period is critical for social, emotional, and cognitive development (Darling-Churchill and Lippman, 2016; European Agency for Special Needs and Inclusive Education, 2017). However, previous research has demonstrated that children with ASD are more passive and have higher levels of non-engagement than their typical peers (Wolfberg, 1995; Odom et al., 2003; Kishida and Kemp, 2009; Kemp et al., 2013). When engaged, they are more likely to be self-absorbed or engaged with objects rather than with people. For instance, Odom et al. (2003) found that the engagement level of children with ASD (51%) was lower compared with TD children (59%). Kemp et al. (2013) observed that children with ASD were engaged during free play activities for only 47.6% of the time compared with children with other disabilities who were engaged in the same activities for 84.6% of the time.

Adults in classrooms play a key role in fostering child engagement (McWilliam et al., 2003). Adult participation is defined as the adult's behavior toward a focal child and is usually classified into three categories (Powell et al., 2008; Sam et al., 2016). First, active adult participation is characterized by direct interaction with the focal child. Second, passive adult participation is defined as the presence of an adult close to the focal child and/or a group interaction including the focal child but without direct interaction. Finally, no adult participation is qualified as the absence of direct interaction and a lack of close distance between the adult and the focal child. Numerous studies have demonstrated that the level of adult participation affects the degree of child engagement (McWilliam et al., 2003; Powell et al., 2008; Tsao et al., 2008; Sam et al., 2016; André et al., 2019a). For example, Sam et al. (2016) showed that preschool children with ASD were less likely to be engaged when adults were participating with them. Studies also found that when adults initiated the activity, children with special needs interacted more frequently with adults as opposed to the other children (Tsao et al., 2008; André et al., 2016). Other studies have shown that adult participation and engagement depend on the type of activity (Powell et al., 2008; Kemp et al., 2013). For example, Powell et al. (2008) found that adult participation was lower in activities chosen and led by children (e.g., free play) compared with adult-led activities (e.g., academic activities). Kemp et al. (2013) also observed that children with ASD were more engaged in child-led activities than in adult-led activities. Finally, in a longitudinal study, André et al. (2019a) revealed that the interactions between adults and a child with ASD developed differently depending on the activity. During the adult-led activities, the child's observation behaviors grew with the passive

participation of the adult, whereas active engagement behaviors, with or without adult participation, increased meaningfully during free play.

Numerous studies have investigated child engagement and adult participation in segregated settings compared to inclusive settings (e.g., Beckman and Kohl, 1987; Hundert et al., 1998; Foreman et al., 2004; Kishida and Kemp, 2009). For example, Kishida and Kemp (2009) revealed that children with ASD were more actively engaged with material in segregated settings than in inclusive settings. Adult interaction was significantly higher in segregated settings, although only inclusive settings favored peer interaction. Beckman and Kohl (1987) found that positive social interaction involving children with disabilities was greater in inclusive settings than in segregated settings. Similar findings were obtained from a study conducted in different school settings. Foreman et al. (2004) found that the communicative interactions of children with profound and multiple disabilities were significantly more frequent in inclusive than in segregated settings.

Previous quantitative studies have compared segregated and inclusive settings while focusing on child engagement and adult participation. However, these studies, which used intergroup analyses, do not elucidate how the adult–child interactions developed over time during the child's transition from a segregated to inclusive setting. The aim of this study is therefore to explore how the dynamics between the type of Kate's engagement and adults' participation vary in the frequency of segregated and inclusive settings. These dynamics will be studied in two contrasting activities (i.e., free play and adult-led gross motor activities), which are organized on a daily basis at the preschool.

Materials and methods

Design

This descriptive study focused on the interactions between one child with ASD and the adults working in the special education and inclusive preschool classrooms. As Walsh and Kemp (2013) stressed, single-subject studies are appropriate for research on inclusion, particularly of students with ASD given the high variability in this population. More specifically, this study uses the method of complex dynamic systems, which provides a deeper understanding into dynamics over time and has already been successfully used in previous research on adult-child interactions (Steenbeck et al., 2012; André et al., 2019a). This method allows us to study the dynamical process of interaction as it unfolds over time (Hollenstein, 2007; Steenbeck et al., 2012). Indeed, students and teachers have been described as being engaged in a mutual process in which the behaviors of students determine the behaviors of the teacher and vice versa (Steenbeck et al., 2012). Furthermore, typical patterns of interaction emerged in a self-organizational manner (Lewis et al., 1999; Granic and Hollenstein, 2003). These typical patterns are known as attractors, which are stable and recurrent interactions that occur over time (Granic and Hollenstein, 2003). Finally, the interaction process is characterized by nonlinearity in the form of intra-individual variability. Variability represents the degree to which the interactions change over time and the degree of the stability in the system (Hollenstein, 2007). A temporary increase in variability could highlight a transition phase, which represents a major change in the interaction patterns (Hollenstein, 2007). Conversely, low variability could indicate fluctuations in relatively stable interaction patterns.

Participants

The UEMA is a program designed for preschool children with ASD who are grouped together in segregated setting (i.e., a specific classroom with special education professionals). The UEMA classroom is situated within an inclusive preschool with the aim to progressively integrate the children with ASD into the inclusive classrooms. The UEMA described in the present study is implanted in a preschool located in a disadvantaged urban area in northern France. The school has six classes with children aged 3–5 years. The UEMA has seven children with ASD aged 3–5 years who were diagnosed by the Regional Resource Center for Autism (CRAHN). Of these children, this study focuses on Kate, as she was the only child who began in the UEMA at the start of the school year and then moved from the segregated to inclusive setting during the course of the year. At the start of the school year in September 2018, Kate was aged 3 years and 2 months. She had been diagnosed with ASD with severe symptoms in July 2018 (CARS-II). Aside from the UEMA program, she did not benefit from any other health care services. Kate had language and communication deficits. She did not express herself verbally and had no social interactions with her peers. She also had difficulty understanding instructions. However, she used imitation. In terms of her behavior, Kate had difficulty remaining seated and presented attention deficits although she did not present major behavioral problems such as aggressiveness. Finally, her motor development was typical for her age.

The team of professionals in the UEMA was comprised of a special education teacher, two early childhood educators, and two teaching assistants who work full-time. A psychologist is also present 2 days per week.

The inclusive setting included 16 neurotypical children aged 3–4 years with a teacher with over 10 years of experience as well as an assistant teacher.

The current study is part of a larger research project, which aims to explore the school inclusion of children with ASD. Ethical approval was obtained from the university ethics committee and the local education authority. Consent to participate in the study was obtained from the children's parents.

Procedure

Two professionals from the education department filmed the classroom sessions once a month for 8 months (i.e., from December to July) except in May when two observations were made because Kate moved from the segregated to inclusive setting. More specifically, the segregated setting was observed from December to May and the inclusive setting from May to July. Two activities proposed on a daily basis were observed more closely: welcome time and gross motor activities. Welcome time is characterized by free play in which the children can freely choose their games. It is the first stage of child-led learning. This period of adaptation allows the child to move from an individual activity to a shared one. The gross motor activities generally included group activities and motor skills courses set up by adults to develop the children's basic motor skills (jumping, climbing, balancing, throwing, etc.).

Measures

The levels of adult participation and child engagement were independently assessed. Two coders, who were members of the research team, coded the behaviors every 5 s.

Adult participation was coded into three categories (Sam et al., 2016): (1) active participation (i.e., an adult is directing coded behavior toward the focal child, including adult support, adult approval, and adult comments); (2) passive participation (i.e., an adult is directing coded behavior toward a group of children including the focal child and/or an adult is in close proximity to the focal child); and (3) no participation (i.e., no adult is directing coded behavior toward the focal child or toward a group of children including the focal child, and no adult is in close proximity to the focal child).

An observational tool combining the Individual Child Engagement Record (Kishida and Kemp, 2006) and social participation categories (Guralnick et al., 1996) was used to assess child engagement. This tool, which has been successfully applied in previous research (Despois et al., 2016; André et al., 2019a), included the following six categories: (1) passive non-engagement (child is unoccupied); (2) active non-engagement (child exhibits inappropriate active behavior); (3) passive engagement (child observes peers or adults); (4) independent active engagement (child exhibits appropriate behavior in a specific task but different from peers); (5) active engagement alongside peers (child exhibits appropriate behavior in parallel with other children undertaking the same activity); and (6) active engagement with peers (child exhibits appropriate behaviors in a collaborative task with peers).

The video recordings were independently coded by two researchers who had participated in three 3-hour training sessions to code the engagement of children with ASD and the participation of adults. All the videos were double-coded. Interobserver agreement was good for child engagement (k = 0.81; variation between 0.72 and 0.93 for each individual code) and for adult participation (k = 0.83; variation between 0.80 and 0.86 for each individual code). In addition, intra-rater agreement, which was estimated from eight randomly selected videos, was very good for both measures (k = 0.94 on average).

Data analysis

State space grids were used to study the dynamics of the adult–child interactions over time (Hollenstein, 2007). This tool takes into account the changing and stable states of the complex dynamic system. The Gridware program allows to model and graphically visualize the interaction between two variables. On the one hand, state space grids highlight the degree of attraction between different states by measuring the frequency and duration of each state in the system in order to identify any attractors. On the other hand, dispersion is a measure used to describe the variability of the system (Hollenstein, 2007), with lower dispersion indicating a more stable system (see **Supplementary material**).

This quantitative analysis is supplemented by a qualitative description of various situations taken from the sessions. This description allows us to illustrate the attractors and better understand the interactions between adult participation and child engagement in the proposed situations.

Results

Four time points were chosen to analyze the results. The first two points (December and May) highlighted Kate's evolution in the segregated setting. The second observation in May showed the transition from the segregated to inclusive setting. Finally, the observation in June revealed her evolution in the inclusive setting. The results for these four time points are presented in **Tables 1**, **2**.

Dynamics of interaction at welcome time

In December, the analysis of the interaction revealed the high dispersion of the system (D = 0.682), indicating that the interactions between child engagement and adult participation were variable. The analysis of the content of the interactions showed that the system was attracted by three states (**Figure 1**). The first state concerns the active engagement of the child with the active participation of the adult (f = 0.36). The other two states are characterized by the absence of adult participation along with the child's passive engagement (f = 0.33) or her

TABLE 1 Frequencies of states, child engagement, and adult participation during free play.

Setting	Month	*D*	PN/ NP	AN/ NP	PE/ NP	IAE/ NP	AEA/ NP	AEW/ NP	PN/ PP	AN/ PP	PE/ PP	IAE/ PP	AEA/ PP	AEW/ PP	PN/ AP	AN/ AP	PE/ AP	IAE/ AP	AEA/ AP	AEW/ AP
Segregated	December	0.772	0	0.08	0.26	0	0	0	0.05	0.17	0	0	0.07	0	0.01	0.01	0.05	0	0.31	0
Segregated	May	0.652	0	0.05	0	0	0.10	0	0	0	0.11	0	0	0	0	0.06	0.06	0.61	0	0
Inclusive	May	0.172	0.03	0	0.93	0.01	0	0.01	0	0	0	0	0	0	0.02	0	0	0	0	0
Inclusive	July	0.414	0	0	0.27	0	0.72	0	0	0	0	0	0	0	0	0	0	0.01	0	0

D, dispersion; PN, child passive non-engagement; AN, child active non-engagement; PE, child passive engagement; IAE, child independent active engagement; AEA, child active engagement alongside peers; AEW, child active engagement with peers: NP, no participation of adults; PP, passive participation of adults; AP, active participation of adults.

TABLE 2 Frequencies of states, child engagement, and adult participation during gross motor activities.

Setting	Month	*D*	PN/ NP	AN/ NP	PE/ NP	AEA/ NP	AEN/ NP	AEW/ NP	PN/ PP	AN/ PP	PE/ PP	AEA/ PP	AEN/ PP	AEW/ PP	PN/ AP	AN/ AP	PE/ AP	AEA/ AP	AEN/ AP	AEW/ AP
Segregated	December	0.702	0	0	0.05	0.01	0	0	0	0.04	0	0	0.24	0	0	0.07	0.06	0.43	0.10	0
Segregated	May	0.514	0	0	0.09	0	0	0	0	0	0.13	0	0.57	0	0	0	0.02	0	0.18	0
Inclusive	May	0.274	0	0	0	0	0	0	0	0	0	0.04	0	0.88	0	0	0	0.03	0.02	0
Inclusive	July	0.469	0	0.1	0.01	0	0	0	0	0	0.07	0	0.77	0.13	0	0	0	0	0	0

D, dispersion; PN, child passive non-engagement; AN, child active non-engagement; PE, child passive engagement; IAE, child independent active engagement; AEA, child active engagement alongside peers; AEW, child active engagement with peers: NP, no participation of adults; PP, passive participation of adults; AP, active participation of adults.

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active non-engagement (f = 0.17). For example, games and toys (e.g., abacus, car, doll, robot, puzzle) were freely available to the children. Three adults supervised the group of six children (one child was absent), while the other two adults prepared the upcoming activities. When the adults interacted individually with the other children to stimulate them or channel their energy, Kate wavered between observation and wandering around the classroom for several minutes. An adult then urged her to play with the car that she was holding in her hand. This was followed by a period in which Kate played with the car on a mat in the presence of an adult who stimulated and encouraged her. Once the adult moved away, however, Kate began to observe the class and wander once again.

In May, variability slightly diminished (D = 0.652). The system became concentrated around the attractor of independent active engagement and active adult participation (f = 0.61), while the two other attractors observed in December disappeared. Aside from this attractor, another state emerged, as Kate was actively engaged without the help of an adult (f = 0.10). For example, Kate took a puzzle and asked an adult to help her. When the adult went away, Kate continued to do the puzzle alone.

In May, Kate's move to the inclusive setting was accompanied by a substantial decrease in variability (D = 0.172). Moreover, the landscape of attractors dramatically changed and became polarized around a new attractor, notably passive engagement in the absence of adult particpation (f = 0.93), while the attractor of independent active engagement and active adult participation that was present in the segregated setting disappeared. To given an example, in this classroom, Kate was with 12 first-year preschoolers with TD as well as two adults. During free play, games and toys were freely available to the children, and the adults did not intervene. Kate's lack of participation was constant. She remained in passive engagement for lengthy periods; without moving, she stared at the other children playing with each other in the doll corner. A clear regression in her engagement can therefore be observed.

