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ABSTRACT

Research Findings: This study examined whether teacher-child interaction quality varied as a function of type of activity in toddler classrooms in four European countries (Finland, Netherlands, Poland, and Portugal). It also investigated whether specific activity settings, namely levels of adult involvement, use of whole group, and children's engagement with materials, explained differences in teacher-child interaction quality across activities. Participants were 129 toddler classrooms and their lead teachers, specifically, 28 in the Netherlands, 40 in Finland, 31 in Portugal, and 30 in Poland. Process quality was measured with the CLASS Toddler (La Paro et al., 2012) and the Activity Setting Measure was used to characterize adult levels of involvement, group organization, and children's engagement with materials. Findings indicated that there were important variations across activities in all countries. Positive associations were found between higher levels of adult facilitation and both Emotional and Educational Support. Other activity settings partially explained differences across activities in interaction quality, although patterns varied by country. *Practice or Policy:* CLASS scores were conditional on the content and format of the activities. Greater attention to activity types and settings may be a means to increase the precision of quality assessment.

Most western countries have invested in early childhood education and care (ECEC) systems, aiming to increase participation rates for all children, including those below 3 years of age (Organisation for Economic Co-operation and Development [OECD], 2018). In Europe, the Council of the European Union (EU) recently adopted a Recommendation on High-Quality Early Childhood Education and Care Systems, aiming to develop a common EU-wide understanding of what constitutes good-quality service provision, and support EU Member States in their efforts to improve access to and the quality of ECEC (Council of the European Union, 2019). These investments are associated with evidence regarding the importance of the early years for later development and learning and the positive effects of high-quality ECEC on children's concurrent and later developmental outcomes (Ulferts et al., 2019; van Huizen & Plantenga, 2018; Vandell et al., 2010). However, available evidence also includes inconsistent findings that may reflect contextual specificities (e.g., Baker et al., 2008; Guerrero-

Rosada et al., 2021) and there is a clear gap in research concerning the quality of activities in toddler classrooms serving children under 3 years of age.

In this study, we advance the field by focusing on the quality of teacher-child interactions experienced by toddlers in ECEC, as a function of type of activity in Finland, the Netherlands, Poland, and Portugal, four European countries with diverse geographic locations, historical, cultural, and economic contexts, and ECEC systems. In addition, considering that past research has examined a limited set of contextual features, this study extends available evidence by examining the associations between a set of overlooked activity settings – levels of adult involvement, use of whole group, and children's engagement with materials – and teacher-child interaction, as a key indicator of process quality. Through the systematic examination of each activity setting, this study attempts to disentangle their unique effects on process quality. Based on a European data set involving four countries with diverse ECEC systems and regulations, this study adds to the current evidence base (built mostly on USA samples) on the role of micro and macro context (i.e., activities, ECEC policy) in shaping the proximal processes likely to influence children's outcomes. We use a consistent methodological approach across countries to identify similarities and country-specific patterns more clearly.

Teacher-Child Interaction Quality in Toddler Classrooms

ECEC quality has been conceptualized as encompassing both structural (i.e., regulable characteristics such as group size, child-adult ratio, and teacher education) and process features of the environment (i.e., proximal processes such as adult-child and peer interactions, and patterns of activities) (e.g., Slot et al., 2015). Previous research suggests that structural features influence the quality of classroom processes and, in turn, classroom processes influence children's developmental outcomes (National Institute of Child Health and Human Development Early Child Care Research Network [NICHD EECRN], 2002). Importantly, high process quality is necessary for ensuring positive developmental outcomes for young children (National Institute of Child Health and Human Development Early Child Care Research Network [NICHD EECRN], 2002), with teacher-child interactions amongst the most consequential process features in ECEC settings (Bronfenbrenner & Morris, 2006).

In the case of very young children, the quality of teacher-child interaction can be defined as encompassing both social-emotional and educational features that drive development (La Paro et al., 2012; Slot et al., 2017), namely sensitive, responsive, and emotionally supportive interactions, within positive relationships (e.g., Norris & Horm, 2015). A growing body of research suggests that sensitive-responsive interactions, through which teachers respond promptly and warmly to toddlers' interests and build strong relationships with them, are crucial for infant and toddler development (Brownlee et al., 2009; Norris & Horm, 2015). Additionally, fostering cognitive development and encouraging language in the context of play, and engaging in back-and-forth interactions and dialogs that are driven by the needs and interests of toddlers, are also widely acknowledged as pivotal for meaningful and high-quality interactions (Norris & Horm, 2015).

Despite lagging behind the knowledge base on the preschool period, evidence regarding the associations between the quality of teacher-child interactions in ECEC settings and toddlers' concurrent and later developmental outcomes is increasing (e.g., Choi et al., 2019; La Paro et al., 2014; Nores et al., 2019). High-quality teacher-child interactions in the toddler years are associated with improved child outcomes (Choi et al., 2019; La Paro et al., 2014), suggesting the importance of this dimension of process quality. However, not all toddlers experience high-quality interactions in their classrooms (e.g., Barros & Aguiar, 2010; La Paro et al., 2014) and, those who do, might not experience high-quality interactions consistently (i.e., across daily activities and routines) (e.g., Slot et al., 2015).

Research conducted in preschool settings suggests that the consistency of teacher-child interactions across daily activities is a predictor of children's outcomes, over and above observed quality-levels of such interactions (Curby et al., 2013). Importantly, variations in the quality of teacher-child interactions in preschool and kindergarten have been documented as a function of the features of the setting, including type of activity, type of teacher involvement, group structure, and extent of engagement with

materials (e.g., de Haan et al., 2014; Early et al., 2010). However, most studies on interaction quality use standard observation procedures that do not consider the activities taking place within the observation. In one notable exception, Thorpe and colleagues (Thorpe et al., 2020) found that, in preschool settings, variations across activities systematically biased interaction quality scores, calling for further research on the format and content of an observation.

Teacher-Child Interactions Across Types of Activities

Different types of activities present children and adults with different configurations of the learning environment, in terms of individual roles, space arrangements, engagement with materials, social grouping, pace, etc. For example, during child-directed activities (e.g., free play), children may choose their own goals, materials, and playmates; conversely, during teacher-directed activities (including those focusing on emerging academics), children engage in learning goals and with materials and peers in ways that they most likely would not experience on their own. It is generally accepted that such variation enriches children's experiences in ECEC, resulting in increased opportunities for learning and development (for studies with preschool children see Fuligni et al., 2012; Goble & Pianta, 2017; Goble et al., 2016). Therefore, balance in child-directed vs. teacher-directed activities has been considered an indicator of high-quality classroom experiences in ECEC (National Association for the Education of Young Children, 2009).

