Conversations in the crèche: Interaction patterns between children and preschool teachers in nine Danish crèches

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Abstract

Interpersonal interactions during childhood form the foundation for development and learning (Tomasello, 2014; Vygotsky, 1962, 1978). Numerous studies have documented the impact of interactions between preschool teachers and preschool-aged children between 3 and 6 years of age (e.g., Denham et al., 2003; Hamre, Hatfield, Pianta & Jamil, 2013). The aims of this 1-year observational study were to investigate patterns of interaction between professional preschool teachers and children between 10 and 24 months of age in Danish crèches and to examine the correlations between these interaction patterns and preschool teachers' pedagogical decisions.

The study indicates that internal pedagogical choices (extent of reflection and planning for the pedagogical activities; criteria for groupings of children; whether preschool teachers worked predominantly alone with smaller groups of children or as a team of two or three with several children)—decisions that differ from crèche to crèche—are crucial. These pedagogical decisions are mutually dependent on or sensitive to the child–adult ratio.

The study reveals significant differences in the character of the interpersonal interactions between teachers and children, according, for example, to the level of planning and pedagogical reflections. This may cause different conditions for children's cultural learning and development.

Keywords

Créche; Denmark; interactions; pedagogical planning; preschool teachers

Introduction

The goal of this study was to investigate patterns of interaction between professional preschool teachers and children between 10 and 24 months of age in Danish crèches and to identify any correlations between these interaction patterns and preschool teachers' pedagogical decisions.

The Danish preschool system is predominantly a public service, with parents paying approximately 30% of the costs. The institutionalised, public preschool system is divided into crèches (*vuggestuer*), for children between approximately 10 and 34 months of age, and kindergartens (*børnehaver*), for children between approximately 34 months and 6 years of age. The teachers are called pedagogues; they are not referred to as preschool teachers, just as the Danish preschool system is not referred to as preschool. The point is that they consider themselves working in play-based kindergartens rather than in schools. However, in this article, I will refer to them as preschool teachers. The Danish preschool system is pedagogically developed as part of the Nordic approach, aiming to balance care and education in a sociocultural paradigm (Vygotsky, 1978).

I analysed the correlations between outcome variables (number of interactions, duration of interactions, number of open questions/comments and dialogue shifts) and background (explanatory) variables: a) the crèche (extent of reflection and planning for the pedagogical activities, criteria for grouping of children, whether preschool teachers worked predominantly alone with smaller groups of children or as a team of two or three with several children), b) child's sex, c) child's age and d) child–adult ratios in the nine crèches, first separately and then by groups of crèches that were significantly similar to one another and significantly different from crèches in other groups along with each of the target outcome variables. Below, I summarise and discuss the results from these two levels of analysis (individual crèche and groups of crèches). I also compare my findings with those in the extant literature and discuss possible implications of my results. Some of my findings are similar to those of previous studies, some are different, and some raise interesting questions for future research, especially given that I purposely selected crèches that were as similar as possible along several important dimensions.

I found that individual crèches had significant correlations between interactions and crèche and between interaction and child–adult ratio. Age and sex did not have a significant correlation with the number of interactions in the crèches.

Theoretical framework

Interpersonal interactions during childhood form the foundation for development and learning (Tomasello, 2014; Vygotsky, 1962, 1978). Numerous studies have documented the impact of interactions between teachers/preschool teachers and preschool-aged children between 3 and 6 years of age (e.g., Denham et al., 2003; Hamre et al., 2013).

This topic is important in Denmark because approximately 90% of children are enrolled in a publicly run crèche by the time they reach their first birthday; therefore, a substantial percentage of their foundational interactions occurs there. This study also has potential implications for infant and toddler care in other countries, especially in light of the growing body of neuroscience research documenting rapid changes in brain architecture and unparalleled capacities for learning during the first years of life (Center on the Developing

Child, 2017a, 2017b; Meaney, 2010; National Scientific Council on the Developing Child, 2010; Phillips & Shonkoff, 2000; Waddington, 1942).

The present study focused on another important dimension of interaction: the interrelated steps of 'joint attention' (Carpenter, Nagell & Tomasello, 1998; Murray & Trevarthen, 1985; Tomasello, Carpenter, Call, Behne & Moll, 2005). By participating in joint attention and engagement, preschool teachers and young children together create a shared reality that further promotes children's emerging capacity to identify another person's goals and intentions during communication (Tomasello, 2008, p. 157). From this perspective, interactions are a zone wherein intentionality is shared and interactions are a hotspot (p. 160) for cultural learning through words, facial expressions, tone of voice and gestures, and for children's growing ability to identify what adults find interesting and important (see e.g., Goodwin, Cekaite & Goodwin, 2012; Peräkylä & Ruusuvuori, 2012).