Finally, in July, variability increases (D = 0.414) with the appearance of a new attractor, notably active engagement alongside peers without adult participation (f = 0.72). Passive observation behavior diminishes (f = 0.27). For example, in a corner of the classroom, Kate was playing with a car on a race track alongside two other children. Even though the two TD children were spatially close to her and interacted with each other, no interaction occurred with Kate (f = 0).

Dynamics of interaction for gross motor activities

In December, the system was highly dispersed (D = 0.702), attesting to the large variability in the interactions. Two attractors can be identified (**Figure 2**): Kate was actively engaged alone with the active participation of the adult (f = 0.43) or alongside other children with the passive participation of the adult (f = 0.24). For example, a target-throwing game was set up with three adults supervising four children. Like the other children, Kate had to wait her turn. When it was her turn, she made several attempts to make the targets fall while the adult encouraged her and helped her pick up the targets.

In May, the dispersion was less pronounced (D = 0.514), with the system forming a strong attractor, notably active engagement alongside peers with passive adult guidance (f = 0.57). Two secondary attractors were also present. Kate was engaged alone with the active participation of the adult (f = 0.18), while she also observed the other children with passive guidance (f = 0.13). To give an example, a motor skills course requiring balancing, crawling, climbing, and jumping was set up (beams, obstacles, etc.). Kate was very active on this obstacle course. The special education teacher supervised the group and gave the group instructions, while the early childhood educator stood at a strategic position (elevated obstacle) in order to individually help each child, including Kate. In this situation, Kate's observation behaviors occurred when she was waiting her turn.

In the inclusive setting in May, the variability in gross motor activities dropped even further (D = 0.274). The system centered around and reinforced one attractor: active engagement alongside peers coupled with passive adult participation (f = 0.88), while active adult participation fell sharply (f = 0.05). For example, the preschool teacher and assistant teacher were supervising the 12 children, including Kate. During the motor skills courses, Kate engaged in a sequence of actions like her TD peers: crawling, balancing, climbing, and jumping. When she froze in front of the beam, the teacher held her hand to reassure her.

In July, the dispersion increased (D = 0.469). Although the attractor of active engagement alongside peers and passive adult participation remained strong (f = 0.73), a new attractor emerged, notably the engagement with peers accompanied by the passive participation of the adult (f = 0.13). To give an example, on the same motor skills course as in May, Kate, who had previously frozen in front of an obstacle (i.e., beam), still asked for the help of an adult. However, the adult did not come to help but instead asked a TD child to do so. During each round of the motor skills course, Kate waited in front of the obstacle, and the same TD child spontaneously came to help her.

Discussion

This study sheds light on how interactions between the engagement of a child with ASD and the participation of adults develop over time, notably when the child moves from

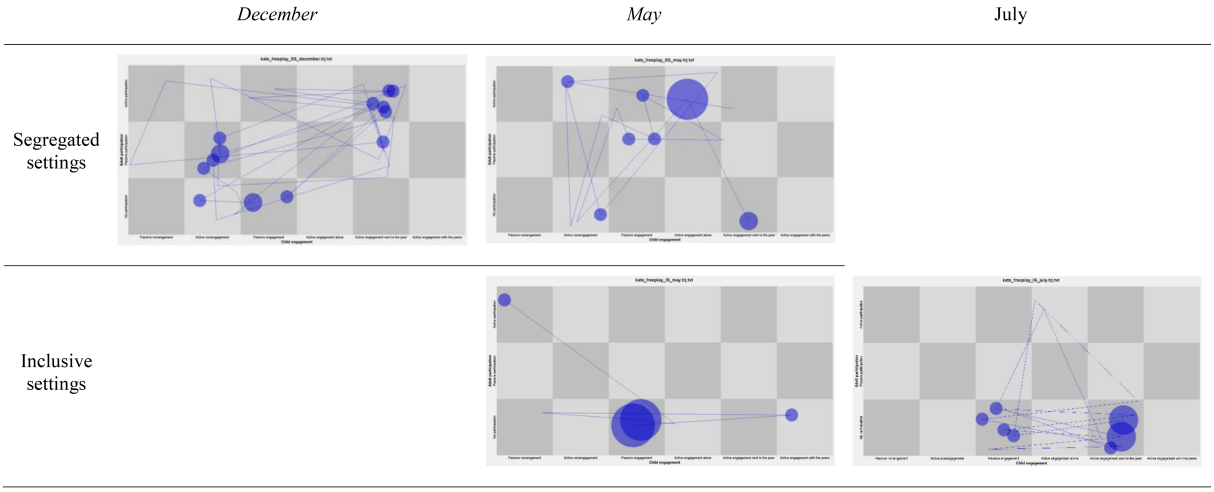

FIGURE 1
State space grids during free play.

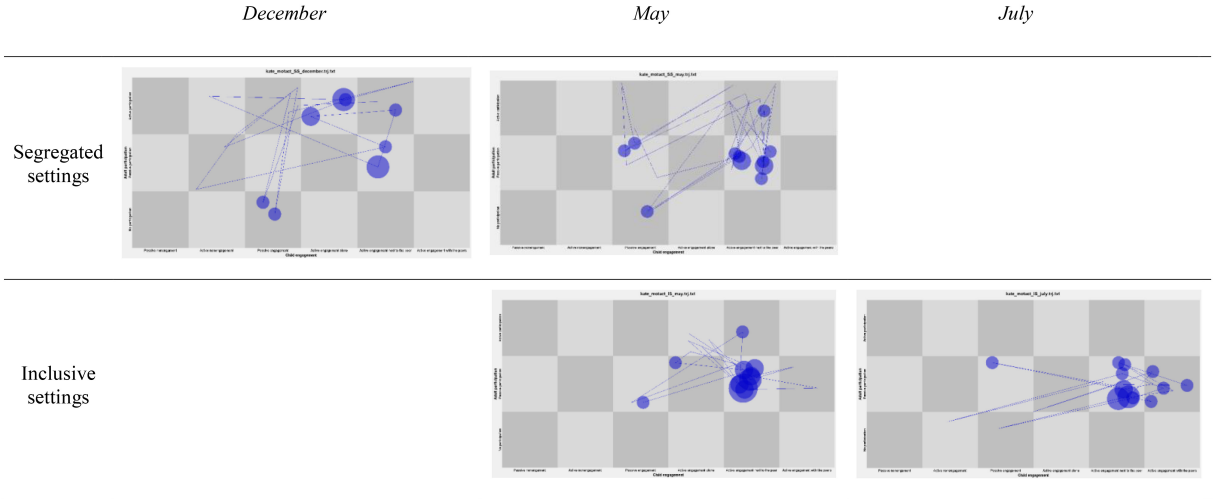

FIGURE 2
State space grids during gross motor activities.

a segregated to inclusive setting. Our results revealed that the child's evolution throughout the school year could be characterized by three phases: an initial phase from December to May in the segregated setting, a transition phase from the segregated to inclusive setting, and a third phase from May to July in the inclusive setting.

First phase: Segregated setting

In the segregated setting, Kate's degree of engagement increased from December to May, whereas the adults' degree of participation differed depending on the activities.

During welcome time, Kate's engagement progressed. Though initially in a state of passive observation, Kate became independently active, either with or without the guidance of adults. We can assume that Kate needed adults to encourage her active engagement in December. As shown by Sam et al. (2016), children with severe autism and communication disorders benefited more from adult participation than other children. Kate was guided minimally during welcome time, as the adults gave priority to the other children who, unlike Kate, could exhibit inappropriate behavior that could interfere with the functioning of the class. In May, Kate's degree of active engagement increased substantially, being higher than that found in other studies on free play (e.g., Kemp et al., 2013). Kate

began to use language, learned to ask adults for help and did not hesitate to ask them to play with her. This individual guidance was possible due to the high adult-child ratio of the segregated setting (Kishida and Kemp, 2009). Nevertheless, when the adult moved away, Kate, after gaining independence during the course of the year, also actively engaged on her own.

In the gross motor activities, in December, Kate was activity engaged with the individual guidance of the adult. The adults' degree of participation remained very high. These results confirm that in this type of adult-led activity, guidance is more important (Odom et al., 2003; André et al., 2019b). The adults urged, accompanied, and encouraged Kate to participate in the proposed activities. Given her age-appropriate motor development, Kate was rapidly successful in this type of activity. In May, the proposed tasks no longer occurrred on an individual basis but in parallel with the other children who undertook the same activity at the same time in order to foster their independence. These tasks favored the active engagement of Kate alongside the other children with the collective guidance of the adults.

In both activities, Kate never interacted with her peers. In this context of children with ASD who present social skill deficits, interactions between peers can prove difficult (Odom et al., 2003; Foreman et al., 2004). Moreover, no collaborative activities were proposed by the educational team, as their main priority was to develop the children's appropriate engagement with the material without their peers.

Second phase: Transition from segregated to inclusive setting

The transition between the two settings showed different trajectories for the two activities.

During welcome time, Kate clearly regressed, as she shifted from an active to passive engagement. The level of her engagement decreased, thus confirming previous results showing the greater engagement of children with materials in segregated settings compared to inclusive settings (Kishida and Kemp, 2009). This regression may have been due to the loss of her points of reference. Even though the two classrooms had a similar material environment, the social environment (i.e., adults and children) changed. The modes of guidance also changed, as Kate was no longer individually or passively guided by the adults. This change was related to several factors. First, the adult-child ratio decreased substantially in the inclusive classroom. Second, welcome time is frequently described by teachers as a period in which children should be independent (André et al., 2019a). Finally, Kate may have been reluctant to speak to the adults in the inclusive classroom as she had done in the segregated setting, because she did not know them very well.

By contrast, in the gross motor activities, despite the new social environment, Kate remained highly engaged alongside the other children. This high level of engagement may be associated with the continuity of the modes of guidance. Indeed, the passive guidance of the adults was present in both settings, allowing for continuity in the proposed situations (motor skills group activities and courses). As in the segregated setting, the teaching professionals did not propose collaborative activities. This choice may have been motivated by the desire to facilitate the inclusion of children with ASD by proposing activities that did not require many social skills, which are lacking in this population (Gillis and Butler, 2007; Mahoney and MacDonald, 2007). In addition, it can be thought that the gross motor skills activities and circuit highly motivated Kate which impacted on her active engagement.

Third phase: Inclusive setting

Kate's engagement progressed in the two activities. During welcome time, she evolved from passive observation to active engagement alongside her peers. As mentioned by Odom et al. (2003), observation is a crucial step toward active engagement, as it allows children with ASD to imitate their socially competent peers. Even in the absence of adult guidance, Kate developed new points of reference, helping her to adapt to her environment. These findings confirm previous research showing that during welcome time, children with ASD need time to engage with the available games and toys without the presence of adults (André et al., 2019a).

In the gross motor activities, we assume that the continuity in the modes of guidance and the proposed situations allowed Kate to maintain a very high degree of engagement. Moreover, these activities led to positive social interactions with her peers. These results confirm that the inclusive setting is favorable to the social interactions of children with ASD, as they can benefit from socially competent peers (Beckman and Kohl, 1987; Foreman et al., 2004). For Odom et al. (2003), inclusion provides the opportunity for children with disabilities to learn social skills by observing their socially competent peers with TD and thus becoming familiar with the typical patterns of social interactions. These collaborative exchanges were rendered possible by the teacher who deliberately chose not respond to Kate's request for help; she instead stepped back, observed, and encouraged the positive interactions with her peers (Tsao et al., 2008).

Limitations and perspectives

Although this study highlighted variations in the configurations of adult–child interactions for two different activities at a preschool, notably during the transition from the segregated to inclusive setting, these results should be considered with caution. First, this study only describes the

behavior of one child with ASD, which limits the generalizability of our findings. Given the high variability within the ASD population (Gillis and Butler, 2007), further studies should be conducted on several children with ASD to identify potential similarities or differences in the interaction trajectories in diverse classroom contexts (Pennings et al., 2014).

Moreover, the natural setting of this study did not allow us to control the type of activities (e.g., individual vs. collaborative tasks). In future research, it would be interesting to work more closely with teaching professionals to propose collaborative activities, which would allow us to study the social interactions of children and the guidance of adults in such situations. The analysis of this study highlighted the evolution of adult–child interactions over a duration of 8 months. It would be interesting to pursue these observations in the next school year to identify possible continuities or discontinuities from one year to another. Finally, this descriptive study does not shed light on the perceptions of the adults during the transition process. This research could therefore be enriched with more qualitative methods based on interviews to better understand the concerns of the adults and the collaboration between special education professionals and inclusive teachers.

Conclusion and implications for practice

The results of this study question the methods used and the resources invested in preschools to favor the inclusion of young children with autism. They highlight the importance of the transition between segregated and inclusive settings. The findings show that the transition phase is facilitated when there is continuity in the modes of guidance between the two settings. In this context, the passive participation of adults seems to be favorable, as it allows the children to develop an optimal degree of autonomy. This means that the adults should prepare the semi-independent engagement of children in the segregated setting and then pursue it in the inclusive setting, which requires close collaboration between the special education professionals and the inclusive teachers.

Our study shows that this type of adult participation could facilitate the positive social interactions between peers. Even though previous studies demonstrated that the active participation of adults could be detrimental to the social interactions of children with ASD (Tsao et al., 2008), our study highlighted that the child's social interactions fail to emerge in the absence of adult participation.

Furthermore, the transition from the segregated setting with the active participation of adults to the inclusive setting without adult participation during free play leads to a momentary drop in the child's active engagement before the reemergence of independent active engagement. This finding should encourage adults to accept the temporary regression in child engagement in order to attain desirable outcomes such as independent engagement at a later time.

Finally, state space grids can be a useful visual tool to make teachers aware of their own inclusion profiles. Coupled with videos, this tool can be incorporated into teacher training to help teachers analyze their own practices from another perspective and to implement changes (Gaudin and Chaliès, 2015).

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving human participants were reviewed and approved by the Ethics Committee of Universty of Rouen Normandy. Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin.