In the first three years of life, children's neurodevelopment is particularly sensitive to environmental influences (Council for Early Child Development, 2010; Naudeau et al., 2011), such as those afforded by early caregiving in the family and ECEC settings (Shonkoff & Phillips, 2000). Consistent with the bioecological framework (Bronfenbrenner & Morris, 2006), it is important that high-quality proximal processes are experienced consistently, across different activities in ECEC settings, such as free play, emergent academics, creative activities, and meals. Still, pressures for a more learning-oriented curriculum have created tensions about the balance between pre-academic oriented activities and child-initiated activities, such as free play (Sylva et al., 2016). There are concerns that current trends toward an early focus on academic goals and activities may unintentionally lead to less encouragement of children's natural learning strategies, such as play or exploration (Van Laere & Vandenbroeck, 2018). It seems therefore relevant to examine whether there is systematic variation in teacher-child interaction quality across emergent academic and play activities.

Research conducted in preschool classrooms has shown differences in the quality of interactions across types of activities, but the research findings have been mixed. For example, Thorpe et al. (2020) found within-classroom variations, with higher quality observed in activities addressing science, math, and social studies content (when compared to meals, physical activity, and transitions). Similarly, Early et al. (2010) reported that preschool teachers engaged in more scaffolded and didactic teaching during teacher-directed activities compared to child-directed activities. In contrast, Chien et al. (2010) found higher process quality in preschool classrooms where children spent more time in free play, illustrating the mixed nature of available evidence.

Similar research is scarce in toddler classrooms (e.g., Guedes et al., 2020). The few available studies are small-scale but nevertheless also suggest important variations across activities (Degotardi et al., 2018; Girolametto et al., 2000; Slot et al., 2017). For example, an observational study of teacher-child interactions reported differences in teachers' language input as a function of activity, observing more directiveness during book reading than in play dough activities for both toddlers and preschoolers (Girolametto et al., 2000). Others have also found important differences in communication and interaction quality between educational and play situations (Degotardi et al., 2018; Slot et al., 2017).

Differences across play and routine care activities have also been examined (Degotardi, 2010; Hallam et al., 2016). Routine care activities, such as meals, have been considered important moments for developing meaningful and sensitive interactions with children under 3, given their high frequency in this age group (Degotardi, 2010; Hallam et al., 2016; Norris & Horm, 2015). Researchers propose that sensitive interactions can be easily embedded in the care opportunities as they usually involve

one-on-one interactions, allowing teachers to develop reciprocal, individualized, and warm exchanges with toddlers (Degotardi, 2010; Hallam et al., 2016; Norris & Horm, 2015). However, the few available studies have shown that interactions in routine care activities are of poorer quality compared to other daily moments (Degotardi, 2010; Hallam et al., 2016). Research on the actual experiences of toddlers is nevertheless scant, calling for further studies in this area.

Adult Involvement, Group Arrangement, and Child Engagement with Materials

Researchers have advanced several possible explanations for the variations in teacher-child interaction quality across activities. For example, it has been suggested that sensitive-responsive interactions require teacher availability and attention toward toddlers' needs and interests, which, in turn, requires high levels of teacher involvement in classroom activities (Brownlee et al., 2009; Norris & Horm, 2015). Thus, teacher involvement can be an important pre-requisite for high-quality teacher-child interactions (de Haan et al., 2014; Hooper & Hallam, 2017). Importantly, some studies have shown that teacher's involvement varies greatly throughout the day (Hooper & Hallam, 2017). For example, in some countries, free play is marked by relatively low levels of teacher involvement, while in organized educational activities teachers tend to be highly involved (de Haan et al., 2014). Similarly, studies conducted in preschool suggest that, in emergent academic activities, teachers spend most of their time actively interacting with children, whereas in free play, the levels of teacher involvement tend to vary more widely (Goble et al., 2016). These findings suggest some variation in the quality of teacher-child interactions across different types of activities may be accounted by the type of adult involvement in the activity.

In addition to the nature of the activity and type of adult involvement, variations in teacher-child interaction quality across activities are likely also a function of other activity settings, including type of social grouping and extent of engagement with materials. For example, larger (and to a lesser extent smaller) groups are typically used during teacher-directed activities in preschool, namely those focusing on emergent academics (Cabell et al., 2013; de Haan et al., 2014; Early et al., 2010), while free play typically occurs individually, in pairs, or small groups. Importantly, there is evidence suggesting that whole-group activities in preschool may limit children's opportunities to interact with the teacher and with peers and place additional demands on the teacher (de Haan et al., 2014; Powell et al., 2008). Relatedly, in teacher-directed whole-group activities, children are more likely to be listening or observing and less likely to be acting (de Haan et al., 2014) and, therefore, engaging with materials. However, providing hands-on experiences with accessible materials is considered an indicator of high-quality ECEC, as it facilitates children's motivation and engagement in learning activities (McClure et al., 2017). In sum, there is preliminary evidence suggesting that, in preschool, process quality is inconsistent across the day and that specific activity features, namely type of activity, adult involvement, social grouping, or children's engagement with materials – may influence process quality. In addition, it seems that some activity settings go hand in hand, that is, vary as a function of one another. For instance, emergent academic activities are more likely to be organized with the whole group, with higher levels of teacher involvement, and decreased engagement with materials. However, studies are scarce, particularly for toddlers, and there is an additional need to disentangle the specific associations between each activity setting and process quality.

Associations Between Structural and Process Quality Across Countries

Levels of teacher-child interaction quality may be also explained by structural features of ECEC classrooms typically examined in the literature, such as teacher qualifications (i.e., level of preservice training), work experience, and child-adult ratio. Although the evidence base is far from consistent, recent meta-analytic findings, including studies with toddler classrooms, suggest that teacher education is positively associated with process quality (Manning et al., 2019) and that child-adult ratio is negatively associated with process quality (Vermeer et al., 2016). Inconsistent findings have also been

Table 1. Selected Features of the ECEC Systems of Participating Countries.