Studies have also affirmed the importance of communication and intersubjectivity between adults and very young children (Goldin-Meadow, 2009; Tomasello, 2014). Characterised by high levels of intimacy, care and common focus, intersubjectivity promotes children's overall development and learning (Dalli, White, Rockel & Duhn, 2011). In addition, a meta-analysis of 40 studies indicated that regular interactions with sensitive and responsive adults promoted the development of safe attachment in day care settings (Ahnert, Pinquart & Lamb, 2006; see also Dalli et al., 2011). Another study (Hawkinson, Griffen, Dong & Maynard, 2013) showed that high-quality relationships between children and preschool teachers promoted children's cognitive, social and motor development.

Group size, child–adult ratios, teacher qualities and teacher planning also influence various aspects of day care quality, including intersubjective interactions and relationships. Smaller group size is associated with positive outcomes, such as children's overall wellbeing and opportunities for learning (Sheridan, Williams & Samuelsson, 2014). The importance of child–adult ratios is indicated by the widespread regulation of ratios in these settings. In addition, teachers' organisational skills and approaches influence program quality, including the conditions for children's learning (Sheridan et al., 2014), especially through intersubjective communication during teacher-planned activities that the children find meaningful (Broström, 2017).

The present study contributes to the literature on communication in crèches by using a lens that considers interactions to be intentional, thereby creating a framework for the social transference of cultural knowledge. The basic questions are as follows: what do these intentional foundations look like in the everyday flow of life in Danish crèches and how do the patterns of interaction between preschool teachers and children reflect and contribute to planning for care? Answers to these questions can then be mined for their implications for the group care of young children in institutional settings.

Method

Participants

Twenty-six children (12 girls, 14 boys) in nine crèches in three municipalities participated in this study. The children ranged from 12 to 22 months old, and all were from Danish ethnic backgrounds. To facilitate comparisons across settings, I selected crèches within homogeneous demographic areas. The aim was for participating crèches to resemble each

other as closely as possible so as to minimise the effects of background variables, such as the educational levels of the staff, socioeconomic backgrounds of the families (Shiraev & Levy, 2010) and physical environments of the institutions (Berliner & Kupermintz, 2009). Based on previous studies, I assessed the crèches according to the following characteristics (see Table 1):

1. the extent of reflection and planning for the pedagogical activities (Greve & Hansen, 2018) as measured by artefacts, such as written and/or visual plans and schedules for the day, week and month
2. the criteria for grouping of children (Sheridan et al., 2014). Ultimately, I selected seven crèches with mixed-age groupings and two with groupings by age and developmental characteristics
3. whether preschool teachers worked predominantly alone with smaller groups of children or as a team of two or three with several children (Samuelsson, Williams, Sheridan & Hellmann, 2016)
4. child–adult ratio—the total number of children per preschool teacher (Samuelsson et al., 2016).

Table 1
Characteristics of the nine crèches

Crèche characteristic	Crèche #								
	1	2	3	4	5	6	7	8	9
Pedagogical activity planning									
Planned								x	x
Partly planned							x		
Not planned	x	x	x	x	x	x			
Grouping of children									
Mixed-age groupings (8–36 months)	x	x	x	x	x	x	x		
Age and developmental characteristics							x	x	x
Teacher organisation									
As a team of two or three with several children	x	x	x	x	x	x	x		
Working alone with smaller groups of children								x	x
Child–adult ratio (children per adult)	3.8	4.2	4.2	4.1	3.8	4.2	3.8	4.7	4.3

In the presence of the supervising preschool teacher, I observed two to five children in each of the nine crèches, starting with the fourth child under the age of 2 years who entered the crèche.

My study was approved by the Institutional Review Board at Aarhus University. I obtained written consent from the preschool institutions, and the parents were informed and assured in a letter that their and their children's identities would remain confidential. Because the children were too young to give verbal or written assent, I assumed their assent when they interacted willingly with preschool teachers without any unusual inducements.

Procedures and materials

In line with earlier studies, I chose an observational method wherein the focus was reduced to well-defined, previously determined, identifiable elements of communications (Goldin-Meadow, 2009; Tomasello, 2008, 2014) that could be measured quantitatively and compared across institutions (Slot, Bleses, Justice, Markusse-Brown & Højen, 2018). To become familiar with the setting and develop an impression of the existing interaction patterns, I spent a few days in each crèche prior to beginning my data-gathering sessions. These initial visits also gave me a baseline for assessing whether the interactions I later observed were representative of everyday practice in each institution or whether teacher behaviours and interactions may have been affected by my presence, my ticking-off of items on the data form or their desire to demonstrate the kinds of interactions they thought I expected or preferred.

My observations had the following conditions, as suggested in previous studies (Mukherji & Albon, 2018):

- To ensure consistency, only I carried out all of the observations, using theoretical benchmarking.
- The predefined target communicative elements were named on the observation form.
- I aimed to be as unobtrusive as possible.
- The method produced empirical data through the numerical registration of previously determined elements of communication.