Author contributions

AA and JD conceptualized the study design, wrote the original draft, and including the visualizing tables and figures. PD and LA were responsible for the data management and analysis, contributed substantially to the data collection and manuscript revisions, and provided critical feedback. AA continued editing and finalized the manuscript. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

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Exploring Swedish preschool teachers' perspectives on applying a self-reflection tool for improving inclusion in early childhood education and care

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Introduction: In order to provide opportunities for high-quality early childhood education and care for each child, inclusive settings need to develop and sustain their potential to enable participation in terms of attendance and involvement for diverse groups of children. In 2015–2017, the European Agency for Special Needs and Inclusive Education completed a project on inclusive early childhood education, focusing on structures, processes, and outcomes that ensure a systemic approach to high-quality inclusive early childhood education. Within the project, a self-reflection tool for improving inclusion, the Inclusive Early Childhood Education Environment Self-Reflection Tool (ISRT), was developed. For purposes of future implementation of the ISRT, the present study focused on the teachers' perspective regarding the ISRT's potential to contribute to enabling all children's participation, defined as attending and being actively engaged in the activities in early childhood education and care. The specific aim was to explore Swedish preschool teachers' perceptions of the ISRT based on their experiences of applying the tool.

Methods: Twelve preschool teachers participated in semi-structured interviews about their experiences of applying the tool. The interviews were analyzed with a thematic analysis.

Results: The thematic analysis resulted in three main themes concerning the teachers' perception of (1) the construction of the ISRT, (2) the time required for using the tool, and (3) the tool's immediate relevance for practice. Each of these themes contained both negative and positive perceptions of the tool.

Discussion: Based on the negative and positive perceptions identified in the three main themes, future research and development of the ISRT in Swedish preschools are discussed. On a general level, the results are discussed in relation to the implementation of the ISRT in terms of acceptability, appropriateness, and feasibility.

KEYWORDS

early childhood education and care, teachers' perspective, engagement, involvement, participation, inclusion, self-reflection tool

1. Introduction

Children learn and develop through the stimulation and challenges they experience in their social and physical environments. In the early years, Early Childhood Education and Care (ECEC) provides opportunities for social interaction and learning, and many children spend a large part of everyday life in ECEC. According to the Sustainable Development Goals 2030 Agenda (SDG2030; UN, 2015), quality ECEC is a universal right of all children based on access and participation opportunities in a context where they are engaged and learn.

This means that the environment and the practices need to respond to the diversity and needs of all children in an inclusive ECEC.

During the past few decades, the benefits of high-quality ECEC have been acknowledged by the European community and international policymakers [e.g., the United Nations (UN, 2015); United Nations Educational, Scientific and Cultural Organization (UNESCO, 1994); United Nations Children's Fund (UNICEF); the World Bank; and the Organization for Economic Co-operation and Development (OECD, 2017)]. Furthermore, based on the 1994 Salamanca Statement and the Dakar Framework Education for All from 2000, the Incheon Declaration for Education 2030 sets out a vision for education for the next 15 years based on the UN SDG 2030 (UN, 2015), where an articulated focus on inclusion likewise was emphasized for pre-primary education. The vision of inclusion formulated in these declarations aligns with the general principle for special education in ECEC. It is docking into the fundamental need to be valued and feelings of being a member of a social group as essential in children's everyday life (Haustätter and Vik, 2021). Therefore, inclusion cannot be limited to access to ECEC. It also involves a focus on all children's participation, i.e., that the children are actively engaged in the everyday activities in the setting (Imms and Granlund, 2014; Imms et al., 2017).

The European Agency for Special Needs and Inclusive Education (EASNIE) describes inclusion by defining it as all learners of any age being provided with meaningful, high-quality educational opportunities in their local communities, alongside their friends and peers (EASNIE, 2022). This definition focuses that both attendance and participation are necessary to enable inclusion, encompassing both "being there" and "being engaged". Engagement can be defined by how much time the child interacts in a developmentally and contextually adequate way with the environment (McWilliam and Bailey, 1992; McWilliam and Casey, 2008). Consequently, being engaged in everyday life in ECEC is crucial for children's social and cognitive development and learning, such as playing and interacting with adults, peers, and materials (Aydogan et al., 2015). Engagement leads to child wellbeing, achievements, and positive development (Castro et al., 2017). It is central in studies of early childhood education and inclusion as it can be regarded as an indicator of positive functioning in the early years.

A prerequisite for child wellbeing, achievements, and positive development in an inclusive environment is a high-quality education (Taguma et al., 2013; Soukakou, 2016; Castro et al., 2017; Ginner Hau et al., 2020; Lee and Janta, 2020; Lundqvist, 2020). Earlier research has proven high-quality ECEC to have positive, long-lasting effects on children's development and learning (Shonkoff and Phillips, 2000; Heckman, 2006, 2011; Pianta et al., 2009; Shonkoff, 2010; Melhuish et al., 2015). Recent research in the United States shows that attending ECEC is not *per se* associated with favorable development and learning later in life. This is instead associated with several factors related to the quality of ECEC (Durkin et al., 2022). Regarding inclusion in ECEC, there is evidence that inclusive settings tend to have higher quality than non-inclusive settings and that high quality is a prerequisite for children's wellbeing and favorable development (Lee and Janta, 2020).

Building teacher capacity for inclusive teaching is fundamental for providing meaningful, high-quality educational opportunities. Subsequently, the education system needs to ensure that the teachers are initially adequately qualified for inclusive teaching and supported throughout their careers. However, most education systems have no comprehensive capacity-building frameworks for inclusive teaching (Brussino, 2021). In order to ensure that teachers have and retain adequate competencies, they have to be regarded as lifelong learners, and continuous professional learning becomes central. The strategies to promote teacher capacity for inclusive teaching in terms of continuous development can, for example, be formal and informal in-service training (Brussino, 2021).

There are several guides and tools for promoting inclusion, which can be used both in teacher training and in schools that want to achieve an inclusive education context (Sandoval et al., 2021). One such tool is the Inclusive Early Childhood Education Environment Self-Reflection Tool (ISRT; EASNIE, 2017b). It was developed as a part of a project on inclusive early childhood education by the European Agency for Special Needs and Inclusive Education (EASNIE). The ISRT focuses on proximal processes in everyday life in ECEC, i.e., play and interaction with adults, peers, and materials. The proximal processes are necessary for wellbeing, learning, and development and are related to participation, defined as attending, and being actively engaged (Imms et al., 2017). In the ISRT, "engagement" means being actively involved in everyday activities, being the core of inclusion (EASNIE, 2017b), and being an essential aspect of quality in educational settings. The ecosystem model for Inclusive Early Childhood Education (IECE) (see Figure 1) can be used as a model to explain the interaction between ECEC policy and practice to promote child engagement and learning (EASNIE, 2016, 2017a). It can be used to scrutinize the processes in the everyday activities in preschool and support preschool teachers in recognizing factors at different levels that are related to the engagement and learning of all children in preschool. The model is inspired by ecological system theory (Bronfenbrenner, 1979; Bronfenbrenner and Morris, 2006) and based on data from 32 European countries in a project by the European Agency for Special Needs and Inclusive Education (EASNIE, 2016, 2017a). Furthermore, the model can support practitioners' work to plan, improve, monitor, reflect on, and evaluate inclusion in their everyday practices in IECE. The inclusive process *per se* reflects the interactions between the child and other children, the practitioners, and the physical environment enabling all children to belong, engage, and learn. National, regional, and local contexts and conditions in the surrounding environments are highlighted as essential structures for the organization and support for IECE.

According to the ecosystem model for IECE, there are five primary processes through which children are involved in the everyday life of the setting as follows: positive interaction, involvement in daily activities, a child-centered approach, personalized assessment for learning and accommodations, and adaptations and support. These processes within the setting are supported by the next level by including parents, welcoming each child, a holistic curriculum, a social and physical environment for all children, qualified staff, cultural responsiveness, inclusive leadership, and collaboration. There are additional supportive structures in the surrounding society, such as community commitment, interdisciplinary collaboration, support for transitions, and possibilities

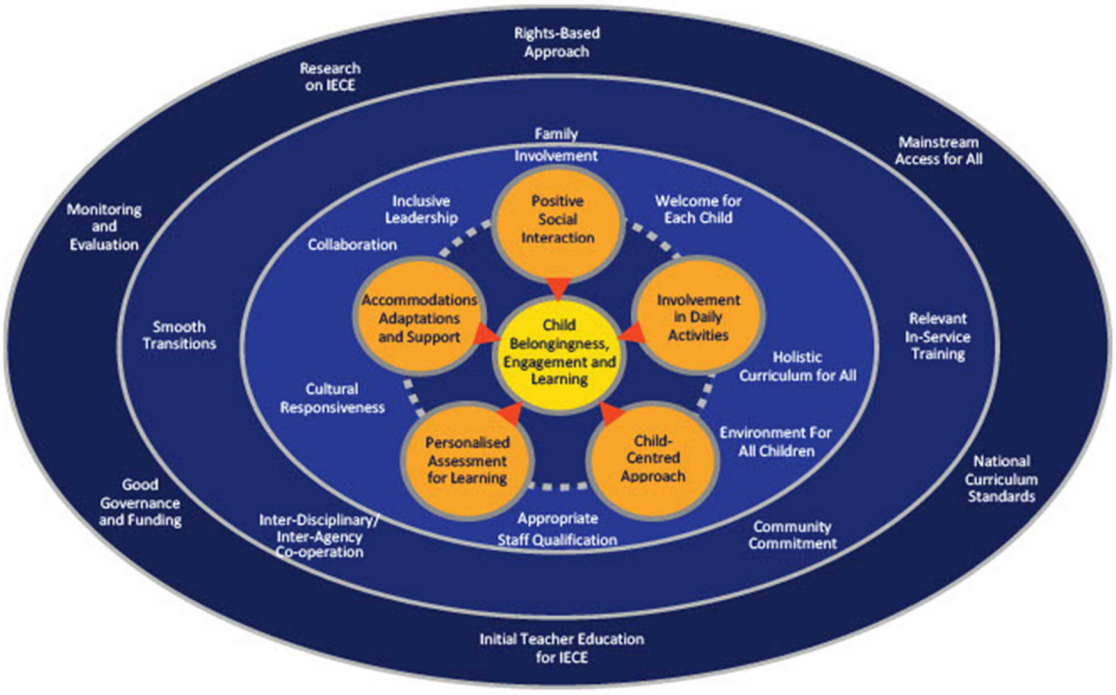

FIGURE 1
The ecosystem model of inclusive early childhood education (cited from EASNIE, 2017a, p. 37).

for staff training. At the highest level in the model are national/regional structures, rights-based policies for ECEC, mainstream access for all children, national curriculum standards, government and financing, monitoring and evaluation, and initial teacher education.

Based on the ecosystem model of Inclusive Early Childhood Education, the Inclusive Early Childhood Education Environment Self-Reflection Tool (ISRT) was developed (EASNIE, 2017b). Furthermore, it is the five primary processes in the everyday activities in the preschool that are focused on the tool but supportive structures at other levels are also included. The ISRT is available in 25 languages on EASNIE's website, free of charge. For the validation process of the English version of ISRT, refer to EASNIE (2017b).

The ISRT can be applied to capture the social, learning, and material/physical environments in the ECEC setting. It consists of eight dimensions with questions reflecting the preschool's inclusiveness. The dimensions are as follows:

1. Overall welcoming atmosphere (seven questions),
2. Inclusive social environment (seven questions),
3. Child-centered approach (seven questions),
4. Child-friendly physical environment (six questions),
5. Materials for all children (seven questions),
6. Opportunities for communication for all (six questions),
7. Inclusive teaching and learning environment (seven questions), and
8. Family-friendly environment (six questions).

The questions are designed to provide an overall picture of the inclusiveness of the preschool setting. For validation of the tool, see EASNIE (2017b). The ISRT is a non-copyright material and is designed to be used in accordance with the needs of stakeholders and contexts. It is important to recognize that the ISRT is neither a standardized instrument that is supposed to be implemented for a specific purpose defined by the authors, nor is the use connected with strict routines in how it should be applied. Instead, the ISRT provides the practitioners with questions that might support them in reflecting on their practices in relation to inclusion. It aims to support a reflective process by focusing on the preschool's social, learning, and physical environment. The instructions for how to apply the tool clearly state that the tool is intended to be used flexibly, guided by the needs of the practitioners, setting, and organization. It is not designed as a standardized assessment or evaluation tool. Preschool settings are encouraged to decide to focus on all aspects or to select some and, if needed, to add their own questions. Due to this flexible approach, the tool can be applied for multiple purposes and guide improvement by various stakeholders, individually or in a group.

In a previous study (Ginner Hau et al., 2020), the ISRT was used in the Swedish preschool context to understand practitioners' perspectives on inclusive processes and supportive structures. From the process of data collection and the obtained data, the ISRT was considered to be a tool that worked well to collect information on practitioners' views of inclusive processes and supportive structures. In addition to the report on the development of the ISRT (EASNIE, 2017b), there are, to the best of our knowledge, few studies on the ISRT.

In the present study, we explore the Swedish early childhood education teachers' perception of the ISRT based on their experiences of applying the tool. In Sweden ECEC is referred to as preschool. Swedish ECEC is a part of the national school system, regulated by Education Act (SFS, 2010:800) and the national preschool curriculum (Swedish National Agency for Education, 2021). Special preschools for children with disabilities are few and predominantly in larger cities. These preschools serve mainly children with autism spectrum disorders and children with severe multiple disabilities. Thus, regular preschools are strongly recommended for all children to have maximal opportunities to interact with their peers. Swedish preschool staff expresses that they need professional support in order to manage the group and the individual child in need of support (The Swedish Schools Inspectorate, 2017). However, it has been suggested that further development is needed for practice to align with the intentions of inclusive education on the policy level (Garvis et al., 2022). The context for this study is, thus, full-day ECEC and that the preschools are required to have the capacity to welcome all children.

Our previous study (Ginner Hau et al., 2020) identified the ISRT as a potentially useful tool for developing inclusion through a reflective approach that is sensitive to the needs of the practitioners (Ginner Hau et al., 2020). For purposes of future implementation of the ISRT, the present study focused on teachers' perspectives regarding the ISRT's potential to contribute to enabling all children's participation, defined as attending and being actively engaged in the activities in early childhood education and care. The specific aim was to explore Swedish preschool teachers' perceptions of the ISRT based on their experiences of applying the tool.

Based on this aim, the following research questions were formulated:

1. What are the preschool teachers' perceptions of the ISRT, based on their experiences of working with the tool?
2. What possibilities and barriers do the preschool teachers perceive to applying the ISRT in order to facilitate inclusive practices?

2. Methods and materials

As previously mentioned, the ISRT has a high degree of flexibility. Therefore, the application of ISRT cannot be evaluated like a standardized evaluation or assessment tool in terms of to what degree users have adhered to how the tool is intended to be implemented. Hence, we chose to explore the teachers' perceptions of using the ISRT with a semi-structured interview that was analyzed inductively in a thematic analysis (cf., Braun and Clarke, 2006, 2013).