Structural features	Netherlands	Finland	Portugal	Poland
Requirement of a bachelor's degree for teachers (age groups)	>3	0-6	1-6	>3
Educational Guidelines (age groups)	>3	0-6	>3	>3
Degree of system and policy integration	Split	Integrated	Somewhat split	Split
Focus of external evaluations for settings serving children <3	Structural and process	ECEC provider responsible	Structural	Structural
Age a place in ECEC is guaranteed	5	<1	4	3
Maximum group size in classrooms serving (mostly) two years olds	16	12	18	–
Maximum child-adult ratio in classrooms serving (mostly) two-year olds	8	4	9	8
Average number of weekly hours in ECEC (children under three years)	16.7	31.8	39.1	34.4
Participation rate in ECEC (children under three years)	61.6	33.3	47.5	11.6

Note. Based on European Commission/EACEA/Eurydice (European Commission/EACEA/Eurydice/Eurostat, 2019).

reported regarding the associations between preschool teacher's experience and classroom process quality, with Pianta et al. (2005) reporting positive associations and Schachter et al. (2016) reporting negative associations. Notably, Slot et al. (2017) found a small positive association between work experience and observed quality in Dutch classrooms serving toddlers. Further, Slot et al. (2015) reported a positive association between preschool teacher's education and process quality in England and in Finland, but not in the Netherlands.

The inconsistent associations between classroom structural features and process quality may be partially explained by the limited set of structural features that have been examined, calling for further research examining a broader set of contextual features. In addition, the mixed evidence may be also explained by country variations in ECEC systems and regulations. Specifically, as suggested by Slot et al. (2015), a possible explanation for the inconsistent findings may reside in country-specific regulations that may reduce the variance within countries and lead to weak or inconsistent associations between structural and process quality. Most studies on ECEC quality have overlooked how country-level regulations, policy, and cultural traditions may have restricted the variation to be explained, making it hard to compare results across studies. Complicating the picture is the use of different methodological approaches across studies. The use of a consistent measurement procedure across countries such as used in this study, with a careful examination of psychometric properties of the observational measures, can help clarify the potential associations between classroom features and process quality. In this study, we selected four countries that represent important variation in regulations, policy, and curriculum, so that a broader range of contextual conditions could be considered and discussed.

The four European countries involved in this study represent different geographic locations in Europe as well as different ECEC systems. Table 1 presents selected features of the four systems, including information on teacher education requirements, group size, and child-adult ratio for classrooms serving toddlers, as well as weekly attendance (hours), and participation rates for children under three years of age. Available information illustrates meaningful differences in the four countries. For example, according to the European Commission/EACEA/Eurydice (European Commission/EACEA/Eurydice/Eurostat, 2019), Finland and Portugal require teachers to hold a bachelor's degree in classrooms serving toddlers, while the Netherlands and Poland require teachers with a bachelor's degree for classrooms serving children above three years old. Further, Finland has more stringent recommendations regarding child-adult ratio, especially when compared to Portugal. It is likely that such differences in ECEC systems and regulations result in different configurations of activity settings.

Current Study

The first and main aim of this study was to compare levels of teacher-child interaction quality across four types of activity (i.e., emergent academics, free play, creative activities, and meals) in Portugal, Finland, Poland, and the Netherlands. The second aim was to examine whether the observed variations in teacher-child interaction quality across activities were associated with activity settings in the four countries. To address this second aim, we examined (a) whether teacher-child interaction quality was associated with adult involvement, social grouping, and children's engagement with materials; (b) whether variations in teacher-child interaction quality across activities could be explained by these three activity settings. All analyses included a set of control structural variables, namely teacher qualifications and experience and classroom child-adult ratio. For the first aim, we expected to find differences in teacher-child interaction quality across activities (H1), with higher quality in free play (H1a) and lower quality in meals (H1b), when compared to emergent academics. As for the second aim, we expected that higher levels of adult involvement (H2), less use of whole group (H3), and more children engaging with materials (H4) would be associated with higher teacher-child interaction quality and could partially explain its variation across activities (H5).

Method

Participants

Participants were 129 toddler classrooms and their lead teachers: 28 from the Netherlands, 40 from Finland, 31 from Portugal, and 30 from Poland. The sample is part of a broader research project designed to examine the complex relations among activity settings, teacher-child interactions, peer interactions and the development of self-regulation during toddlerhood across these four European countries. To be part of this study, in each country, centers had to meet a set of inclusion criteria: centers had to be aligned with national guidelines regarding structural characteristics (e.g., group size, child-adult ratio, teacher qualification); and participating classrooms had to serve mainly, but not exclusively, 2-year-olds. Selection of ECEC centers was based on prior or ongoing collaboration between the centers and/or municipalities, universities and/or teacher training centers. The convenience sample in each country covered regional variation of urban and less urban areas.

Table 2 presents descriptive statistics regarding classroom and teacher characteristics for all participating countries. Group sizes ranged from 7 to 16 children in the Netherlands ($M = 14.44$, $SD = 2.03$), from 5 to 45 in Finland ($M = 16.42$, $SD = 6.78$), from 8 to 22 in Portugal ($M = 16.00$, $SD = 3.09$), and from 15 to 43 in Poland ($M = 32.43$, $SD = 6.79$). Child-adult ratio averaged 7.25 ($SD = 0.78$) in the Netherlands, 5.02 ($SD = 1.10$) in Finland, 8.23 ($SD = 3.80$) in Portugal, and 8.00 ($SD = 1.29$) in Poland. Most teachers were women in all countries. In the Netherlands, most teachers had an intermediate vocational degree (70.4%), and 29.6% held a bachelor's degree. In Finland, most of the lead teachers (84.2%) held a bachelor's degree. Similarly, in Portugal, 64.3% of the lead teachers held a bachelor's degree and 35.7% a master's degree. In Poland, most lead teachers (63.3%) held a master's degree, 3.3% attended high school or less, 16.7% completed intermediate vocational training, and 16.7% held a bachelor's degree. Teachers working in the observed toddler classrooms had an average experience in ECEC settings of 16.08 ($SD = 6.96$) years in the Netherlands, 17.46 ($SD = 9.29$) in Finland, 12.62 ($SD = 5.92$) in Portugal, and 11.17 ($SD = 10.44$) in Poland.

Procedure

To increase comparability across countries, a manual with a set of guidelines to conduct video recordings was followed by research assistants. The manual was created within the scope of a larger European research project (Slot, Cadima et al. 2016). Instructions included definitions of the four types of activities, expected length of the videos, and other technical guidelines. Instructions were given about the positioning of the camera and the use of a tripod to ensure a stable and high-quality

Table 2. Descriptive Statistics for Classroom and Teacher Characteristics.