During 182 hours in the crèches, I completed 1,561 observations and recorded 8,040 target interactions on a checklist constructed for this study, which included the following predefined components of interaction:

- observations/interaction start time
- verbal interactions between preschool teacher and child as a particularly important aspect of intersubjective communication
- duration of the interaction
- nature of the interaction—closed or open—where closed questions/comments call for simple, one-word responses like 'yes' or 'no', and open questions/comments leave more open the possibility of several dialogue shifts. I recorded only interactions that met the predetermined definition
- dialogue shifts.

I observed the children one at a time from when they arrived at the crèche until their parents picked them up, except at times when they were sleeping or having diaper or clothing changes. I observed each of the 26 children for an average of 7 hours (range: 3 hours and 44 minutes to 8 hours and 18 minutes).

Analysis model

To analyse data from my recorded observations, I needed a statistical model that could determine the number of interactions per hour by the background variables (Johnson & Albert, 2004; Zelterman, 2006) as measured against chance or statistical probability.

Assuming that interactions were not equal for all children in terms of their number or duration within or across institutions, I used an extension of Poisson distribution (Zelterman, 2006, p. 45), called the negative binomial distribution model, to reveal the correlations between background variables and target behaviours. The model's parameters were estimated using statistical analysis software.

Results

Number of interactions

Overall, the children had an average of 13.1 interactions with preschool teachers per hour, with a range of 3.8–20.9. Analysis revealed a significant correlation between interactions and crèche ($p < .0001$) and between interaction and child–adult ratio ($p = .0018$). The background factors of the child–adult ratio and crèche had a marginal effect on the total number of interactions. Even when correlated with the child–adult ratio, there were still significant differences between crèches. The effects of age and sex were not significant when analysed separately.

Next, I assessed the effects of individual factors after adjusting for other factors with significant effects. This assessment indicated that the higher the child–adult ratio (i.e., the more children per teacher), the lower the number of interactions between child and preschool teacher. This finding, then, made it possible to rank the crèches from the most to the least number of interactions as follows: 1, 2, 8, 9, 7, 3, 4, 6 and 5.

This ranking was the basis for further analysis. The background variable, a crèche, had a strong significant effect on the total number of interactions ($p < .0001$). Logically, then, this indicated that at least one crèche differed significantly from the others. Further analysis showed that Crèches 1–4 and 7–9 (Group A-I) did not differ significantly from each other in terms of the total number of interactions, while Crèches 5 and 6 (Group A-II) did not differ significantly from each other. However, Group A-I differed significantly lower from Group A-II; the crèche variable accounted for significant differences in the number of interactions between the two groups, as indicated by the distance between the two lines in Figure 1.

While the correlation between individual crèches and the number of interactions was significant ($p <.0001$), the picture changes with analysis by crèche group. Furthermore, the significance of the crèche variable was reduced the higher the ratio (i.e., more children per preschool teacher). This can be inferred through the decreasing distance between the lines in Figure 1 as the ratio increases. This means that the variable that may cause the distance— the crèche variable—became less meaningful as the ratio increased. Conversely, the importance of the variable was the greater the lower the ratio.
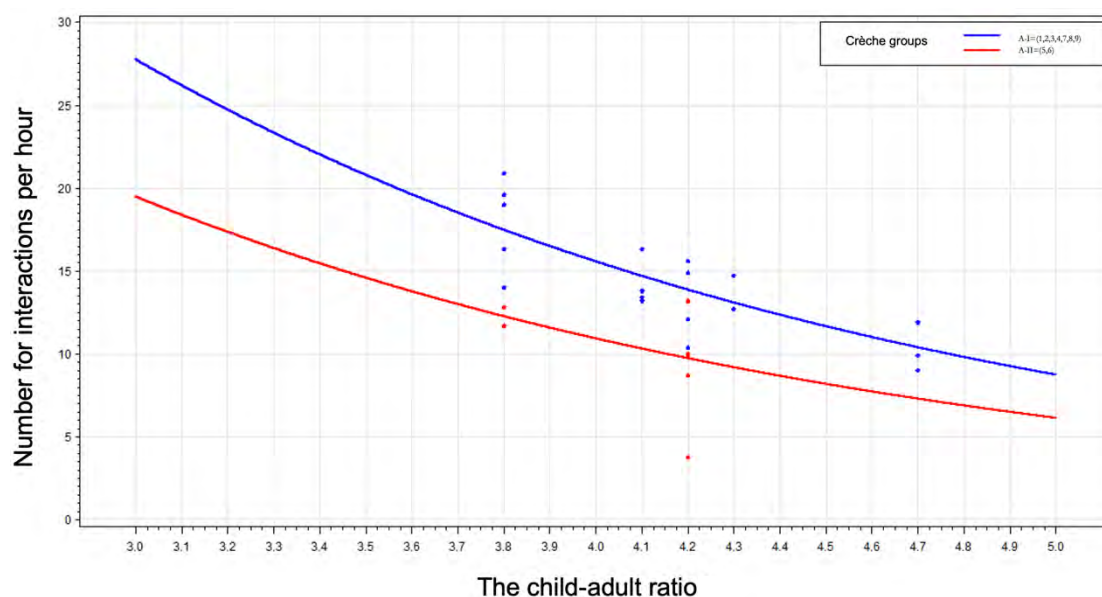
Figure 1. The expected number of interactions in the two crèche groups per hour. A-I: Crèches 1–4 and 7–9; A-II: Crèches 5 and 6. This figure shows the actual number of interactions in the two groups in relation to the expected number (probability) and child–adult ratios (actual). The dots represent each of the 26 children, colour-coded to match their crèche group. Children within each group are significantly similar to each other. A-I shows significantly more interactions than A-II.