2.1. Participants

In the current study, 12 preschool teachers participated. The participants were all preschool teachers with a university degree and no further special education qualification. They worked at seven different preschools with children aged 1–5 years in a municipality in Greater Stockholm. The teachers have experience meeting children with varying cultural backgrounds, as many have immigrant backgrounds, and more than 100 languages are spoken in the municipality. All the participating preschool teachers had used the ISRT together with collogues at their regular team meetings at the preschools.

2.2. Recruitment process

Participants were recruited among preschool teachers that had participated in our previous study (Ginner Hau et al., 2020). Preschools were selected in the order they had reported to have worked with all dimensions of the ISRT. No more than one teacher from each team working with the ISRT was recruited. For recruitment of participants and data collection, two students in the Special Education Program at the Department of Special Education, Stockholm University, Sweden, were involved in the project as a part of their theses. The students contacted the heads of the unit in preschools that had applied the tool and asked for permission to contact the individual preschool teachers. Altogether, contact was taken with 16 of the preschools that had worked with the ISRT.

In the preschools that chose not to participate, either heads of units or teachers declined participation. Without any exception, both heads of units and teachers that chose not to participate did so due to lack of time. After getting permission from the heads of the unit, the students directly asked preschool teachers that had worked with the tool for participation in this study. After an initial contact over the phone, potential participants were emailed with more detailed information about the study and asked to answer the email if they consented to participate. As the recruitment of participants turned out to be challenging, we preliminary regarded 12 participants as sufficient for the objective of the present study. After a preliminary analysis of the collected data, we concluded that no further recruitment was necessary.

2.3. Data collection

Data were collected with individual interviews. These were booked and took place in the participants' workplace, with one out of the two students as the interviewer. The interviews were semi-structured following an interview guide developed by the students and the first author (see Table 1). The interview guide consisted of open-ended questions that focused on the teacher's experience using the ISRT, i.e., questions concerning their experiences of using the ISRT. The interviews were recorded and transcribed verbatim. The length of the recorded interviews was 20–30 min, and the transcriptions were 5–7 pages (Times New Roman 12, simple line spacing).

2.4. Analysis

Data were analyzed with a thematic analysis (Braun and Clarke, 2006, 2013). We used an inductive approach and carefully followed the phases formulated by Braun and Clarke. Initially, the first

TABLE 1 Interview questions to the preschool teachers.

Interview guide
What is your experience using the Inclusive Early Childhood Education Environment Self-Reflection Tool?
When using the ISRT, did you and your colleagues discuss something that has not been discussed before?
Did you and your team recognize something new in your preschool practice?
What reflections did the questions lead to? Please give examples.
How did you experience the questions in the tool?
Which questions contributed to a discussion in the team?
Which questions did not contribute to a discussion in the team?
Which questions contributed to more reflections for you as a preschool teacher?
Which opportunities are there to work more continuously with the ISRT?
Which obstacles are there to working more continuously with the ISRT?
Do you meet other preschool teachers regularly to reflect on the preschool practice together?

author read the interviews in their entirety and took continuous familiarization notes. These notes were the content of potential interest, content perceived as familiar/unfamiliar, ideas for coding, and responses to the data. The familiarization was followed by semantic and selective coding of the transcripts. In this phase, the first author inductively coded data relevant from the perspective of the aim of the study. When the coding was finalized, the first author listed the codes and relevant data for each. As a next step, the first author reviewed coded data and generated initial themes. Similar codes were clustered together to create initial themes that were distinctive and could be regarded as part of a larger whole. In line with Braun and Clarke (2022), the second author reviewed six initial themes and discussed them with the first author in this phase. The two authors agreed on the following six themes for the teachers' perceptions of the ISRT: (a) The ISRT helps to shed light on areas that otherwise would be invisible, (b) the ISRT includes a considerable number of questions that are difficult to know how to answer, (c) the ISRT is helpful by creating the kind of time that is required for reflection, (d) the ISRT requires time that does not exist, (e) the ISRT is with the proper prerequisites as a useful tool, and (f) the ISRT is constructed in a way that makes it unclear how it shall be useful in everyday practices. In this phase of the analysis, the two authors also discussed and agreed that the six themes had a pattern of being contradictive pairs. Even if the themes could be regarded as contradicting each other, as presented in the Result section, pairing the six themes, they constituted three theoretically meaningful main themes. Therefore, the authors considered it more meaningful to pair these six themes into three qualitatively concerning aspects of the preschool teachers' experiences working with the tool. In the continuous process of reviewing and developing themes, the first author identified the nature and character of the pattern of the contradictive pairs and also reviewed their potential to be themed, which the second author then reviewed. Consequently, the first and the second authors discussed the quality, boundaries, and meaningfulness of the three themes and related data. Thenceforth, the first author revised the names of themes and formulated definitions in dialog with the second author. The themes and definitions were not changed in the last phase of writing the results, but when writing the results, we elaborated and further developed them in discussing the results. All themes are illustrated with quotes from the participants.

2.5. Ethical considerations

The current study has followed Swedish legislation of research on people. A review from the Swedish Ethical Review Authority was not required. However, we have followed the All European Academies (2017) code of conduct for research integrity.

Recruitment of participants was conducted so that it would not be possible for employers or colleagues to get information about who had agreed to participate and who had not. Limited background information was collected in order not to enable the identification of participants by employers or colleagues. In addition, general background information was regarded to have a limited value for the study's explorative approach. When transcribing the interviews, all personal details were omitted.

All participants were informed about the study *via* e-mail and in connection to the interviews. They were asked to give their consent in replying to the initial e-mail. All information about the study was repeated at the beginning of the interview. The participants were informed about the aim of the study, that it was voluntary, and that they could withdraw at any time without any consequences. They were also told that no one other than the interviewers and researchers of the current study would have access to the data and that the data would be anonymized. They got the information that data would be used for a student's master thesis and research on the ISRT. The participating preschool teachers also gave their consent before the interview started.

3. Findings

The three main themes were as follows: (1) *The suitability of the construction of the ISRT*, which was composed of (a) the ISRT helps to shed light on areas that otherwise would be invisible, and (b) the ISRT includes a considerable number of questions that are difficult to know how to answer. (2) *The time required for applying the ISRT*, where time shortage was identified as central in applying the ISRT. This was constituted by (c) the ISRT is helpful in creating the time required for reflection, and (d) the ISRT requires time that does not exist. (3) *The ISRT's immediate relevance for preschool practice.* This theme covered the practitioners' perception of the ISRT based on whether it has instant relevance for practice, which was constituted by (e) with the proper prerequisites the ISRT is a useful tool, and (f) the ISRT is constructed in a way that makes it unclear how it shall be useful in everyday practices.

3.1. Suitability of the construction of the ISRT

The ISRT is described as composed of questions that helped the preschool teachers shed light on inclusive structures and processes that otherwise would be invisible to them. However, at the same time, the tool is described as including a considerable number of questions that the participants are unsure how to answer. The statements that signify this theme concern the adequacy of how the questions are formulated, which was a common topic in data and manifested in the interviews in completely contradictive statements. The questions were, on the one hand, considered to be highly adequate. Participants described them as good, clear, and easy to understand and answer. They were also described as constituting a good starting point for reflection on inclusive practices by covering a broad area of relevant topics. To an equal extent, they were described negatively as inadequate and unclear. Participants expressed that they had "got stuck" as they could not figure out the meaning of some questions and that the formulation of many questions was odd. It was also brought up that the yes/no construction of some of the questions in the ISRT did not encourage reflective discussions and that such questions were perceived as contradictive as the ISRT is formulated as a tool for reflection. The following quotations illustrate the theme *suitability for the construction of the ISRT*:

> [The questions were] clear, that... you didn't have to sit and think that much, as soon as a colleague said something, the rest of us could spin on it. (Participant 11)

> But there were some questions that felt like, what do they want to know, what are they looking for, and what do they actually mean [for example] by cultural diversity? (Participant 12)

> I think all questions are relevant, and we have more or less discussed all questions. (Participant 3)

> We thought the questions were rather strangely worded. (Participant 8)

3.2. Time required for applying the ISRT

Working with the ISRT is explained by the participating preschool teachers to require time that does not only exist but also creates a temporal space necessary for discussing inclusion. Time is a central aspect for all interviews. Time is described as the main obstacle to using the tool in practice and also reported as the explanation for why participants have not continued working with the ISRT. There are also statements concerning the abundance of documentation the participants are expected to handle in their everyday practices. Consequently, the ISRT requires time that does not exist.

On the other hand, there are statements by the participants regarding the tool as creating the necessary temporal space for discussing central aspects of participation and engagement for each child. Moreover, some participants considered the tool suitable for focusing on a limited number of dimensions or questions at a time by dividing it into smaller sections. The theme *time required for applying the ISRT* is illustrated by the following quotations:

> The only obstacle is the time pressure that you need to organize it with everything you have to do, then I thought these were questions that were really about our work and what is important, but it is so incredibly extensive. It's really our whole everyday practice, so the obstacle is probably just the time. I mean, it must not be an obstacle. We need to find a structure that makes it possible to work with it continuously. (Participant 1)

> Then it is the amount of time it takes, and we have a lot of other things . . . we have forms that we have to fill in every week, every month, and every semester so there is a lot of paperwork. (Participant 9)

> We really appreciated this day [working with the tool] when we got to talk about all these areas... (Participant 5)

> Time is always an obstacle in preschool because you must prioritize, and working with the children must come first. It is difficult to prioritize reflection and to sit with a bunch of papers and leave our colleagues on their own with the children . . . it won't be good for the children if you are away too much. (Participant 5)

3.3. ISRT's immediate relevance for preschool practice

The ISRT is described both as relevant and irrelevant to preschool practices. Participants believed the tool to have the potential to be very useful with the proper prerequisites. They also thought it was a tool that was very useful for practice. At the same time, it is also described as being constructed in a way that makes it unclear how it shall be useful in practice. The tool is described as relevant as it corresponds with the preschool curriculum. It contributes to daily practice clarifications and gives the participants a good overview of their work. The participants also gave concrete examples of the outcome of reflections on the practice that the tool has initiated. The tool is also suggested as a relevant starting point for weekly reflections.

On the contrary, the ISRT is mentioned as a part of a constant inflow of tools that shall be applied in preschool that does not contribute to practice. The tool is also said to cover broad and general areas, thus not relevant for everyday practices. Contradicting the aforementioned statement that the tool is relevant by being in line with the curriculum is that the tool is

not meaningful because many yes/no questions are more or less like a checklist related to the curriculum. The theme of *ISRT's immediate relevance for preschool practice* is illustrated by the following quotations:

> So, this is a good tool for us, also because teachers come and go. This is a tool that can guide us toward the goals we have. (Participant 4)

> It is evident that it is carefully developed and that it is based on the curriculum. I think it is very good because all these questions are what our mission is. (Participant 12)

> We can get preschool teachers who have completed an education that can do this, but then we have preschool teachers who can barely formulate a vision regarding the activities she wants to run. So, it becomes difficult to add a tool like this that requires you to know what inclusion means. You should know and be able to formulate yourself. I also see this as a shortcoming. (Participant 10)

> … it was pretty easy to use, I thought, but I do not know what function it should fill. (Participant 8)

4. Discussion

For the purposes of future implementation of the ISRT, the present study focused on the teachers' perspective regarding the ISRT's potential to contribute to enabling all children's participation, defined as attending, and being actively engaged in the activities in early childhood education and care. The specific aim was to explore Swedish preschool teachers' perceptions of the ISRT based on their experiences of applying the tool. In the analysis of the interviews, we identified three main themes on a general level related to the teachers' experiences of using the ISRT. The first general central theme concerned the suitability of the construction of the ISRT. This theme dealt with both negative and positive perceptions of how the questions in the ISRT are constructed. The positive perceptions underlined that the ISRT includes questions covering significant aspects of inclusive education. The negative perceptions stressed that it was unclear how to answer a considerable amount of the questions. In general, this generates contradictive implications for future adaptations of the ISRT for Swedish preschools and probably for ECEC. It indicates that an adaptation would require studying the teachers' perception of individual questions in more detail.

The second general central theme concerned the time required for working with the ISRT. In our data, lack of time was expressed as a barrier to applying the ISRT. The tool was also regarded as an opportunity to create temporal space for discussions that would not take place otherwise. As described initially, Swedish ECEC is a full-day preschool for children aged 1–5 years. Considering the context of full-day preschools, it is reasonable to assume that a barrier to using the tool is the limited opportunities for joint reflections, such as the ISRT requires. However, as expressed in the interviews, making time available to work with the ISRT is itself a way to prioritize joint reflections. This might be particularly valuable in a context such as Swedish preschools. Both with regard to the full-day preschool offering limited opportunities of joint time for reflection and that for a universal preschool that welcomes all children, such reflections can be regarded as a prerequisite for a high-quality ECEC. From this perspective, our results imply that the ISRT can contribute to creating opportunities to overcome barriers associated with a lack of time for joint reflections.

Finally, the ISRT's relevance for practice was a central general theme. The theme captured data that described the ISRT as relevant for practice if applied under the proper circumstances and also statements regarding the ISRT as irrelevant for practice. This theme implies the need for in-depth studies of the teacher's view of specific sections of the tool. This could be a way to find out more in detail why some teachers consider the tool irrelevant. Based on such detailed information, adaptations to the Swedish context might increase to what degree the tool is considered relevant. As the tool is constructed in a European context, it is reasonable to assume that implementation in other European contexts will raise questions similar to our interviews. Therefore, even if one of the ISRT's strengths is that it is based on data from more than 30 European countries, some adaptations for individual countries might be necessary to make the tool relevant for inclusive everyday practices.

4.1. Central themes and acceptability, appropriateness, and feasibility

At a higher level of abstraction, the qualities of the themes align with general aspects of implementation. As we discussed initially, a core feature of ISRT is the tool's flexibility, which is supposed to be adjusted to the specific needs of each preschool context. It is up to the end users to decide for what purposes the tool shall be applied in their particular settings (cf., EASNIE, 2017b). In contrast to standardized tools, the ISRT has no clear directions for how it should be applied. Instead, it is intended to be implemented in the most useful ways for practice. Even so, on this more abstract level, the identified themes can be considered to correspond to fundamental implementation challenges in general. The interpretation of the results led us to connect each of the three main themes to three central concepts of implementation: acceptability, appropriateness, and feasibility (Proctor et al., 2011). Therefore, regarding the ISRT as an innovation for supporting teachers to promote inclusive education, these three concepts could be considered aligned with the three inductively identified main themes.