Variables per country	M	SD	Min	Max
		Netherlands		
Classroom characteristics				
Group size	14.44	2.03	7.0	16.0
Number of adults	2.00	0.27	1.0	3.0
Child-adult ratio	7.25	0.78	5.3	8.0
Lead teacher characteristics				
Sex (1 = woman)	92.6%			
Age (years)	49.96	10.74	28.0	67.0
Years of experience	16.08	6.96	5.0	32.0
Preservice qualifications				
High school or less				
Intermediate vocational	70.4%			
Bachelor	29.6%			
Master				
		Finland		
Classroom characteristics				
Group size	16.42	6.78	5	45
Number of adults	3.36	1.40	2	9
Child-adult ratio	5.02	1.10	3.5	7.5
Lead teacher characteristics				
Sex (1 = woman)	100%			
Age (years)	48.74	9.53	26.0	63.0
Years of experience	17.46	9.29	4.0	36.0
Preservice qualifications				
High school or less				
Intermediate vocational	13.2%			
Bachelor	84.2%			
Master	2.6%			
		Portugal		
Classroom characteristics				
Group size	16.00	3.09	8.0	22.0
Number of adults	2.22	0.75	1.0	4.0
Child-adult ratio	8.23	3.80	3.8	20.0
Lead teacher characteristics				
Sex (1 = woman)	100%			
Age (years)	40.85	7.85	27.0	57.0
Years of experience	12.62	5.92	2.0	24.0
Preservice qualifications				
High school or less				
Intermediate vocational				
Bachelor	64.3%			
Master	35.7%			
		Poland		
Classroom characteristics				
Group size	32.43	6.79	15.0	43.0
Number of adults	4.03	0.49	3.0	5.0
Child-adult ratio	8.00	1.29	5.0	10.8
Lead teacher characteristics				
Sex (1 = woman)	96.7%			
Age (years)	40.52	8.51	29.0	61.0
Years of experience	11.17	10.44	1.0	37.0
Preservice qualifications				
High school or less	3.3%			
Intermediate vocational	16.7%			
Bachelor	16.7%			
Master	63.3%			

image, placed at sufficient height to allow for a more complete and clearer overview of the classroom, without disturbing the teacher and the children. Observers were asked to take field notes while observing the activities. Four activities were chosen because they typically occur each day in toddler classrooms: free play, emergent academic activities, arts-related activities, and meals. Before the visit to the center, research assistants briefly informed teachers about the daily activities eligible for

videotaping. After clarifying the types of activities of interest to teachers, researchers and teachers discussed the global schedule and teachers' plans, and decided which activities would be videotaped by research assistants. Teachers were asked to maintain their classroom daily routines and visits were scheduled to capture a regular day, with no special events taking place. Teachers were asked to behave as they usually do, and no instruction was given about their levels of engagement. Observers were present during the activities and took notes to get additional relevant information.

Each toddler classroom was visited twice, starting each visit early in the morning. Each visit took approximately 2 hours. In each classroom, several videos were recorded, with each video capturing one of the four target activities. If needed, research assistants double-checked with the teachers if the observed activity corresponded to the previously assigned category. In a few cases, when the observed activity did not fit in the initially planned category, research team members discussed and reached a consensus on activity type, according to the description below (See Type of Activity). In most classrooms (97%), four videos were recorded, one for each assigned activity, in a total of 512 videos (112 in the Netherlands, 156 in Finland, 124 in Portugal, and 120 in Poland). The duration of videos averaged 17 minutes (17 minutes in Netherlands, Finland, and Portugal; 15 minutes in Poland). Videos were scored by trained observers in two stages. First, each video was scored with the Classroom Assessment Scoring System Toddler (CLASS Toddler; La Paro et al., 2012). Second, each video was scored using the Activity Setting Measure. For both observational measures, the first 15 minutes of each video were scored. Videos shorter than 15 minutes were coded during the entire video length.

Teachers completed a questionnaire on structural characteristics, including teacher characteristics (e.g., qualifications and work experience), group composition (group size, gender, age, socioeconomic background), and classroom characteristics (e.g., number of teachers and assistants; space and materials).

Measures

Type of Activity

Video recordings covered four typical types of activities, namely emergent academic activities, free play, arts-related activities, and meals. Emergent academic activities were teacher-initiated and corresponded to a particular curricular domain, such as emergent literacy, mathematics, sciences, or social studies. For example, reading and discussing a book or a story, conversations about body parts using a mirror, playing a matching game with objects of different shapes and colors, or exploring water, sand, and containers of different sizes. Free play moments were situations during which children were able to choose what and whom to play with, among several available options. For example, play with blocks, pretend play, among other options that could differ between classrooms. Arts-related activities were described as situations during which teachers provided arts-related materials or asked children to engage in arts-related experiences, for example, painting, drawing, modeling with dough, playing musical instruments, or dancing. Meals corresponded to lunchtime or morning and afternoon snacks.

Activity Settings

The Activity Setting Measure was developed in the scope of the current project (see Alvim Gonçalves et al., 2020 for detailed information), aiming to characterize observable aspects of the activities, such as their configuration, group organization, or the contents and materials used. The measure comprised the following domains: Adult Involvement, Activity Content, Materials, Social Grouping, Engagement with Materials, Open-ended, and Location of the Activity. In this study, we used only Adult Involvement, Children's Engagement with Materials, and Social Grouping.

Adult Involvement

The Adult Involvement score refers to the level of teacher involvement with children in the activity. For each 30-seconds interval, Adult Involvement was coded according to five possible categories: (a) Non-involved, when the teacher did not engage in interactions with children and did not participate in children's activities; (b) Passive, when the teacher helped or assisted children (e.g., passing materials) without engaging in interaction or conversation with them; (c) Active-Responsive, when the teacher merely nodded or responded to children without adding or enriching, scaffolding, or extending the interaction; (d) Active-Facilitator, when the teacher engaged in reciprocal conversations and/or played interactively with children, gave children suggestions regarding their activity, and when teacher-child interactions included back and forth exchanges; or (e) Active-Directive, when the teacher introduced new elements into the activity, instructed children regarding their actions, gave directions on what children should do, and directed actions and dialogs. The categories were mutually exclusive. This domain was coded each 30-seconds interval, for the first 15 minutes observed in each video. For each video/activity, the percentage of active facilitation was calculated based on the total number of 30-seconds intervals coded as Active-Facilitation.

Social Grouping

Social Grouping represents the type of grouping predominant in the activity (more than 50% of the video length), which was categorized according to the following criteria: (a) whole group, when the activity was provided for all (7 or more children); (b) small group, when a group of three to six children was involved in the activity; (d) individual/pairs, when one or two children were involved in the activity; and (e) free, when children moved freely around the classroom. For this study, to reduce the number of categories and the complexity of the models, the activities involving small groups ($M = 34\%$), individual/pairs ($M = 5\%$), and free activities involving less than 7 children ($M = 10\%$) were merged into a single category referred to as "other" (small, pair or free). Each video/activity was thus categorized in a dichotomous variable as either whole group ($M = 51\%$) or other (small, pair or free), based on the predominant social arrangement of the activity.