Interaction duration

Based on observational data recorded in increments of minutes and seconds, I calculated and compared the average duration of interactions per hour for each child. For example, Child 1 had 12 minutes of recorded interaction for 3 hours and 44 minutes, yielding an average of 3 minutes and 13 seconds of interaction per hour. Child 26 had 3 hours and 4 minutes of interaction for 4 hours and 30 minutes of observation, yielding an average of 40 minutes and 53 seconds of interactions per hour. Overall, the 26 children averaged 12 minutes and 11 seconds of interaction per hour.

Probability testing for the marginal test for no effect of background factors indicated a significant correlation between interaction duration and child–adult ratio ($p = .0018$) and between duration and crèche ($p < .0001$). To assess the effect of each individual factor, I statistically controlled the variance for the factors with marginal significant effects (child–adult ratio and crèche).

Even after calibrating the child–adult ratio, a significant difference remained between the crèches. Parameter estimates (95% confidence interval) indicated that the higher a crèche's child–adult ratio, the shorter the interaction between child and preschool teacher.

Crèches represented by the B-III line had significantly longer interactions than the crèches represented by the B-II and B-I lines (see Figure 2). Additionally, Crèche 8 (B-III), with a child–adult ratio of 4.7, had substantially longer interactions than crèches on B-II and B-I lines, all of which had a lower ratio (i.e., fewer children per preschool teacher). This indicated that the crèche variable had a markedly greater significance in relation to the

duration of interactions as compared to the ratio variable. Again, the crèche variable (referring to internal conditions other than the ratio) accounted for significant differences between the lines representing the three groups. Figure 1 illustrates how Crèches 1–4 and 7–9 engaged in significantly more interactions Crèches 5 and 6. In Figure 2, we can see that Crèches 8 and 9 sustained interactions for significantly longer. The question is, what separates Crèches 8 and 9 from the others?
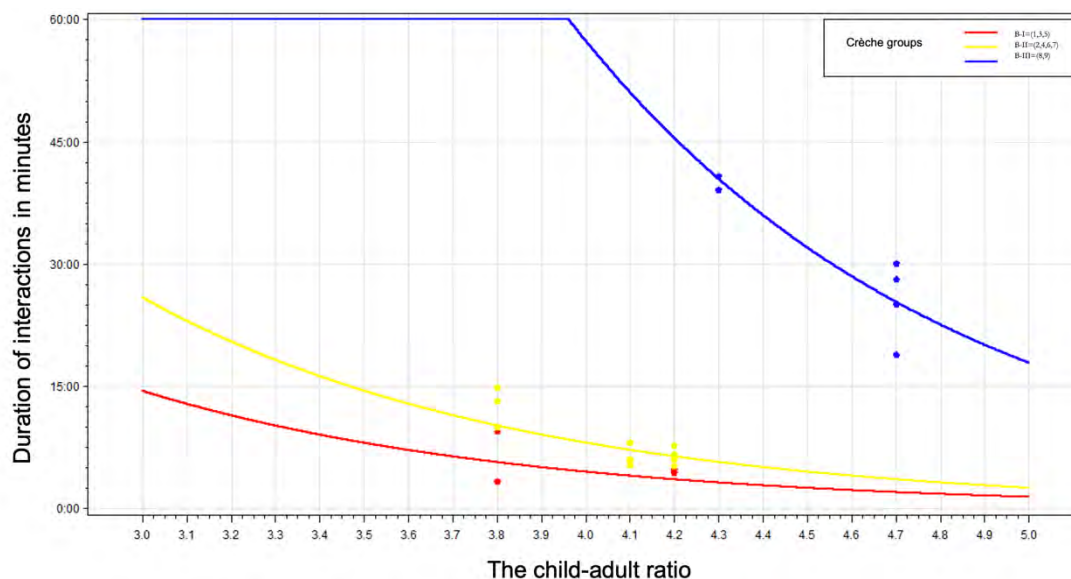

Figure 2. The expected duration of interactions per hour in minutes. This figure shows the duration of interactions in minutes in three groups: B-I (Crèches 1, 3 and 5), B-II (Crèches 2, 4, 6 and 7) and B-III (Crèches 8 and 9). The dots represent each of the 26 children, colour-coded to match their crèche group. Children within each group are significantly similar to each other. B-III shows significantly longer interactions than B-II and B-I.