4.1.1. Suitability of the construction of the ISRT—acceptability

Proctor et al. (2011) have defined acceptability as "the perception among implementation stakeholders that a given treatment, service, practice, or innovation is agreeable, palatable, or satisfactory" (Proctor et al., 2011, p. 67). For the acceptability

of the ISRT, the perceptions of how the questions in the tools are formulated are central. As mentioned previously, the construction of the questions was both appreciated and criticized by participants. It could be interpreted that those who appreciated the questions understood the instrument's basis as a reflection tool. They used the questions as a starting point for reflections rather than questions that shall be answered. In contrast, those who perceived the tool as a regular evaluation tool and tried to understand the exact meaning of the questions and deliver a clear answer probably became more frustrated.

4.1.2. Time required for applying the ISRT—feasibility

Based on Karsh (2004) and Proctor et al. (2011, p. 69) define feasibility as "the extent to which a new treatment, or an innovation, can be successfully used or carried out within a given agency or setting". Whether the ISRT is feasible for practice is likely to depend on several factors. However, the time aspect can be assumed to be critical. Similar to the other two themes, this theme is constituted of contradictive statements that clearly establish time as a central aspect of the tool's feasibility. What is unexpected is that the tool is actually perceived as creating time for discussions of inclusive education. While some participants find the tool far too extensive, others introduce ideas on how the tool could be applied by discussing one area at a time based on the needs of the settings. It might be that those who find the tool feasible regarding time have acknowledged the possibilities they have to design how to apply the ISRT, whereas those who find the tool too demanding in regard to time might perceive it as a traditional evaluation tool.

4.1.3. ISRTs immediate relevance for preschool practice—appropriateness

Appropriateness is defined as "the perceived fit, relevance, or compatibility of the innovation or evidence-based practice for a given practice setting, provider, or consumer; and/or perceived fit of the innovation to address a particular issue or problem" (Proctor et al., 2011, p. 69). In line with this definition, the results from the current study concerning participating preschool teachers' beliefs of the relevance of the ISRT in promoting inclusive education can be considered as corresponding to the concept of appropriateness. Some experience the tool as helpful in everyday practices, whereas others find it difficult to see the ISRT's relevance for practice. It should be noted that some of the difficulties the participants express could be related to the freedom they have to adjust the tool for the needs of their specific settings might not be sufficiently communicated.

4.2. Limitations

This study is, to the best of our knowledge, the first to explore teachers' perceptions of applying the ISRT. The study provides valuable information for future implementation of the ISRT. However, the study also has limitations, mainly related to the limited number of participants recruited from a geographically restricted area. For confidentiality reasons, we chose not to collect detailed information about the participants. Further knowledge about the participants could have contributed to the comprehensiveness of our data. None of the participants had a special education degree, thus, this type of instrument might have been unfamiliar to them. In addition, the participants had limited experience with using the tool, and we did not follow their processes for applying it over time. The teachers' perceptions of the tool are, however, in line with the findings in our previous study, for example, concerning problems with how some of the questions are constructed (Ginner Hau et al., 2020). The results should not be generalized. Nevertheless, our results could be assumed to have relevance for other contexts inside and outside Sweden. There is a need for further implementation studies on the ISRT.

4.3. Conclusion and implications

The ISRT is a tool that should support reflective processes regarding the preschool's social, learning, and physical environment (EASNIE, 2017b). According to its instructions, it is a tool intended to be used flexibly, guided by the needs of the practitioners, setting, and organization. The ISRT should not be implemented as a standardized assessment or evaluation tool. Even so, some participants appear to assume that they are supposed to apply the ISRT for evaluative purposes. One possible explanation for this could be the emphasis on evaluations in Swedish preschools (Swedish National Agency for Education, 2011, 2018). Possibly, this can have led practitioners to regard the purposes of discussions and documentation to be solely evaluative rather than joint reflections having an intrinsic value.

Furthermore, evaluations in Swedish preschools usually aim to identify measures that need to be undertaken, which might also have hindered practitioners from appreciating the reflective approach of the ISRT. Therefore, introducing a tool such as the ISRT in a context such as the Swedish preschools requires careful consideration of what barriers a well-established evaluative tradition might constitute for implementing a tool that aims to promote reflective processes. However, some of the questions of the ISRT partly have a construction that does not necessarily support reflection (Ginner Hau et al., 2020). Revising the formulation of some questions might enhance the potential of the tool to encourage reflection.

Feasibility in the Swedish context could be improved by guiding stakeholders in planning their work with the ISRT. For example, by adding concrete instructions and examples pointing to the importance of deciding what they want to achieve when using the tool. Such instructions might improve users' confidence in choosing their purposes with the tool and adapting it to their needs in developing inclusive education. A more general interpretation is that for an unstandardized tool without fixed procedures, there are challenges in communicating how it should be applied.

One of the strengths of the ISRT is that it is based on information about structures and processes collected in ECEC in most European countries (EASNIE, 2017a,b). There are, however, linguistic aspects that should be considered. The tool was constructed with English as the working language, and the validation was performed based on the English version (cf.,

EASNIE, 2017b). The tool has been translated into more than 20 languages, of which Swedish was one. However, ecological validation is necessary for using the ISRT in different countries with different languages and practices. Subsequently, the results regarding comprehensiveness may be interpreted as the necessity for such an ecological validation for the tool to be implemented in Swedish preschools.

Finally, exploring the application of the ISRT, both in the current study and in our previous study (Ginner Hau et al., 2020), the results can be interpreted as shedding light on participation not only as a key for inclusion in terms of children's participation but also in terms of practitioners' active engagement. In turn, this could be regarded in the light of the potential to increase the preschools' capacity to enable all children's participation. The development and use of tools such as the ISRT require that teachers are motivated to be engaged in each child's active participation and inclusive practices. Hence, acceptance, appropriateness, and feasibility for tools such as the ISRT might best be achieved by co-production in close collaboration with practitioners in preschools.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. The patients/participants provided their written informed consent to participate in this study.

Author contributions

HG contributed to the initial conception and design of the study, the design of procedures and performing of the data collection, and has lead the writing of the manuscript. HG performed data-analysis in continuous cooperation with HS and with EB in the final discussions of the analysis and interpretation of the results. HS and EB have contributed to the drafting the manuscript as well as revising it critically for important intellectual content. All authors have approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

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Corrigendum: Exploring Swedish preschool teachers' perspectives on applying a self-reflection tool for improving inclusion in early childhood education and care

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In the published article, there was an error in **Methods and materials**, *Analysis*, paragraph one.

The second sentence previously stated: "We used an indicative approach and carefully followed the phases formulated by Braun and Clarke."

This should have been written as: "We used an inductive approach and carefully followed the phases formulated by Braun and Clarke."

The authors apologize for this error and state that this does not change the scientific conclusions of the article in any way. The original article has been updated.

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Are relations between children's hyperactive behavior, engagement, and social interactions in preschool transactional? A longitudinal study

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Based on bioecological systems theory, engagement is the mechanism for children's learning and development. However, children with hyperactive behavior tend to be less engaged in early childhood education and care (ECEC), which might negatively influence their learning and development. On the other hand, social interaction might support children with hyperactive behavior staying engaged in these activities. The current study investigates whether the association between teacher responsiveness, positive peer-to-child interaction (i.e., the quality of peer interaction) and children's hyperactive behavior and engagement levels are transactional. Two hundred and three children aged 1 to 5 in Swedish preschool settings were followed. Data was collected at three points in time between 2012 and 2014. This data was then analyzed to identify associations and how they changed over time. Transactional paths were found between children's levels of core engagement, teacher responsiveness, and the quality of positive peer-to-child interaction. Children's core engagement increases the probability of better quality positive peer-to-child interaction and teacher responsiveness, increasing core engagement over time. Teacher responsiveness and the quality of positive peer-to-child interaction are predictors of reduced hyperactive behavior over time. Meanwhile, children's hyperactive behavior does not significantly influence these two types of social interaction, that is, decreased hyperactivity may not improve social interaction to the same extent as increased engagement. The findings are discussed in relation to how special support for children with hyperactive behavior can be designed, with a focus on increasing core engagement in preschool settings.

KEYWORDS

hyperactive behavior, core engagement, social interaction, early childhood education, bidirectional paths, special support needs

Introduction

A large body of research stresses the importance of engagement in early childhood education and care (ECEC). Engagement is assumed to be essential for children's learning and development, both in the short and long term (Fredricks et al., 2004; Skinner et al., 2008; Aydogan, 2012; Cadima et al., 2015). It has been suggested that global engagement (e.g., cognitive, social, and emotional engagement), which becomes increasingly complex as the child matures, is the mechanism for children's learning and development (Bronfenbrenner and Evans, 2000).

However, not all children show global engagement due to developmental delay or behavior difficulties (BD), such as hyperactive behavior or conduct problems, which negatively affect their opportunities to learn and develop new skills (Gustafsson et al., 2021). On the other hand, not all aspects of engagement behavior necessarily become more complex over time. For instance, studies show that attention and persistence behavior, part of engagement behavior, is not related to child maturity but is related to motivation and is an essential pre-academic skill, which is a salient predictor of later outcomes (McClelland et al., 2007, 2013; Skinner et al., 2008; Kasari et al., 2012; Nesbitt et al., 2019). Children displaying behavioral difficulties (BD) such as hyperactive behavior often lack attention and the ability to exclude non-relevant stimuli (Allan et al., 2015). Moreover, children with BD tend to spend more time in teacher-child conflict and less time in positive peer-to-child interaction (Hamre and Pianta, 2001; Sheridan, 2007). Thus, it is crucial to support their core engagement in order to improve their learning and development. For instance, proximal processes, such as teacher responsiveness, positive peer-to-child interaction, and engagement, are the engine for children's development and learning (Bronfenbrenner and Evans, 2000; Sjöman et al., 2016). Teacher responsiveness refers to their emotional tone and approval responses to children's behavior, which is a significant predictor for children's engagement in ECEC and less BD in grade 1 (Spivak and Farran, 2016).

Thus, although there is evidence of a negative association between children's hyperactive behavior, global engagement, and social interaction, less is known concerning how the child's behavior and social environment in ECEC influence each other over time. It is therefore essential to investigate the reciprocal influences between children's behavior and social interaction (Sameroff, 2009). The current study investigates the association between children's core engagement, hyperactive behavior, and two types of social interactions (e.g., positive peer-to-child interaction and teacher responsiveness) in Swedish preschool settings, and whether transactional paths exist.

The association between children's core engagement and hyperactive behavior

Engagement refers to children's active involvement in social interactions with materials or everyday activities at different levels of complexity and in a developmentally appropriate manner (Raspa et al., 2001). Numerous studies have demonstrated that a child's global engagement (i.e., social, cognitive, emotional, and behavioral engagement) varies depending on the child's maturity and gender (Raspa et al., 2001; Vitiello et al., 2012; Aguiar and McWilliam, 2013; Searle et al., 2013; Williford et al., 2013). For children with BD, it has been found that their hyperactive behavior negatively affects their engagement (Sjöman et al., 2016). One explanation might be that children with hyperactive behavior usually have self-regulation challenges, resulting in difficulties maintaining engagement long enough to be active participants in everyday activities in preschool settings (Metcalfe et al., 2013; Searle et al., 2013; Allan et al., 2015). Severe behavior difficulties might be predictive of psychiatric diagnoses such as Attention Deficit/Hyperactivity Disorder (ADHD) in later life (Hong et al., 2015). However, although most children with hyperactive behavior during preschool years do not meet the requirements for formal diagnoses (Vasileva et al., 2021), they might still have issues sustaining their attention and engaging in social interactions or with materials. For instance, proxy ratings reported by preschool staff in Swedish preschools showed that between 11 and 17% of children aged 1–5 display a BD, such as hyperactive behavior, peer–interaction problems, or conduct issues, to a degree that negatively affects their everyday functioning (Lutz, 2009; Lillvist and Granlund, 2010).

Previous research showing a strong association between hyperactive behavior and engagement indicates that improving children's engagement may have a more substantial effect on decreasing behavior problems as it may elicit reactions from teachers that promote the child's future engagement behavior. On the other hand, other studies show that children with hyperactive behavior tend to be less engaged in complex activities, such as symbolic and cooperative play, and spend more time in solitary play (Coplan et al., 2001; Searle et al., 2013; Coplan et al., 2015).

Thus, it might be sufficient to investigate the intensity of engagement behavior for children with hyperactive behavior, regardless of its complexity and maturity, from low to high levels of engagement behavior. High levels of engagement could be observed in the child's body language, e.g., the child concentrates highly and shows persistence and attention behavior. Meanwhile, low levels of engagement might be observed when the child briefly looks around without paying attention to or interest in something specific (Farran, unpublished manuscript). Several studies, based on proxy ratings, showed that the construct 'engagement' consists of two underlying dimensions: developmental engagement and core engagement (De Kruif and McWilliam, 1999; Aguiar and McWilliam, 2013; Sjöman et al., 2016). Developmental engagement is related to child maturity and could be observed during problem-solving and pretend play in ECEC. Meanwhile, core engagement refers to the child's attention and persistence behavior unrelated to maturity or complexity. These behaviors could also be observed among children with autism or in toddlers (De Kruif and McWilliam, 1999; Kasari et al., 2012; Aguiar and McWilliam, 2013).

Moreover, a cross-sectional study (Sjöman et al., 2016) investigated the association between children's hyperactive behavior and less complex engagement behavior (core engagement), such as shared attention or persistence behavior; versus complex engagement behavior (developmental engagement), such as problem-solving. A negative association was found between hyperactive behavior and developmental engagement. Meanwhile, a weak negative association between hyperactive behavior and core engagement was found. Moreover, attention and persistence behavior has also been shown to positively impact motivation (Skalski et al., 2021), learning, and development among children with BD (Sjöman et al., 2016).

Thus, although there is evidence for a negative association between global engagement and BD, investigated over time or cross-sectional, less is known about the association between core engagement, hyperactive behavior, and possible transactional paths between child behavior and social interactions.