Children's Engagement with Materials

Children's engagement with materials refers to the percentage of children who used available materials. The observer registered the proportion of children using materials in successive 30-seconds intervals according to four levels: 0–24%, 25–49%, 50–74%, 75–100%. For each video/activity, the percentage of children engaging with materials was calculated based on the relative proportion of 30-seconds intervals in which at least 50% of children were manipulating materials (sum of intervals 50–74% and 75–100%).

Training on the Activity Setting Measure involved observers from the four countries discussing each domain and practicing the coding procedure based on videotaped observations of classrooms not participating in this study. At the end of the training, for reliability purposes, each observer coded five videos independently and all reached at least 80% of inter-rater agreement. In each country, two independent observers scored adult involvement, social grouping, and children's engagement with materials. For reliability purposes, 25% of the videos were double coded in all countries. Inter-observer reliability was evaluated with Cohen's Kappa for nominal variables and Weighted Kappa for ordinal variables. Inter-observer reliability was considered adequate for all dimensions in all countries, with Adult Facilitation weighted kappa ranging from .53 to .87; Social Grouping kappa ranging from .59 to .96; and Children's Engagement with Materials weighted kappa ranging from .80 to .96.

Interaction Quality

The quality of teacher-child interactions was observed with the Classroom Assessment Scoring System (CLASS Toddler; La Paro et al., 2012). This instrument measures eight dimensions of teacher-child interactions categorized on two broad domains: Emotional Support and Engaged Support for

Learning, herein referred to as Educational Support. Emotional Support captures teachers' attunement, sensitivity, responsiveness, consideration of children's perspectives, and behavior management strategies. It consists of the following dimensions: Positive Climate, Negative Climate, Teacher Sensitivity, Regard for Child Perspectives, and Behavior Guidance. Positive Climate reflects the overall emotional tone of the group and the connection between teacher and children. Negative Climate reflects the overall level of expressed negativity in the group. Teacher Sensitivity encompasses the teacher's responsivity to children's needs and awareness of children's level of development and emotional functioning. Regard for Child Perspectives captures the degree to which the teacher's interactions with children and activities place an emphasis on children's interests and points of view. Behavior Guidance encompasses the teacher's ability to use effective methods to develop and maintain acceptable classroom behavior. The Educational Support domain focuses on the extent to which teachers promote children's learning and development, give specific feedback to expand children's participation, and encourage children's language development. It is comprised by the following dimensions: Facilitation of Learning and Development, Quality of Feedback, and Language Modeling. Facilitation of Learning and Development considers how well teacher facilitates and supports children's learning and development. Quality of Feedback assesses the degree to each teacher provides specific feedback. Language Modeling captures the quality and amount of the teacher's use of language stimulation and language facilitation with children. For each video/activity, each of the eight dimensions was scored on a 7-point scale, based on behavioral descriptors provided in the manual. Scores 1 and 2 represent low quality, scores 3 to 5 represent mid-range quality, and scores 6 and 7 represent high interaction quality.

Observers from the four countries passed the CLASS Toddler training which consisted, first, of reading the manual and getting familiar with the coding procedure. Second, a certified trainer presented each dimension in a two-days training, where each domain and dimension were discussed between the trainer and trainees (i.e., observers). Third, observers practiced the coding procedures based on videotaped situations representing a range of quality of interactions at the group level. Lastly, observers coded five master-coded videos individually, and passed the reliability test by reaching within one-scale point agreement of at least 80% with the master-code. For reliability purposes, a set of videos from the four countries were coded by observers from all countries. The inter-observer agreement within one-scale point was 96% on average, ranging from 91% (Quality of Feedback) to 99% (Positive Climate). Intraclass correlations averaged .84, ranging from .73 (Teacher Sensitivity) to .93 (Quality of Feedback), indicating good consistency across observers.

Confirmatory Factor Analysis

We initially conducted separate confirmatory factor analysis (CFA) for each country. Following the proposed structure of the CLASS Toddler (La Paro et al., 2012), a two-factor model was examined using the CLASS dimensions as indicators of two latent factors representing Emotional and Educational Support, respectively. To address nesting of activities within classrooms, the models were estimated using the special feature for complex survey data available in the Mplus software. Given that prior research on other CLASS versions has shown low factor loadings for the Negative Climate dimension (Cadima et al., 2018; Pakarinen et al., 2010), we estimated models including and excluding this item. After examining the CFAs, we decided to exclude the Negative Climate item, given that the models improved significantly in three countries, in Netherlands, Finland, and Poland (see Table 3). The two-factor model had acceptable fit and provided the best relative fit to the data, compared to the one-factor model (see Table 3).

Measurement Invariance

To test whether the same latent structure was invariant across countries, Multiple Group Confirmatory Factor Analysis was used, which has been the most common technique for testing measurement invariance (Chen, 2008; Meade et al., 2008; Millsap & Kwok, 2004). After separate CFAs, a series of increasingly more restrictive confirmatory factor analysis models were fit to the data. In the first step,

Table 3. Model Fit Statistics for Measurement Invariance Models of the CLASS.

Model	χ^2	df	RMSEA	CFI	TLI	ΔCFI	S-BΔχ2	df	p
Netherlands									
Two-factor model	33.805	19	0.083	0.953	0.931				
Two-factor excluding NC	18.273	13	0.060	0.982	0.971	.029	15.60	6	.016
One-factor model	117.968	14	0.257	0.643	0.464	−.339	−14.92	1	<.001
Finland									
Two-factor model	55.939	19	0.112	0.944	0.918				
Two-factor excluding NC	40.248	13	0.116	0.954	0.926	.010	15.30	6	.018
One-factor model	102.987	14	0.202	0.851	0.776	−.103	−35.07	1	<.001
Portugal									
Two-factor model	26.913	19	0.058	0.990	0.986				
Two-factor excluding NC	14.236	13	0.028	0.998	0.997	.008	12.27	6	.056
One-factor model	49.652	14	0.143	0.955	0.933	−.043	−18.54	1	<.001
Poland									
Two-factor model	43.588	19	0.104	0.946	0.921				
Two-factor excluding NC	23.711	13	0.083	0.973	0.956	.027	21.07	6	.002
One-factor model	193.156	14	0.327	0.552	0.327	−.421	−576.17	1	<.001
Measurement invariance									
M1: Configural Invariance	103.31	53	0.086	0.976	0.962				
M2: Metric invariance	125.156	67	0.089	0.967	0.959		21.60	14	.087
M3: Scalar invariance	357.815	82	0.162	0.867	0.864		209.18	15	<.001

Note. TLI = Tucker – Lewis Index; CFI = Comparative Fit Index; RMSEA = Root Mean Square Error of Approximation; NC = Negative Climate; S-BΔχ2 = Satorra-Bentler scaled χ^2 difference test.