As expected, there was a decrease in the duration of interactions as the child–adult ratio increased for all three groups. This decrease was most pronounced for crèches in Group B-III. I further analysed the effect of increasing the ratio of children per preschool teacher from 4 to 5 and from 5 to 6 in each of the crèche groups. Interaction duration decreased dramatically for B-III with each increase of one additional child per preschool teacher. Additionally, there was a trend for the crèche variable to become less significant as the child–adult ratio increased (i.e., more children per adult) and, conversely, more significant as the ratio decreased.

Number of open interactions

I recorded dialogue initiated by the adult as closed or open, where closed questions and comments typically called for simple, one-word responses ('yes', 'no') and open questions and comments typically created the opportunity for extended interactions and more dialogue shifts (i.e., one person talks or vocalises, then the other person talks or vocalises). I averaged the number of open questions/comments per hour of interaction. There was a wide variation for each in both the number of open interactions and their periods of wakefulness. For example, I recorded four open interactions for Child 17 during 2 hours and 2 minutes of wakefulness, for an average of 1.9 open interactions per hour. I recorded

56 open interactions for Child 20 during 4 hours and 22 minutes of wakefulness, for an average of 12.8 open interactions per hour. Overall, the children experienced an average of 7.3 open interactions per waking hour in the crèche, with a range 1.9–12.8 interactions.

I tested, individually, the relationships between the number of open interactions and the crèche, child's sex, child's age and child–adult ratio. An analysis of probabilities for the marginal test for no effect of background factors showed a strong statistical correlation between open interactions and crèche ($p < .0001$), but there were no significant correlations with the other variables.

I assessed the effect of the individual factors after adjusting for the other analysed factors, which showed a marginally significant effect for a crèche as the only significant factor. Even though the crèche was then correlated with the child–adult ratio, a significant difference remained between crèches. This suggests that the more children per preschool teacher, the fewer the number of open interactions between a child and preschool teacher. I was able to rank the crèches from lowest to highest in terms of open interactions as follows: 9, 8, 7, 2, 1, 4, 3, 6 and 5.

The statistical test and the statistical analysis revealed that the crèches fell into three significantly different groups: C-I (Crèches 3–6), C-II (Crèches 1 and 2) and C-III (Crèches 7–9; see Figure 3). Figure 3 shows the expected number of open interactions per hour, with a 95% confidence interval for the slope, the average of the actual number of open interactions recorded and child–adult ratios. The graph reveals a decreasing tendency for open interactions with increases in the number of children per preschool teacher. Again, it was the crèche variable that differed most significantly. The crèche variable became less important as the child–adult ratio became higher. As the ratio of children per preschool teacher increased from 3 to 5, there was a decrease in the number of open interactions per hour of 8.77 for Group C-III, 6.66 for Group C-II and 4.68 for Group C-I.
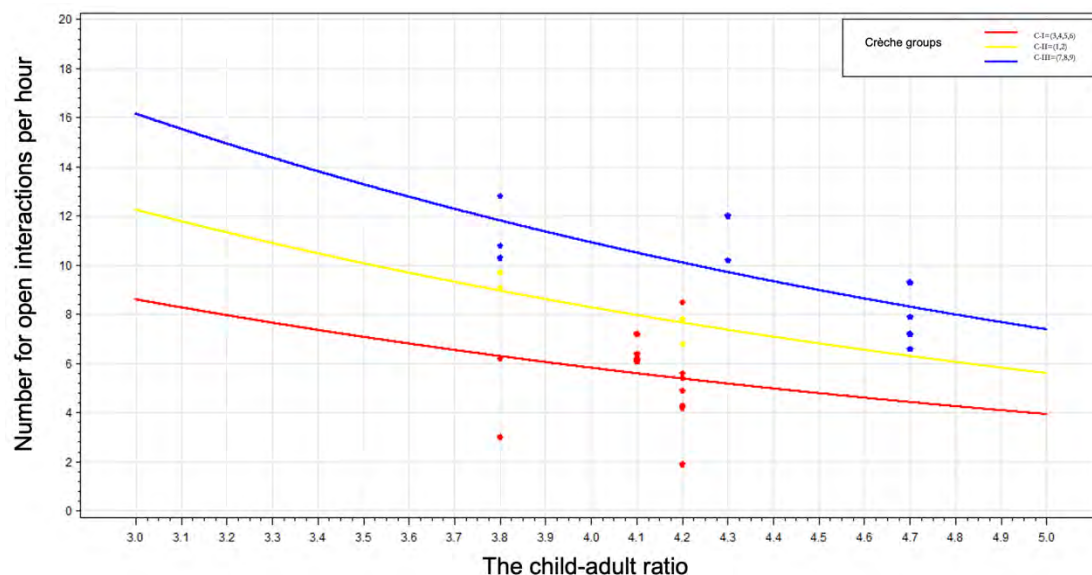

Figure 3. The expected number of open interactions per hour. This figure shows the number of open interactions per hour in three groups: C-I (Crèches 3–6), C-II (Crèches 1, and 2) and C-III (Crèches 7–9). The dots represent each of the 26 children, colour-coded

to match their crèche group. Children within each group are significantly similar to each other. C-III shows a significantly higher number of open interactions than C-II and C-I.