Proximal processes – engine for engagement for children with BD

Based on bioecological systems theory (Bronfenbrenner and Evans, 2000), proximal processes seem to be the engine for child development. Proximal processes are transactional paths between the child and the

environment and are mutually rewarding. Engagement can be viewed as a snapshot of a proximal process between the child and their surroundings, with intensive engagement behavior in everyday activities or social interactions expressing an effective proximal process (Bronfenbrenner and Evans, 2000) improving the child's competence in cognitive domains (White et al., 2021). However, less intense engagement behavior represents a non-effective proximal process (Bronfenbrenner and Evans, 2000) associated with hyperactive behavior and difficulties in maintaining attention, which in turn has a negative influence on the child's learning and development (Yoder et al., 2019).

Over the past decades, research has stressed positive social interactions as an essential factor promoting children's engagement and acquisition of pre-academic skills, such as early mathematics, letter skills, and the ability to shift focus and sustain attention (Birch and Ladd, 1997; Howes et al., 2008; Nesbitt et al., 2019). Examples of positive social interaction are teacher-child interaction characterized by teacher responsiveness, adequate scaffolding, and learning support (Yates and Yates, 1990; Sylva et al., 2006). Moreover, teacher responsiveness is based on reciprocal paths between the child and teacher through 'serve-and-return' processes (i.e., transactional processes) (Vygotskij and Cole, 1978). An observational study revealed that when teachers interacted with children in an emotional and responsive manner during instruction, this was positively associated with gains in children's language and literacy skills, regardless of their initial patterns of classroom engagement (Williford et al., 2013). Moreover, a longitudinal observational study by Curby et al. (2014) indicated that teachers' emotionally and supportive behaviors was associated with children's engagement. However, the only significant transactional paths were found between children's engagement and later teacher emotional supports. In other words, the study indicated that children's engagement was the force that improved teachers emotional and supportive behavior. A similar association has been found in other studies, i.e., teachers seem to interact more frequently with children who respond with positive emotions and interact less frequently with children who respond negatively or do not respond at all (Birch and Ladd, 1997; Shonkoff and Phillips, 2000).

Moreover, teachers' behavior has been found to be associated with behaviors among children within the classroom. For instance, a cross-sectional study by Sheridan (2007) conducted in ECEC settings in Germany and Sweden revealed that teachers' use of abdication or dominant behavior, such as overriding the child's initiatives, was associated with more conflicts between children. In addition, little space for children's own initiatives was observed, which in turn showed a negative influence on their engagement. On the other hand, teachers' use of democratic/learning strategies, such as sensitive, social, and negotiating teaching strategies, promoted interplay, participation, communication, and cooperation between the teachers and children and among children in the peer group.

Another important social interaction for children's engagement is positive peer-to-child interaction, which refers to the quality of the interaction between peers and the focal child, which has been found to promote engagement among children with BD (Almqvist, 2014; Sjöman et al., 2016). Examples of high-quality positive peer-to-child interaction are when peers show interest in what the child is doing or when another child can direct the child's interest toward a shared object, activity, or person (Granlund and Olsson, 1998). A longitudinal study (Sjöman et al., 2021) revealed that positive peer-to-child interaction might reduce hyperactive behavior among children with BD.

However, it has been shown that there are critical aspects of proximal processes and frequencies among children with hyperactive behavior in social interaction with teachers and peers (Doumen et al., 2008; Sameroff, 2009). For instance, children with BD tend to be less engaged with materials, peers, and teachers in appropriate ways (Searle et al., 2013), which in turn can lead to less teacher responsiveness and positive peer-to-child interaction (Sjöman et al., 2016). Moreover, studies show that children with BD are more often involved in teacher-child conflicts (Hamre and Pianta, 2001; Buyse et al., 2008; Zhang and Sun, 2011), and meet with less teacher responsiveness, more reprimands and teacher use of more disapproving behavior (e.g., disapproving facial expressions or a negative tone of voice) and spend less time in peer-to-child interaction (Buhs et al., 2006; Almqvist et al., 2018). Moreover, the results of a longitudinal study by Almqvist (2014) showed decreased teacher responsiveness towards children with BD. In summary, less time in positive interactions with teacher and peers, and more time when the child experiences negative behaviors from the teacher or less time in peer-interaction are aspects related to non-effective proximal processes.

Moreover, a previous longitudinal study by Gustafsson et al. (2021) showed that children displaying multiple risk factors such as low engagement behavior, hyperactive behavior, conduct problems, and less engagement in social interaction are at higher risk for later maladjustment. On the other hand, children who displayed one or two risk factors but also protective factors, such as engagement in social play, did not show the same negative pattern. Thus, later maladjustment is not only related to the number of risk factors but also protective factors such as children's engagement and social interactions with peers and teachers. Similarly, although a negative association between BD (e.g., hyperactive behavior) and core engagement (e.g., attention and persistence behavior) was found in a cross-sectional study (Sjöman et al., 2016) in Swedish preschool settings, teacher responsiveness and positive peer-to-child interaction mitigate the negative association between children's engagement and hyperactive behavior. Thus, the study indicates that although children show BD, they also show core engagement if they are meet with positive interactions in ECEC. Moreover, a longitudinal study has shown that teacher responsiveness and positive peer-to-child interaction were significantly associated with children's hyperactive behavior and attention and persistence (i.e., core engagement) (Sjöman et al., 2021). In other words, increased core engagement led to decreased hyperactive behavior over time.

Based on the above, the inconsistent findings regarding the direction of the association between children's engagement, hyperactivity, teacher responsiveness and the child are unclear. Thus, more knowledge is needed concerning the association between social interactions, engagement behaviors, and hyperactive behaviors over time. The current study proposes that the development of the relationship, rather than the individuals, is the appropriate unit of analysis for identifying transactional paths. Transactional paths are not only ongoing and simultaneous processes involving the behavior of the child and others, but also encompass how different individuals change their behavior over time (Kuczynski and Parkin, 2009).

Aim and hypothesis

Based on previous research, children with hyperactive behavior are meet with less positive peer-to-child interaction and teacher

responsiveness and spend less time in social play (see Hamre and Pianta, 2001; Zhang and Sun, 2011; Curby et al., 2014; Coplan et al., 2015). On the other hand, when children demonstrate intense engagement behavior (i.e., core engagement), it is associated with positive peer-to-child interaction as well as teacher responsiveness (see Searle et al., 2013; Williford et al., 2017; Sjöman et al., 2021). However, both the direction of these associations and possible transactional paths are unclear. To investigate the direction of these associations and their possible transactional paths, the relationships need to be investigated over time.

Thus, the current study aimed to explore possible directional or transactional paths between social interactions (e.g., teacher responses and positive peer-to-child interactions) and core engagement and hyperactive behavior over time. The data was collected at three points in time between 2012 and 2014. Two models were used to investigate the possible transactional paths. The first model tested the associations between teacher responsiveness and children's core engagement and hyperactive behavior over time. The second model tested the associations between positive peer-to-child interaction and children's core engagement and hyperactive behavior over time.

For the teacher-child model, the following hypotheses were tested:

> Children's hyperactive behavior at time-point one is associated with less teacher responsiveness at time-point two, which is associated with increased hyperactive behavior at time-point three.
>
> Children's core engagement at time-point one is associated with teacher responsiveness at time-point two, which is associated with increased core engagement at time-point three.

For the peer-to-child model, the following hypotheses were tested:

> Children's hyperactive behavior at time-point one is associated with less positive peer-to-child interaction at time-point two, and less positive peer-to-child interaction at time-point two increased hyperactive behavior at time-point three.
>
> Children's core engagement at time-point one is associated with positive peer-to-child interaction at time-point two, which is associated with increased core engagement at time-point three.

Method

The current study is based on a longitudinal survey design that used preschool staff members' ratings of children's engagement, BD, and social interactions. The participants in the current sample were children with complete data collected at three points in time between 2012 and 2014. The data came from a longitudinal study conducted in Swedish preschools during 2012 to 2014 (Granlund et al., 2015).

Participants

The sample consisted of 203 children (114 boys and 89 girls) in 23 classrooms in public preschools. The first assessments were done when most children were 2.5 years old ($M = 32$; $SD = 9.05$). The group size ranged from 9 to 44 children ($M = 20$; $SD = 8.81$). The child to staff ratio for toddlers—usually between 15 and 36 months old—was, on average, 5:1 ($SD = 1.23$). In classrooms for preschool-age children—usually between 37 and 71 months old—the average child to staff ratio was 6:1 ($SD = 1.76$). The staff responded to a survey asking whether the children were formally identified as needing special support due to developmental delay and/or BD affecting their everyday functioning in preschool. The number of children needing special support in each classroom ranged from 0 to 9 ($SD = 0.96$); 45 children needed special support due to BD or for other reasons.

Procedures and ethical considerations

The current study is based on a longitudinal design, The surveys were filled out by the preschool staff. Data was collected at three points in time between 2012 and 2014 in the autumn between August to October. Initially, the survey package was evaluated by an expert panel consisting of experienced preschool teachers and special educators. Following the expert panel's suggestions, some items on the survey were adapted to the Swedish preschool environment.

The directors of the preschools and the preschool staff gave written informed consent to participate in the project. All parents of the participating children were informed about the study by the preschool staff and given a request for consent for their child to participate. Each Fall, the surveys were handed out by project group members during the first visit, and each preschool unit returned them during the second visit. The ethical review committee in Linköping, Sweden approved the project (Reg. no. 2012/199–31).

Measurements

Preschool staff rated children's everyday functioning (i.e., engagement, social interaction, and BD) at three points in time between 2012 and 2014. Questions about staff collaboration with parents and the preschool's physical environment (e.g., access to materials) were also included in the survey. The whole survey package contained 159 items. For the current study, only the demographic data and items that relate to the study's aim were used for the analyses, i.e., items related to teacher responsiveness, positive peer-to-child interaction, hyperactive behavior, and core engagement. The content of the scales used is described in greater detail below.

Social interactions in preschool

Social interactions were measured with an adapted version of the questionnaire "Interaction – your child, your interaction" (Granlund and Olsson, 1998), in which preschool teachers rated their experiences of different types of social interactions between peers and the child as well as between the teachers and the child. The instrument used included 36 items covering teacher–child interactions, child–teacher interactions, positive peer-to-child interactions, and child-to-peer interactions. The responses are based on a five-point Likert scale from 1 to 5, where 1 = "seldom" and 5 = "often." In the current study's analyses, two subscales were used to measure *teacher responsiveness to the child* (10 items) and *other children's interactions with the child,* i.e., *peer-to child interactions* (five items). Examples of items for teacher responsiveness were: 'I comment or show interest in what the child is doing,' 'I know what situations inspire the child to interact and can, if necessary, create such situations.' Examples of items for positive peer-to-child interaction were: 'Other children show interest in what the

child is doing,' 'Other children can steer the child's interest towards a common object, activity or person.' According to Almqvist (2006a) and Sjöman et al. (2016), the internal validity was high for each subscale measuring teacher responsiveness (α = 0.77) and positive peer-to-child interaction (α = 0.92). In the current study, the Cronbach alpha coefficients for teacher responsiveness for each data collection point were data collection 0.75, 0.80, and 0.72. The Cronbach alpha coefficients for positive peer-to-child interaction for each data collection point were 0.92, 0.90, and 0.91.

Behavior difficulties

Children's BD was measured using the "Strength and difficulties questionnaire" (SDQ) by Goodman (1997). This instrument has 25 items covering five subscales related to conduct problems, hyperactive behavior, emotional problems, peer problems, and prosocial behavior. Responses are provided on a three-point Likert scale from 0 to 2: 0 = "not at all," 1 = "only a little" and 2 = "quite a lot." It has been suggested that, using cutoff scores for each subscale, the total score on the BD scale can be divided into three subgroups: normal, abnormal, and borderline, where abnormal to borderline cutoff scores are signs of poor mental health (Goodman, 1997). However, the objective of the present study is not to identify children's mental health problems; the focus is instead on the transactional paths between their levels of hyperactive behavior and social interactions. Thus, a continuous scale was used for the analyses, with the total scores ranging between 0 = "no hyperactive behavior" to 10 = "high level of hyperactive behavior." The internal consistency for the SDQ subscale for hyperactivity was α = 0.69. In addition, the hyperactivity scale had shown good validity and reliability for children aged 1–3 years (Gustafsson et al., 2016).

Engagement

Children's engagement in preschool was measured with the "Child engagement questionnaire" (CEQ) (McWilliam, 1991). The preschool staff rated children's engagement behavior using free-recall impressions of the level of each child's engagement with teachers, peers, activities, or materials. The questionnaire consists of 32 items on a four-point Likert scale with values from 1 to 4. The response alternatives for the child's behavior were 1 = "not at all typical," 2 = "somewhat typical," 3 = "typical," and 4 = "very typical." To further clarify each item, examples were provided. For instance, the item "Seems constantly aware of what's going on around him or her," gives the example of "The child looks at sources of noises and at moving objects and people" was given. Based on an earlier adaptation of the questionnaire, only 29 of the original 32 items were used, since feedback from an expert panel had indicated that three of the items were not suitable for the Swedish preschool context. One of the omitted items, for instance, was "Uses repetitive vocalizations," with the example "The child says, 'Ba-ba-ba-ba-ba." "This type of engagement behavior is most frequently observed in infants who, in Sweden, are usually cared for at home during their first year of life. Earlier studies have reported high content and construct validity and intra-rater reliability for the CEQ (Almqvist, 2006a).

According to an earlier study by Sjöman et al. (2016), the CEQ has two related underlying constructs. The first construct, *core engagement*, is primarily a rating of focus of attention/less complex behavior and has a relatively low correlation with chronological age ($r = 0.28$). The second construct, *developmental engagement*, is related to more complex behavior (e.g., the child talks about things in the past or the future), and it has a higher correlation with chronological age ($r = 0.54$). Since the purpose of the current study was to explore the possible transactional paths between social interactions and children's engagement, regardless of their chronological age or developmental delay, only core engagement was used in the analyses.

Data analytic strategy

In order to longitudinally explore the relationships between teacher responsiveness/positive peer-to-child interaction and the child's core engagement/hyperactive behavior, a series of autoregressive, cross-lagged path analyses were conducted within the framework of structural equation modeling design by using two models: a *peer-to-child interaction model* and a *teacher-child model*.