Configural Invariance, we tested whether the countries had the same factor structure through an estimation of a combined model in which all model parameters were allowed to differ across groups. This was the baseline model for further comparisons. In the second step, *Metric Invariance*, the factors loadings were constrained to be equal across groups, while the intercepts were allowed to differ across groups. In the last step, *Scalar Invariance*, intercepts for same item were constrained to be equal, to test whether the mean of each construct had the same meaning across countries (Hair et al., 2006). We used maximum likelihood estimation with robust in Mplus Version 7 (Muthén & Muthén, 1998/2012). The configural invariance model showed adequate fit, suggesting that the two-factor structure was equivalent across countries (see Table 3). The metric invariance model did not significantly differ from the configural model, indicating that the factor loadings were invariant across countries. However, the decrease in model fit for the scalar invariance model was statistically significant, indicating that scalar invariance was not achieved, precluding the comparison of the CLASS latent means across countries. Nevertheless, because we were mainly interested in conducting regression models which do not imply mean comparisons across countries, we were able to proceed with the analyses. The subsequent models allowed for country-specific estimates (i.e., without constraints for equivalence of parameters across countries).

Structural Quality Indicators

A teacher-report questionnaire on structural characteristics was used to collect information on lead teacher's preservice qualifications, years of experience, and classroom-level child-adult ratio. Adult's preservice qualifications were coded with the following categories: high school or less (up to ISCED 3), intermediate vocational (up to ISCED 5), bachelor (ISCED 6) or master's degree (ISCED 7), and were reported by the participants through a questionnaire. Classroom-level child-adult ratio refers to the child-adult ratio as reported by the lead teacher, referring to how many children attended a specific classroom, and how many adults were responsible for that same classroom.

Data Analysis

A series of models were estimated to examine levels of teacher-child interaction quality across four types of activity (i.e., emergent academics, free play, creative activities, and meals), and investigate its

associations with activity features. To address nesting of activities within classrooms, two-level models were estimated. Level one (activity level) represented differences across activities; level two (classroom level) represented differences across classrooms. Table 4 presents variance components at the activity and classroom levels. As shown, for both CLASS domains, a large proportion of variance in teacher-child interaction quality was due to differences across activities in all countries (42.9% − 98%).

To address our first aim and examine whether there were differences in teacher-child interaction quality across activities, type of activity (i.e., emergent academics, free play, arts-related activities, and meals) was entered at level one (activity level) into the models. Type of activity was dummy-coded, so that the effect of each type of activity was contrasted with a reference activity, specifically emergent academic activities. The decision of using emergent academic activities as the reference activity was based on the literature (Van Laere & Vandenbroeck, 2018) and current discussions about whether an early focus on academic content was associated with overall levels of interaction quality. Thus, in the models, interaction quality in emergent academic was contrasted with levels of quality in the other three types of activities. At level two (classroom level), teacher qualification, years of experience, and child-adult ratio were entered as covariates. The models investigated whether CLASS Emotional and Educational support were higher in free play (H1a) and lower in meals (H1b), compared to emergent academic.

After examining the differences across activities, to address our second main aim – examining the associations between variations of teacher-child interaction quality and activity settings – a series of models were estimated to examine whether higher levels of active facilitation (H2), less use of whole group (H3), and greater child engagement with materials (H4) were associated with higher levels of CLASS Emotional and Educational support. The three predictors (i.e., percentage of time of teacher's active facilitation, whole group vs. other, and the percentage of time in which at least 50% of children were manipulating materials) were entered simultaneously into the models (activity level), to take into account the interrelations among predictors and disentangling their unique associations with teacher-child interaction quality. To examine whether these specific activity settings could explain differences across activities (H5), the Sobel's (1982) test was used. Specifically, for each activity setting with a statistically significant effect on teacher-child interaction quality, a Sobel test was computed to test whether the strength of the association between type of activity and teacher-child interaction quality decreased as a function of that particular activity setting, thus examining if differences in interaction quality across activities could be explained by any of these activity settings. Following recommendations and prior research on interaction quality (cf. McCartney & Rosenthal, 2000; National Institute of Child Health and Human Development Early Child Care Research Network [NICHD EECRN], 2002; Vandell et al., 2010), we estimated effect sizes by multiplying the unstandardized coefficient by the standard deviation of the predictor and dividing by the

Table 4. Variance Decomposition of the CLASS Domains.

	Emotional Support			Educational Support		
	Estimate	SE	%	Estimate	SE	%
Netherlands						
Level 1: Activity	.35*	.05	62.5%	.49*	.08	66.9%
Level 2: Classroom	.21*	.08	37.5%	.24*	.10	33.1%
Finland						
Level 1: Activity	.66*	.09	95%	1.31*	.16	98%
Level 2: Classroom	.03	.05	5%	.01	.13	2%
Portugal						
Level 1: Activity	.55*	.08	42.9%	.78*	.12	62.5%
Level 2: Classroom	.73*	.22	57.1%	.47	.17	37.5%
Poland						
Level 1: Activity	.43*	.07	68.7%	.60*	.09	73.1%
Level 2: Classroom	.20*	.08	31.3%	.22*	.10	26.9%

Note: *$p < .05$.

standard deviation of process quality (see NICHD ECCRN & Duncan, 2003, for details). This effect size indicates the change in process quality in standard deviation units with an increase of one standard deviation in the predictor.

Almost all classrooms (97%) had data for the four activities. For the 512 activities, complete data were available for CLASS domains and type of activity. Adult facilitation, social grouping, and children's engagement with materials had less than 5% of missing data. Missing data were handled using full information maximum likelihood estimation (FIML) to prevent sample size reduction and subsequent loss of statistical power (Enders, 2001). FIML estimates model parameters and standard errors directly from all available data, including cases with incomplete data, and without imputing missing values (Buhi et al., 2008). FIML parameter estimates are advantageous in comparison with traditional techniques, such as listwise and pairwise deletion and mean substitution, as they provide less biased estimates (Baraldi & Enders, 2010; Enders, 2001).

Results

Descriptive Results

Table 5 shows the descriptive statistics including means, standard deviations, and frequencies for study variables. Across activities, levels of CLASS domain Emotional Support were in the mid- to high-range, whereas the levels of CLASS Educational Support were in the low- to mid- range. In all countries, the levels of adult active facilitation were moderate to high in emergent academics (48.5%-86%), play (50%-70%), and arts-related activities (56%-78%), but low to moderate during meals (37%-67%), with important variations across countries. Portuguese classrooms presented moderate percentages of active facilitation. In Dutch classrooms, active facilitation was particularly

Table 5. Descriptive Statistics According to Activity Type.