Total number of dialogue shifts

I recorded a dialogue shift each time the speaker or vocaliser changed from one person to another. In this study, I focused only on conversation shifts between adults and children. I used the average number of dialogue shifts per hour per child as an indicator of intersubjective engagement. Overall, the children had an average of 33.6 dialogue changes per hour, ranging from 11.4 (Child 15) to 78.4 (Child 25). The background crèche variable had a significant effect on dialogue shifts ($p = .0001$), but there were no significant correlations between shifts and the other factors (sex, age and child–adult ratio). When testing the effect of the individual factors after adjusting for factors with a marginally significant effect, age and sex were not significant when considered separately. Even though it was correlated with the child–adult ratio, there was still a significant difference between crèches. The ranking of the crèches from the most to the least number of dialogue shifts was as follows: 9, 8, 2, 4, 3, 7, 1, 5 and 6.

The statistical test and the statistical analysis revealed that the crèches fell into three significantly different groups: D-I (Crèches 1 and 5–7), D-II (Crèches 2–4) and D-III (Crèches 8 and 9). With a 95% confidence interval for the interval slope, Figure 4 illustrates the expected number of dialogue shifts per hour (represented by the lines) in relation to the actual number of shifts per hour and child–adult ratio (represented by the dots).
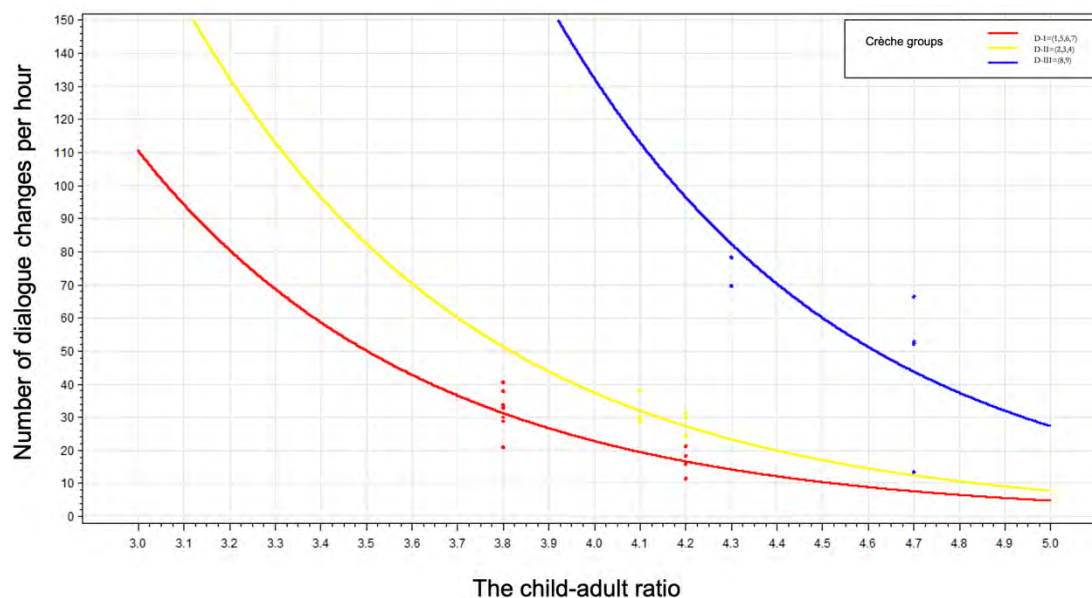

Figure 4. The expected number of dialogue changes per hour. This figure shows the expected number of dialogue changes per hour in three groups: D-I (Crèches 1, and 5–7), D-II (Crèches 2–4) and D-III (Crèches 8 and 9). The dots represent each of the 26 children, colour-coded to match their crèche group. Children within each group are significantly similar to each other. D-III shows a significantly higher number of dialogue changes per hour than D-II and D-I.

For all three groups, the graph shows a decreasing tendency for multiple dialogue changes as the child–adult ratio increases. This indicates that the more children per preschool teacher, the fewer the dialogue changes.