The analyses are presented below in two main subsections of the Results section. Firstly, descriptive statistics and bivariate correlations for the variables of interest, covering the data collection point 1, point 2, and point 3 between 2012 and 2014, August to October. The strength of the correlation is based on the guidelines suggested by Cohen (1992): weak $r = 0.10$ to 0.29, moderate $r = 0.30$ to 0.49, and strong $r = 0.50$ to 1.00. In addition, Cronbach alphas were used to describe internal consistency for each construct: *core engagement*, *hyperactive behavior*, *positive peer-to-child interaction,* and *teacher responsiveness*. Secondly, a series of autoregressive, cross-lagged path analysis models assessing the concurrent and prospective associations between children's core engagement, hyperactive behavior, teacher responsiveness, and positive peer-to-child interaction, respectively, were examined by using AMOS 21.0 (Arbuckle, 2013).

When the model fit was evaluated, three fit indices were used: X^2, comparative fit index (CFI; Bentler, 1990), and root mean square error of approximation (RMSEA; Browne and Cudeck, 1993). For X^2, $p > 0.05$ (i.e., no differences between the model and the data) was used as the criterion for a good model fit. Comparative fit index values above 0.90 indicate good model fit (Byrne, 2013), RMSEA values less than 0.05 indicate a good model fit, and RMSEA between 0.05 and 0.08 indicate a moderate model fit (Browne and Cudeck, 1993). Due to the clustering effect, the standard errors were corrected using the bias-corrected bootstrap resampling method in Amos (Nevitt and Hancock, 2001; Arbuckle, 2013). Clustering effects are common in research conducted in natural environments such as preschools or schools, where children in the same classroom tend to show similar behavior, due to the influence of the same context, compared to children in other classrooms (Killip, 2004; McCoach and Adelson, 2010). The bias-corrected bootstrap resampling method corrects for the bias in the central tendency of the estimate, accommodates the non-normal distribution of the estimator of the indirect effects, and adjusts the actual sample according to the clustering effect (Shrout and Bolger, 2002; Mackinnon et al., 2004).

Results

Descriptive statistics for the variables of interest are presented in Table 1. On average, the children showed high levels of core

engagement at each data collection point, increasing over time. On average, teachers reported low levels of children's hyperactive behavior, decreasing over time. Meanwhile, teacher responsiveness and positive peer-to-child interaction increased over time.

The association between two types of social interactions and children's hyperactive behavior and core engagement are presented in Table 2. For hyperactive behavior a moderate to strong significant positive association was found between data collection points 1 and 3 (0.558**). For core engagement a moderate significant correlation was found between data collection points 1 and 3 (0.205**) The results indicate stability on each construct over time. The association between hyperactive behavior and core engagement showed a strong correlation between data collection points 1 och 3 (0.434**). Moreover, a weak positive correlation was found between teacher responsiveness at data collection points 1 and 2 (0.261**), as well as between data collection points 2 and 3 (0.0.427**). However, a non-significant correlation between teacher responsiveness at T1 and T3 (0.056) was found. Similar paths were found for positive peer-to-child interaction. A significant positive association was found between data collection points 1 and 2 (0.396**), and between data collection points 2 and 3 (0.455**), while a non-significant association was found between data collection points 1 and 3 (0.127). Thus, the non-significant association between data collection points 1 and 3 for teacher responsiveness as well as for peer-to-child interaction indicates a non-linear stability over time.

Autoregressive, cross-lagged path analysis

A series of autoregressive, cross-lagged path analyses were used for the two models—the teacher-child-model and peer-to-child-model—to assess the directional and transactional paths between the level of social interaction, level of core engagement, and hyperactive behavior, respectively.

Teacher–child model

For the teacher-child model, three autoregressive, cross-lagged path analyses were conducted (teacher-driven, child-driven, and transactional) which tested the within-time and prospective relationship between teacher responsiveness, children's core engagement, and hyperactive behavior, respectively. All three models with the paths showed adequate fit with the data. Thus, the models were improved by deleting non-significant associations. In accordance with CFI and RMSEA, the model with transactional paths provided the best fit with the data (see Table 3).

The association between children's hyperactive behavior, core engagement, and teacher responsiveness

Hypotheses I and II were used to investigate the association over time between children's hyperactive behavior and teacher responsiveness, and the association between children's core engagement and teacher responsiveness, respectively. The first hypothesis was not supported. Children's hyperactive behavior at data collection point 1 is associated with less teacher responsiveness at data collection point 2. Meanwhile, a non-significant association was found between teacher responsiveness at data collection point 2 and hyperactive behavior at data collection point 3. As Figure 1 shows, a non-significant association was found between hyperactive behavior

TABLE 1 The table presents the internal validity for children's core engagement, hyperactive behavior, teacher responsiveness, and peer-to-child interaction at three points.

Variables	α	Mean	SD	Range	Skewness	Kurtosis
Core engagement						
T1	0.88	3.40	0.55	1.88–4.0	−0.88	−0.09
T2	0.87	3.53	0.52	1.63–4.0	−1.38	1.68
T3	0.86	3.64	0.45	1.88–4.0	−1.65	2.75
Hyperactive behavior						
T1	0.85	3.03	2.45	0–10	0.95	0.37
T2	0.89	2.85	2.80	0–10	1.05	0.31
T3	0.88	2.28	2.55	0–10	1.15	0.58
Teacher responsiveness						
T1	0.75	4.54	0.33	2.8–5.0	−1.6	4.2
T2	0.80	4.59	0.34	2.9–5.0	−1.5	3.2
T3	0.72	4.62	0.28	3.5–5.0	−1.4	2.2
Peer-to-child interaction						
T1	0.92	3.70	1.02	1.0–5.0	−0.79	0.01
T2	0.90	4.25	0.75	1.4–5.0	−1.2	1.3
T3	0.91	4.49	0.67	1.4–5.0	−1.78	3.87

Hyperactivity, sum score 1–10; Core engagement, range 1–4, mean score of 12 items; Peer-to-child interaction, range 1–5, mean score of 5 items; Teacher responsiveness, range 1–5, mean score of 10 items.

TABLE 2 Pearson correlation.

Variables	1	2	3	4	5	6	7	8	9	10	11	12
Hyperactive behavior												
1. T1												
2. T2	**0.473****											
3. T3	**0.503****	**0.558****										
Core engagement												
4. T1	−0.467**	−0.419**	−0.253**									
5. T2	−0.294**	−0.533**	−0.441**	**0.513****								
6. T3	−0.209**	−0.279**	−0.545**	**0.205****	**0.434****							
Teacher responsiveness												
7. T1	−0.364**	−0.321**	−0.195**	0.487**	0.273**	0.094						
8. T2	−0.132	−0.281**	−0.331**	0.274**	0.466**	0.362**	0.261**					
9. T3	−0.028	−0.061	−0.377**	0.009	0.197**	0.531**	0.056	0.427**				
Peer-to-child interaction												
10. T1	−0.412**	−0.289**	−0.194**	0.579**	0.301**	0.074	0.510**	0.272**	0.080			
11. T2	−0.202**	−0.423**	−0.348**	0.433**	0.736**	0.456**	0.310**	0.512**	0.233**	0.396**		
12. T3	−0.162*	−0.202**	−0.488**	0.105	0.393**	0.749**	0.056	0.364**	0.567**	0.127	0.455**	

Note The bold values show significant association on each construct over time indicating stability over time.
***$p < 0.001$; **$p < 0.01$; *$p < 0.05$.

TABLE 3 Model fit indices for the modified path models.

Model	X^2 (df)	CFI	RMSEA (90% CI)
Teacher – child model			
1. Teacher-driven path	34.16 (15), $p < 0.01$	0.969	0.080 (0.044–0.115)
2. Child-driven path	55.46 (19), $p < 0.001$	0.941	0.097 (0.068–0.128)
3. **Transactional path**	29.83 (19), $p < 0.01$	0.978	0.065 (0.026–0.101)
Peer – to – child model			
4. Peer-driven path	47.65 (16), $p < 0.001$	0.963	0.099 (0.067–0.132)
5. Child-driven path	62.65 (17), $p < 0.001$	0.947	0.115 (0.086–0.147)
6. **Transactional path**	48.60 (18), $p < 0.001$	0.964	0.092 (0.061–0.123)

Best-fitting models are shown in boldface.

at data collection point 1and teacher responsiveness at data collection point 2, as well as between data collection points 2 and 3. Thus, the results indicate that children's hyperactive behavior did not influence teacher responsiveness over time. In other words, no transactional paths were found between children's hyperactive behavior and teacher responsiveness.

The association between children's core engagement and teacher responsiveness

Hypothesis II was supported. Children's core engagement at data collection point 1is associated with teacher responsiveness at data collection point 2, which is associated with increased core engagement at data collection point 3. As Figure 1 shows, a positive association was found between children's core engagement at data collection point 1 and teacher responsiveness at data collection point 2 (0.165*), and between teacher responsiveness at data collection point 2 and core engagement at data collection point 3 (0.203*). Thus, the results indicate that children's core engagement was a significant predictor of teacher responsiveness. In other words, if children display attentive and persistence behavior (e.g., core engagement), this seems to contribute to teacher responsiveness over time, which in turn improve children's attentive and persistence behavior. These associations are indicators of a transactional path.

Peer-to-child model

For the peer-to-child model, the within-time and prospective relationship between positive peer-to-child interaction, children's core engagement, and hyperactive behavior were each tested, respectively. The paths—peer-driven, child-driven, and transactional-driven—were not entirely satisfactory. Thus, the models were improved by deleting non-significant associations, and the modified models with peer-driven and transactional paths fit the data well. Following RMSEA, the model with a transactional path provided the best fit with the data (see Table 3).

The association between children's hyperactive behavior and peer-to-child interaction

The third hypothesis was not supported. Children's hyperactive behavior at data collection point 1 is associated with less positive peer-to-child interaction at data collection point 2, and less positive peer-to-child interaction at data collection point 2 increased hyperactive behavior at data collection point 3.

As Figure 2 shows, a non-significant association was found between children's hyperactive behavior at data collection point 1 and peer-to-child interaction at data collection point 2, as well as between

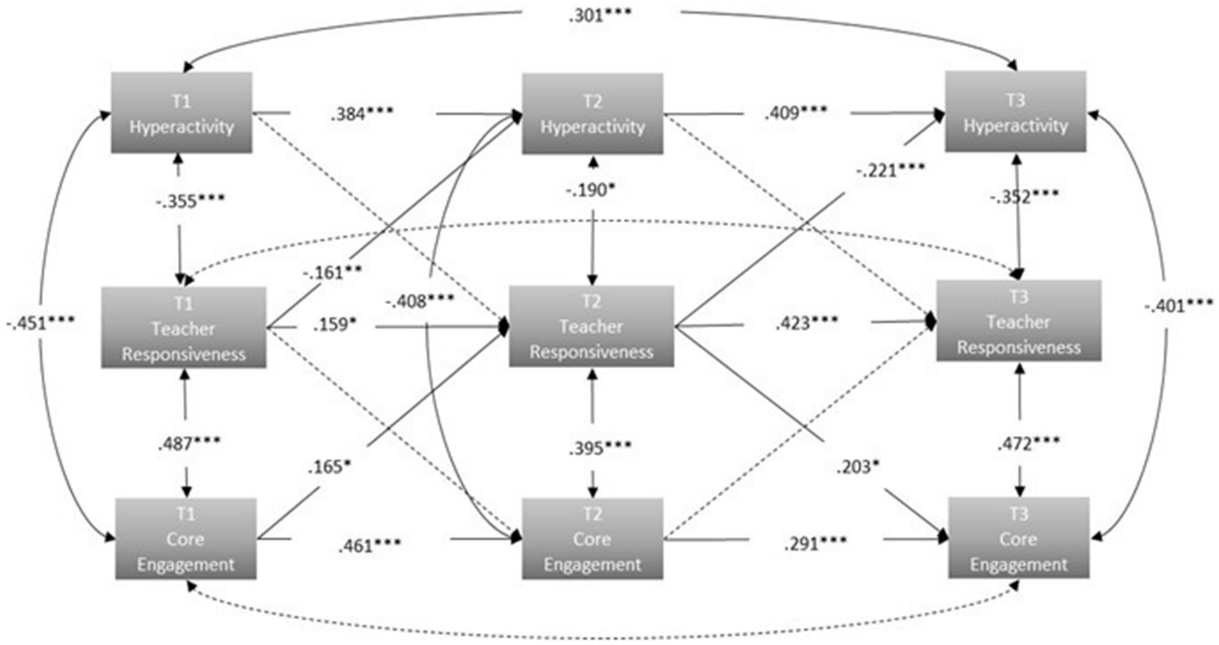

FIGURE 1
Teacher–child model with transactional paths with standardized estimates presented (Sjöman et al., 2016). Dashed lines indicate non-significant paths. ***p<0.001, **p<0.01, *p<0.05.

data collection points 2 and 3. In other words, children's hyperactive behavior seems not to be a significant predictor for less peer-to-child interaction. However, a significant negative association was found between peer-to-child interaction at data collection point 2 and children's hyperactive behavior at data collection point 3. The results indicate that less peer-to-child interaction predicts increasing hyperactive behavior, whereas hyperactive behavior is not a significant predictor of less peer-to-child interaction. Thus, there are no transactional paths between children's hyperactive behavior and peer-to-child interaction.

The association between children's core engagement and peer-to-child interaction

The fourth hypothesis was supported. Children's core engagement at data collection point 1 is associated with positive peer-to-child interaction at data collection point 2, which is associated with core engagement at data collection point 3. As Figure 2 shows, children's core engagement at data collection point 1 predicts positive peer-to-child interaction at data collection point 2 (0.243***), which in turn was associated with a stronger association with children's core engagement at data collection point 3 (0.447***). In other words, if children display attentive and persistent behavior (e.g., core engagement), this seems to contribute to positive peer-to-child interaction over time, which in turn improves children's core engagement. Similarly, as in the teacher-child model, a transactional path was found between core engagement and peer-to-child interaction.

To conclude, the results indicate that when the children showed core engagement in everyday activities in preschool at data collection point 1, they were more likely to be met over time with teacher responsiveness and positive peer-to-child interaction. In contrast, hyperactive behavior was not a significant predictor of less teacher responsiveness or less positive peer-to-child interaction over time. The only significant association was found between peer-to-child interaction at data collection point 2 and hyperactive behavior at data collection point 3. Thus, the two models did not show transactional paths between social interactions and children's hyperactive behavior.

Discussion

The current study was conducted in a Swedish preschool context and explores possible transactional paths over time between social interactions (e.g., teacher responsiveness and positive peer-to-child interaction), children's core engagement and hyperactive behavior, respectively. The associations were examined at three points in time between 2012 and 2014, August to October. This data was then analyzed to identify associations and how they changed over time.