Variables per country	Emergent Academic		Free Play		Arts-related		Meals	
	M	SD	M	SD	M	SD	M	SD
				Netherlands				
Emotional Support	5.1	0.7	5.2	0.7	4.7	0.9	4.8	0.6
Educational Support	4.1	0.8	3.5	0.9	3.3	0.8	3.3	0.8
Child-adult ratio	5.2	2.5	5.1	2.3	4.5	2.2	5.7	2.8
Adult facilitation (%)	76.6	18.7	70.1	28.9	72.3	20.5	66.5	21.5
Whole group (%)	64.0		23.0		24.0		78.0	
Engagement with materials (%)	26.9	36.3	89.9	24.2	80.9	26.4	62.8	23.0
				Finland				
Emotional Support	6.0	0.6	5.8	0.8	5.5	0.8	4.9	0.7
Educational Support	4.1	0.8	3.8	1.1	3.1	1.0	2.3	0.8
Child-adult ratio	4.0	1.9	4.0	2.0	3.8	2.3	3.3	1.1
Adult facilitation (%)	85.7	12.8	66.9	28.0	79.5	18.6	34.8	21.7
Whole group (%)	31.0		26.0		23.0		92.0	
Engagement with materials (%)	31.6	35.3	90.1	19.1	50.9	43.1	97.5	6.5
				Portugal				
Emotional Support	4.3	1.0	4.9	1.1	4.6	1.2	4.1	1.0
Educational Support	3.4	0.9	3.3	1.1	3.4	1.2	2.4	0.9
Child-adult ratio	6.2	3.1	6.3	3.6	4.8	2.2	5.8	2.3
Adult facilitation (%)	48.5	29.5	50.5	29.3	55.8	33.5	41.2	29.7
Whole group (%)	81.0		0.0		35.0		87.0	
Engagement with materials (%)	30.2	41.2	99.1	4.2	61.2	37.3	87.2	18.0
				Poland				
Emotional Support	5.1	0.9	5.9	0.6	5.7	0.7	5.4	0.8
Educational Support	3.1	0.8	2.8	0.8	3.0	1.1	2.5	0.8
Child-adult ratio	5.3	2.1	5.5	1.8	4.9	1.5	5.1	1.1
Adult facilitation (%)	79.2	28.7	66.6	29.7	68.3	32.2	48.6	23.0
Whole group (%)	67.0		30.0		59.0		97.0	
Engagement with materials (%)	52.9	41.4	97.4	6.7	88.1	24.3	92.5	9.2

Note. Emotional support and Educational support are coded on a scale of 1 (low quality) to 7 (high quality).

Table 6. Correlations among Variables.

Variables	1.	2.	3.	4.	5.	6.	7.
				Netherlands			
1. Emotional Support	1						
2. Educational Support	.55**	1					
3. Adult facilitation	.20*	.33**	1				
4. Whole group	−.10	.09	−.23*	1			
5. Engagement with materials	.00	−.21*	−.05	−.42**	1		
6. Lead teacher qualifications	.11	.23*	−.03	.06	−.07	1	
7. Lead teacher experience	−.03	.09	−.03	.01	.01	−.34**	1
8. Child-adult ratio	−.16	.00	.04	.12	−.01	.05	.05
				Finland			
1. Emotional Support	1						
2. Educational Support	.71**	1					
3. Adult facilitation	.61**	.64**	1				
4. Whole group[a]	−.30**	−.32**	−.40**	1			
5. Engagement with materials	−.22**	−.26**	−.43**	.03	1		
6. Lead teacher qualifications	.19*	.11	.10	.10	−.04	1	
7. Lead teacher experience	−.15	−.12	−.14	−.10	.04	.09	1
8. Child-adult ratio	.03	.03	−.07	−.10	−.04	−.06	−.24
				Portugal			
1. Emotional Support	1						
2. Educational Support	.75**	1					
3. Adult facilitation	.53**	.59**	1				
4. Whole group[a]	−.40**	−.21*	−.14	1			
5. Engagement with materials	.23*	−.04	.03	−.38**	1		
6. Lead teacher qualifications	−.21*	−.19*	−.06	−.06	−.12	1	
7. Lead teacher experience	−.01	−.05	.02	.10	.05	−.62**	1
8. Child-adult ratio	−.38*	−.31*	−.14	.07	−.05	−.21	.36*
				Poland			
1. Emotional Support	1						
2. Educational Support	.31**	1					
3. Adult facilitation	.20*	.52**	1				
4. Whole group[a]	−.23*	−.15	−.20*	1			
5. Engagement with materials	.46**	−.14	−.11	−.22*	1		
6. Lead teacher qualifications	.20*	−.10	−.12	−.13	.16	1	
7. Lead teacher experience	−.14	−.01	−.10	.14	−.08	−.61**	1
8. Child-adult ratio	.12	−.01	.13	−.07	.17	37*	−.37*

Note. [a] Whole group (= 1) vs. other (small, pairs, or free) (= 0).
*p < .05.

high for meals. Play activities were generally organized in small groups, pairs or allowing children to freely move in the room (70%-100%), whereas meals tended to be organized in whole group (78%-97%). Emergent academic activities were also mainly organized in whole group (60%-81%), except in Finnish classrooms (31%). The percentage of time most children were using materials was high in free play (89%-99%) and in arts-related activities (50%-88%), but low in emergent academics (30%-53%).

The correlations among variables are presented in Table 6. As expected, teacher-child interaction quality domains were moderately to highly correlated with one another. Higher levels of adult facilitation were associated with higher levels of teacher-child interaction quality in both domains in all countries. The levels of Emotional Support were lower in whole group activities in Finnish, Portuguese, and Polish classrooms. In addition, the levels of Educational Support were lower in whole group activities in Finnish and Portuguese classrooms. In Portuguese and Polish classrooms, as more children engaged with materials, the higher the emotional support, whereas in Finnish classrooms, the opposite pattern was found.

Table 7. Summary of the Two-Level Models Predicting Emotional Support.