Finally, it is seen that, in relation to dialogue changes, the crèche variable is sensitive to the child–adult ratio; in this way, the number of dialogue changes rapidly increases as the ratio decreases. Here, it is the Crèches 8 and 9 (D-III) that have the largest decrease but have also best utilised their ratio. The indications that the Crèches 8 and 9 are the most sensitive to the crèche variable in relation to the child–adult ratio could be related to the fact that they indicated the largest considerations for the factors encompassed within this variable. This could be the reason why they score so high—that is, why the slope of its curve is steeper—while the crèches at D-I and D-II did not indicate considerations for those factors to the same extent and therefore are not as sensitive to a decreasing child–adult ratio.

Qualitative exploration of Crèches 8 and 9

In the following analysis, I describe the common pedagogical strategies and observable practices of Crèches 8 and 9. To do so, I conducted nine qualitative interviews of the two crèche leaders and four interviews of the preschool teachers and observed whether the leaders' statements held true in actual pedagogical practice (Brinkmann, 2018; Hammersley & Atkinson, 2007; Kvale & Brinkmann, 2009). The data were analysed as a case study.

The objective of this description is to explain what the word 'planned' (see Table 1) implied and thereby also explain how Crèches 8 and 9 differ from Crèches 1–7.

Case study (Schwandt & Gates, 2018)

I conducted the qualitative data analysis in five analytical steps (Creswell & Poth, 2018):

1. create and organise data files (interviews and observations)
2. read through the text, make margin notes and form initial codes
3. use categorical aggregation to establish themes or patterns—in this case study, I established five themes
   a. strategies for planning
   b. view on children
   c. view on learning
   d. play and learning
   e. the size and composition of children's groups
4. use direct interpretation
5. develop naturalistic generalisations of what was learned and apply references.

Generalisations of Crèches 8 and 9

Strategies for planning

Crèches 8 and 9 are located in the same municipality, and their practices are based on the same local policy. Moreover, they have the same expectations for children's learning and development. This implies that their preschool teachers are expected to possess the ability

to share intentionality (Tomasello et al., 2005) and respect the children's suggestions and ideas. At the same time, they must also be able to involve the children as participants in their planning and be able to assess the children's everyday life, implement learning activities through play and document the children's wellbeing and learning.

The two crèches are based on an understanding of learning environments as sociocultural (Vygotsky, 1978): knowledge is created in the interaction between the child and preschool teacher and among the children. With this view on learning, elements such as children's curiosity, desire for knowledge and the quest to understand and create contextual meaning become the starting point for thinking, science, technology, art forms and cultural understanding.

The pedagogical work of the crèches is structured in the following three planning schedules:

- Planning Schedule 1—Here, the preschool teacher described their hypotheses and ideas based on the knowledge of the children's preoccupation and interests.
- Planning Schedule 2—This is a process scheme that supports the preschool teacher's ongoing reflections, and concrete planning and goals from time to time, often weekly.
- Planning Schedule 3—This is the preschool teacher's assessment and evaluation form, which concludes the process documentation and assesses both the children's and the individual child's benefits as well as the preschool teacher's own learning.

The assessment methods used in the two crèches are like the forms, developed upon a dynamic didactic (*didaktik-Bildung*) approach, which implies being sensitive and reflective to the child in their particular context, needs, interests, issues and special conditions, level of development, activities and games, and relationships with other children and adults (Broström, 2017).

View of children

The two crèches had a view of children that considered the child to be an active learner (Samuelsson & Carlsson, 2008). In this view, the child actively contributes to creating their own learning and participates in developing their own knowledge—doing so with other children and adults. Furthermore, the child has a congenital mental readiness to enter into social contexts and communicate with their surroundings (Gopnik, 2009; Stern, 2004). This readiness is supported and strengthened when the child's close preschool teachers communicate positively with the them from the outset. The child is a rich and strong person who communicates, is curiously involved, asks, wonders and is ready to be challenged. Additionally, the child processes impressions, responds and expects a reaction from their surroundings. Thus, the child is recognised as their own distinct person (Sommer, Samuelson & Hundeide, 2010).

View on learning

It is through active participation that the child, together with preschool teachers and other children in a relational learning environment, is able to create knowledge and culture and influence the form and content of everyday life (Samuelsson & Carlsson, 2008). Project work as part of children's active participation in activities and play supports the fact that

they develop an independent creativity and routine in relation to, for example, the possibilities in the room and the playground (Hirsh-Pasek, Golinkoff, Berk & Singer, 2009). The learning environment in the institution reflects and makes possible this vision for preschool teachers, who have an eye for identifying the child's resources; they see the child as a creative learner who acquires new knowledge and creates new experiences through active participation.

Play and learning

In the encounter with more skilled partners that the child finds in the zone of proximal development, they are able to respond on a different level than in ordinary play. In this process, the child can often raise themselves to a higher level; it can be more than what is evident in daily behaviour. Children use their knowledge and skills in combination (Wertsch, 1985) and are included with each other in an alternative play. They transform their knowledge and experience into play, which involves their own goal-oriented activities. A parallel can be drawn between the concepts of reshaping and self-activity but with the difference that the latter focuses more narrowly on children's self-initiated processes (Hirsh-Pasek, Golinkoff & Eyer, 2004). By providing space and time for play, it would be possible to observe whether the children's knowledge and experience gained from joint projects have been sufficiently meaningful for them such that they are recognisable in play.