Providing support for the proximal processes hypothesized by the bioecological systems theory (Bronfenbrenner and Evans, 2000), the transactional-driven paths fit the data best for both the teacher-child and peer-to-child models. The analyses yielded three significant findings. Firstly, transactional paths were found across time between children's core engagement, teacher responsiveness, and positive peer-to-child interaction, respectively. Secondly, no transactional paths were found between children's hyperactive behavior and social interactions (i.e., teacher responsiveness and positive peer-to-child interaction). The only significant associations for peer-to-child model between hyperactive behavior and peer-to-child interaction was between data collection points 2 and 3. Thirdly, a weak and negative association was found between teacher responsiveness at data collection point 1 and hyperactive behavior at data collection point 2.

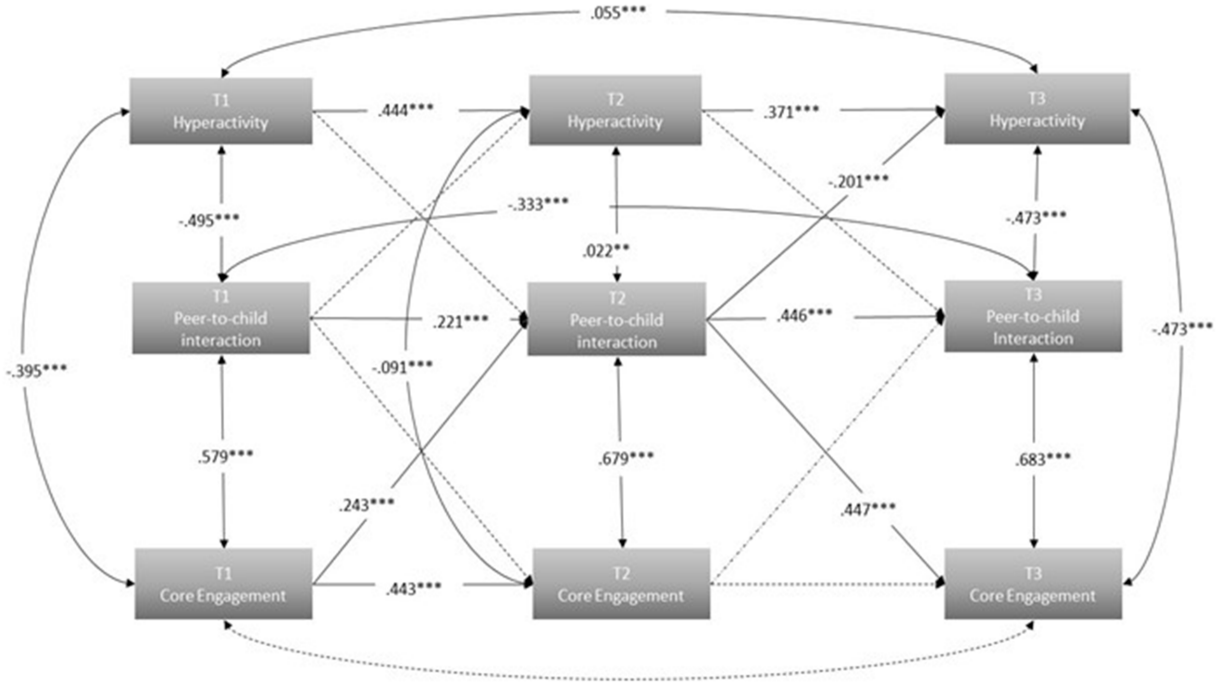

FIGURE 2
Peer-to-child model with transactional paths with standardized estimates presented (Sjöman et al., 2016). Dashed lines indicate non-significant paths. ***p<0.001, **p<0.01, *p<0.05.

After modifying the models to account for the stability in core engagement, teacher responsiveness, and positive peer-to-child interaction across the three sets of data, indications of transactional paths were found. In addition, social interactions had significant associations with levels of core engagement over time. These findings align with earlier studies that show that teachers interact more frequently with children who respond positively to the interaction (Birch and Ladd, 1997; Shonkoff and Phillips, 2000), indicating that children's engagement behavior had a positive influence on teacher behavior, e.g., increased responsiveness. The results showing an association between core engagement and social interaction could also be interpreted from the opposite direction. Low core engagement is associated with less teacher responsiveness and less positive peer-to-child interaction, which in turn predict less core engagement. Accordingly, the association over time between children's core engagement, teacher responsiveness and peer-to-child interaction, respectively, supports the hypothesis that transactional paths exist. Following the cross-sectional study by Sjöman et al. (2016), the previous research shows a negative association between hyperactive behavior and social interaction. On the other hand, that study also showed that both teacher responsiveness and peer-to-child interaction mitigate the negative association between children's core engagement and hyperactive behavior. However, when investigating transactional paths for the present study, neither positive peer-to-child interaction nor teacher responsiveness was associated with hyperactive behavior. On the other hand, the present study's investigation of transactional path shows that for a child with hyperactive behavior, their involvement in positive social interactions not only helps the child to focus and sustain attention in everyday activities in preschool (i.e., their core engagement), it also positively impacts teachers' and other peers' interactions with the child. Thus, these positive social interactions create a positive feedback loop for children with hyperactive behavior. It is, therefore, essential to design interventions that target core engagement among children with hyperactive behavior, which seems to be the engine for positive peer-to-child interaction and teacher responsiveness. For instance, Yoder et al. (2019) observed more positive peer engagement during free play, snack time, and meal time. Similarly, Sheridan (2007) found that sensitive, social, and negotiating teaching strategies promoted the interplay, participation, communication, and cooperation between the teachers and children and among children in the peer group. Thus, results from previous studies and the present study indicate that social interactions (e.g., peer-to-child interaction, teacher responsiveness) as well as structural aspects such as activity settings (e.g., free play, meal times) might be the mechanism for increased engagement among children with and without hyperactivity.

Hyperactive behavior and social interactions

After the stability in hyperactive behavior, teacher responsiveness, and positive peer-to-child interaction had been accounted for, both models showed stability across time. Contrary to the original hypotheses, no significant cross-lagged paths were found between children's hyperactive behavior and social interactions over time. The results are in contrast with earlier longitudinal studies reporting that children's externalizing BD predicts more conflict with teachers and peers (Hamre and Pianta, 2001; Zhang and Sun, 2011). Other studies have also suggested that children's externalizing BD negatively influences

their social interactions, which in turn might lead to peer rejection and solitary play (Buhs et al., 2006; Coplan et al., 2015; Sjöman et al., 2016).

However, additional longitudinal studies have indicated the opposite directional paths, i.e., high levels of teacher responsiveness and positive peer-to-child interaction predict reduced BD over time and increased cognitive self-regulation and social competence (Fuhs et al., 2013; Spivak and Farran, 2016). In contrast, this study showed no transactional path between hyperactive behavior and teacher responsiveness over time.

Core engagement and social interaction

In contrast with previous studies (Birch and Ladd, 1997; Howes et al., 2008; Spivak and Farran, 2016; Nesbitt et al., 2019) neither teacher responsiveness nor peer-to-child interaction was a significant predictor for children's core engagement. One explanation might be that previous studies have investigated children's global engagement, while the present study investigates core engagement, e.g., persistence and attentive behavior, not related to child maturity. Children with BD show less engagement in more complex activities such as symbolic and cooperative play (Coplan et al., 2001; Searle et al., 2013; Coplan et al., 2015), which require sustained attention and persistence behavior in a cognitively demanding activity long enough to become engaged.

For the present study, core engagement was a significant predictor for both teacher responsiveness and peer-to-child interaction. The path indicated the existence of a transactional path between children's core engagement and teacher responsiveness. However, it seems that core engagement is the engine for the transaction paths, e.g., core engagement improves teacher responsiveness and peer-to-child interaction, which in turn leads to increased core engagement. Moreover, as the results show that a negative association was found between core engagement and hyperactive behavior at each data collection point. These negative associations within the child must be considered in order to understand how environmental factors such as social interactions and the child's behavior shape each through 'serve-and-return' paths (Vygotskij and Cole, 1978; Sameroff, 2009). Interventions aiming solely to reduce children's BD are probably insufficient for improving engagement (see Kirkhaug et al., 2016; Almqvist et al., 2018), and they will not automatically lead to better teacher responsiveness and positive peer-to-child interactions. Accordingly, preschool staff need to reflect on how to improve engagement for children with BD, and how social interactions shape the children over time. In line with previous studies showing that engagement and social interactions are essential for the child's development and learning (Aydogan, 2012; Cadima et al., 2015), the present study shows that core engagement is important to consider when attempting to understand how social interactions, such as teacher responsiveness and positive peer-to-child interaction, are influenced by children's behaviors.

Implications for preschool practices

Overall, the findings of this study support the idea that children's behavior, especially their core engagement (e.g., attention and persistence), has a considerable influence on how teachers and peers respond to children with BD. These findings also demonstrate different transactional paths between children's core engagement, hyperactive behavior, and interaction with teachers and peers. Both teachers and peers are more likely to respond to children exhibiting high levels of core engagement, to some extent whether the children display hyperactive behavior or not. However, the probability that children with hyperactive behavior also show high levels of engagement is low. Thus, different types of support strategies may be needed in the classroom, depending on whether children exhibit both hyperactive and low core engagement, low core engagement alone, or hyperactive behavior alone. For example, in their interactions with children with BD, teachers tend to give more reprimands and use more disapproving behavior (e.g., disapproving facial expressions or a negative tone of voice; Almqvist et al., 2018) as compared to their interactions with children without BD. The teacher might be supported by encouraging them to use a positive emotional tone associated with children's core engagement behavior (e.g., attentive and persistence behavior). For example, they show interest in a child's positive actions and interact more frequently with children when exploring a topic using inferential, open-ended questioning that has several conversational turns (Spivak and Farran, 2016). Teachers also play an essential role in supporting peer interaction. For example, during free-choice play activities, children with hyperactive behavior need to be supported in initiating play activities with peers in their proximal development zone. Examples of such activities that can sustain their attention in play are simple role-plays or play with repeated actions that can be done while moving around.

Comprehensive strategies, such as teacher reflection on democratic/learning strategies, abdication/dominance behavior, and approval or disapproval behavior, encourage preschool staff to reflect on barriers to or facilitators for children's engagement, but also, how children's engagement and hyperactive behaviors influence teachers' and other children's behaviors. Understanding the transactional paths between the individual child's behavior and the people in their proximal environment is necessary to improve teacher responsiveness and positive peer-to-child interactions. Accordingly, intervention studies on designing special support measures in preschool settings to improve social interactions and core engagement among children with BD are needed.

Limitations and future research

Overall, the current study contributes to the body of research on children's hyperactive behavior, core engagement, and directional and transactional paths involving social interactions (i.e., teacher responsiveness and positive peer-to-child interaction) in preschool settings. The sample included children—aged 1 to 5 in preschool settings—showing different degrees of hyperactive behavior and core engagement, from low to high. The children in the sample represent a diversity of ages and levels of hyperactive behavior and core engagement. The findings may be generalizable to other natural preschool settings. Nonetheless, the data are based on teachers' ratings, which may have led to bias due to teachers' apprehension that their perceptions of the positive and negative behaviors in the classroom might affect how their performance is rated. On the other hand, other studies have yielded similar results, showing that teachers' perceptions of children's behavior in everyday activities in preschool influence their responses to the children (Coplan et al., 2015), and that preschool staff's ratings of their responsiveness decreased over time (Almqvist, 2006b). Thus, further research, including observations and children's reports of social interactions, hyperactive behavior, and engagement, may find other associations that differ from those found in the current study.

The current study reveals several non-significant paths in both models which fit the data adequately. One explanation for this might be related to clustering effects observed in the data, which are common in research in natural environments such as preschools. Children from the same classroom tend to exhibit similar behavior due to the influence of the same context. In contrast, these behaviors may differ from that of children from other classrooms with other contextual factors (Killip, 2004). The clustering effects in the current study were addressed by bias-corrected bootstrap resampling methods in AMOS (Nevitt and Hancock, 2001; Arbuckle, 2013). These methods correct for the bias and adjust the actual sample according to the sampling effect (Shrout and Bolger, 2002; Mackinnon et al., 2004). Moreover, given the three-year sampling period, the children in the study were older at each data collection point, and this may have affected their levels of hyperactive behavior (causing it to decrease over time) and of core engagement (causing it to increase over time). This factor has not been controlled for. On the other hand, the results revealed moderate stability in the autoregressive paths for core engagement and hyperactive behavior for the teacher-child model, whereas the non-significant paths for core engagement between data collection points 2 and3 indicate non-linear stability over time.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the author, without undue reservation.

Ethics statement

The studies involving human participants were reviewed and approved by Ethics committee in Linköping, Sweden. Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin.

Author contributions

The author confirms being the sole contributor of this work and has approved it for publication.

Conflict of interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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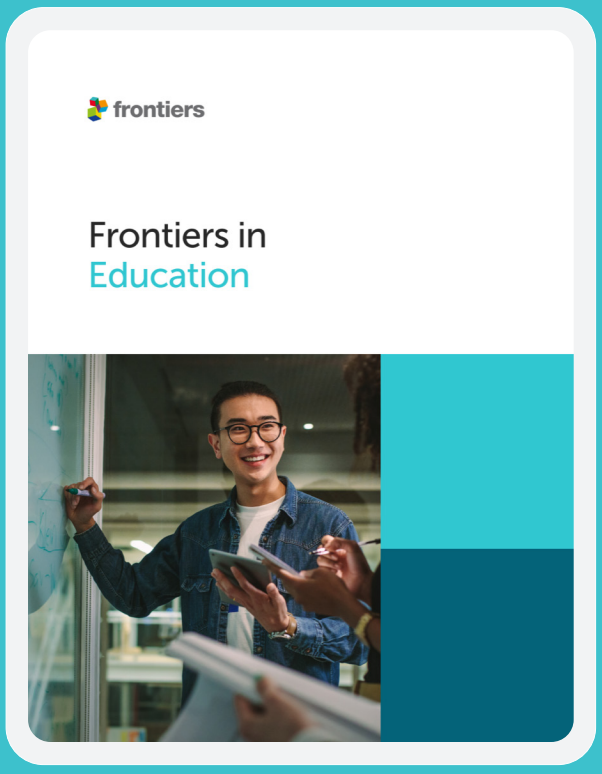

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