Play is not perceived to be a contradiction to learning (Samuelsson & Carlsson, 2008). Simply put, one can say that, in nurseries, play is an activity characterised as being a goal in itself. The play's goal and motives lie in the actual play; children do not play to learn something specific. They play to play, and yet they learn something in the process: they learn skills, develop competencies and understand their world better (Vygotsky, 1967). Moreover, they learn to think creatively, develop their imagination and express emotions; they develop ideas and thoughts, learn to listen and build on the ideas of others; they learn to say, 'yes, I will' and 'no, I won't' to express their viewpoints. Furthermore, they learn social responsibility and develop self-esteem and confidence. In good play, the child experiences self-forgetfulness (flow), cohesion and community (Hirsh-Pasek et al., 2004).

When play approaches drama—either as role-play, social fantasy or dramatic form—communication changes, and a zone is created wherein it is possible to learn to express and handle one's own and others' feelings.

With play and learning as prerequisites for each other, projects aimed at children's play become a prerequisite for rich play, and rich play becomes a prerequisite for project work to include children's preoccupations and interests. Preschool teachers have the opportunity, among other things, to find out about children's understanding of relationships and theories by listening to the questions they ask.

The size and composition of children's groups

The composition of children's groups may be relevant if the preschool teacher is expected to create relevant dialogue of longer duration. The preschool teachers in Crèches 8 and 9 reflected over whether the groups should be composed according to function level, gender, age or other principles that seemed important in terms of the activity. One assumption was that, by dividing the children into function-based subgroups and doing this on the basis of children's developmental levels, preschool teachers can create better opportunities for all

the children in the group. In these crèches, the preschool teachers were attending to children in groups of four or five.

Conclusion

This study aimed to investigate the patterns of interaction between professional preschool teachers and children aged 0–24 months in Danish crèches and to examine the correlations between these interaction patterns and the preschool teachers' pedagogical decisions.

The observed interactions show significantly diverse interaction patterns. This could indicate that each of the nine crèches provided rather diverse conditions for intersubjectivity.

In all nine crèches, a smaller number of children per adult (i.e., low child–adult ratio) led to more interactions of a longer duration, more open interactions and more dialogue shifts. Simultaneously, the analysis implies that a higher ratio (i.e., more children per adult) increased the effect of the variable of the particular crèche, and a lower ratio (i.e., fewer children per adult) reduced the impact of that variable. In addition, the best scoring crèches in the study (8 and 9) had the lowest ratios, while the worst scoring crèche had the highest ratio. This indicates that internal pedagogical choices are crucial. For example, the extent of reflection and planning for pedagogical activities, criteria for grouping of children and whether preschool teachers worked predominantly alone with smaller groups of children or as a team of two or three with several children were decisions that differed from crèche to crèche. These pedagogical decisions are mutually dependent on or sensitive to the child–adult ratio. In the crèches that scored best (8 and 9), the variable of the crèche was sensitive to child–adult ratio; conversely, in the poorer scoring crèches, the variable of the particular crèche was less sensitive. This could indicate that the lower scoring crèches exhibited a greater degree of simple warehousing of children as opposed to a pedagogically well-thought-out and well-structured offer.

Furthermore, the analysis indicates an important and significant correlation between Crèches 8 and 9, implying a specific pedagogical approach comprising:

- a planned, goal-oriented structure with planning schedules and evaluation of the children's learning processes
- a high child–adult ratio (4.3–4.7)
- children grouped by age and developmental characteristics
- preschool teachers predominantly working alone with smaller groups of children
- fewer interactions of longer duration with more open interactions (fewer closed questions) and more dialogue shifts.

Conversely, Crèches 1–7 are significantly similar, and this similarity implies a different pedagogical approach and indicates a significant relationship between the following:

- an unplanned day, no fixed structure, no planning schedules and no evaluation of the children's learning processes
- a low child–adult ratio (3.8–4.2)
- children divided into mixed-age groups (8–36 months)

- preschool teachers predominantly working as a team of two or three with several children
- multiple interactions of shorter duration with fewer open interactions (more closed questions) and fewer dialogue shifts.

Gender and age showed no significant influence.

The study reveals significant differences in the character of interpersonal interactions, involving the exchange of information, feelings and meaning through communication between preschool teachers and children according to, for example, the level of planning and pedagogical reflection. This may result in different conditions for children to participate in episodes of joint attention, where the child shares intentions with the preschool teacher through multimodal means of communication that underlie young children's developing ability to participate in the collectivity that is human cognition (Tomasello et al., 2005, pp. 675–676). From this perspective, the differences in pedagogical reflection become differences in interpersonal interactions, which become differences in cultural learning and children's overall development and learning.

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