Two-Level Models	Netherlands B (SE)	ES	Finland B (SE)	ES	Portugal B (SE)	ES	Poland B (SE)	ES
Within-level (activity)			Model 1					
Emergent academic vs.								
Play	.08 (.11)	.06	−.16 (.09)	.15	.52* (.11)	.33	.58* (.09)	.33
Arts-related	−.24* (.11)	.18	−.23* (.09)	.22	.22 (.12)	.14	.44* (.09)	.24
Meal	−.22* (.11)	.17	−.63* (.08)	.59	−.03 (.12)	.02	.25* (.10)	.15
Within-level (activity)			Model 2					
Emergent academic vs.								
Play	.07 (.14)	.06	−.04 (.10)	.04	.13 (.15)	.09	.41* (.11)	.33
Arts-related	−.24 (.13)	.19	−.21* (.08)	.20	.02 (.12)	.01	.29* (.10)	.24
Meal	−.19 (.13)	.15	−.23 (.14)	.22	−.13 (.13)	.09	.19 (.12)	.15
Adult facilitation	.32* (.10)	.24	.54* (.09)	.49	.42* (.09)	.30	.29* (.09)	.23
Whole group vs. other	.05 (.13)	.04	−.02 (.09)	.02	−.27* (.13)	.19	−.02 (.10)	.02
Engagement with materials	.09 (.14)	.10	.04 (.10)	.05	.14 (.14)	.10	.33* (.10)	.26
Between-level (classroom)[a]								
Teacher qualifications	.21 (.22)	.14	.42 (.32)	.10	−.75* (.30)	.23	.27 (.25)	.20
Teacher experience	.05 (.23)	.04	−.33 (.34)	.08	−.43 (.34)	.13	−.04 (.26)	.03
Child-adult ratio	−.29 (.20)	.22	.23 (.34)	.05	−.07 (.29)	.05	.08 (.22)	.03

*Note.*ES = Effect size.
[a]Because the between-level coefficients for the covariates did not vary substantially across the models, they are only presented once (last model).
*p < .05.

Table 8. Summary of the Two-Level Models predicting Educational Support.

Two-Level Models	Netherlands B (SE)	ES	Finland B (SE)	ES	Portugal B (SE)	ES	Poland B (SE)	ES
Within-level (activity)			Model 1					
Emergent academic vs.								
Play	−.44* (.10)	.36	−.09 (.09)	.09	.02 (.12)	.01	−.16 (.11)	.13
Arts-related	−.55* (.09)	.44	−.29* (.08)	.29	.07 (.12)	.05	−.04 (.11)	.03
Meal	−.55* (.09)	.44	−.67* (.07)	.66	−.43* (.12)	.35	−.35* (.10)	.30
Within-level (activity)			Model 2					
Emergent academic vs.								
Play	−.38* (.12)	.31	.00 (.10)	.00	−.16 (.14)	.13	−.03 (.12)	.02
Arts-related	−.49* (.12)	.40	−.29* (.08)	.29	−.04 (.11)	.04	.07 (.11)	.06
Meal	−.53* (.11)	.44	−.38 (.14)	.37	−.52* (.13)	.43	−.04 (.13)	.03
Adult facilitation	.32* (.09)	.26	.45* (.10)	.43	.55* (.08)	.46	.45* (.09)	.40
Whole group vs. other	.18 (.11)	.14	.03 (.09)	.00	−.01 (.13)	.00	−.12 (.10)	.11
Engagement with materials	.07 (.12)	.04	.01 (.09)	.00	.13 (.13)	.00	−.13 (.11)	.10
Between-level (classroom)[a]								
Teacher qualifications	.51* (.19)	.32	.49 (.58)	.06	−.61* (.33)	.23	−.32 (.28)	.04
Teacher experience	.32 (.20)	.22	−.76 (.76)	.05	−.63 (.35)	.20	−.19 (.28)	.01
Child-adult ratio	.09 (.20)	.02	.09 (.44)	.05	−.08 (.31)	.03	−.04 (.24)	.03

Note. ES = Effect size.
[a]Because the between-level coefficients for the covariates did not vary substantially across these models, they are only presented once.
*p < .05.

Variations in Teacher-Child Interaction Quality in Four European Countries

To examine differences in teacher-child interaction quality across the four activities, a series of multilevel models were performed. The summary of the results is displayed in Tables 7 and 8, for Emotional and Educational Support, respectively. The models examined differences in interaction quality across activities, controlling for classroom-level preservice qualifications, years of experience, and child-adult ratio. In response to first research aim and H1, the results revealed that, overall, levels of Emotional Support varied across activities, showing differences in teacher-child interaction quality across activities. In regard to differences between free play and emergent academic, results further

showcased, in Portuguese and Polish classrooms, higher quality in free play compared to emergent academics, with effects of moderate size (see Table 7). In contrast, no differences were found in Dutch and Finnish classrooms between emergent academic activities and free play.

Regarding differences in interaction quality between emergent academic and meals, in Dutch and Finnish classrooms, Emotional Support was lower in meals compared to emergent academic activities, but in Polish classrooms, the opposite pattern was found. In addition, differences in Emotional Support between emergent academic and arts-related activities also varied by country. In Dutch and Finnish classrooms, teachers demonstrated higher levels of Emotional Support in emergent academic activities compared to arts-related activities, whereas in Polish classrooms, the levels of Emotional Support in emergent academic activities were lower compared to all activities (see Table 7).

For Educational Support, no differences were found between emergent academic activities and free play, except for Dutch classrooms, in which teachers were observed to demonstrate higher, not lower, levels of educational quality in emergent academics than in free play (see Table 8). Regarding differences between emergent academic and meals, findings further revealed that, in all countries, levels of Educational Support were higher in emergent academic activities compared to meals. Effects were moderate to strong. Additionally, in Dutch and Finnish classrooms, educational quality was higher in emergent academics compared to arts-related activities.

Associations Between Activity Settings and Teacher-Child Interaction in Four European Countries

In the second model, levels of adult facilitation, social grouping, and children's engagement with materials were added to respond to the second aim of the current study of examining the unique associations of each activity setting and process quality. In all countries, a positive association was found between adult facilitation and Emotional Support (see Table 7). As teachers spent more time actively facilitating the activity, the higher the levels of emotionally supportive interactions. Effects were small to moderate. Few associations were found for social grouping and children's engagement with materials. In one exception, in Portuguese classrooms, the levels of Emotional Support were lower in whole group activities. Regarding children's use of materials, in Polish classrooms, more children engaging with materials was associated with higher levels of Emotional Support.

Similar to the results for Emotional and Behavioral Support, adult facilitation was positively and moderately related to Educational Support in all countries (see Table 8). The other two activity settings, social grouping and engagement with materials, were not associated with Educational Support in any country.

Regarding classroom-level covariates, few associations were found between the covariates and levels of Emotional or Educational Support. In Portuguese classrooms, surprisingly, a negative association was found between lead teacher's qualifications and both dimensions of interaction quality, although the effects were modest. In the Netherlands, preservice qualifications were positively associated with Educational Support. No other associations were found.

Explaining Differences in Teacher-Child Interaction Quality in Four European Countries

Lastly, we examined whether activity settings could explain differences in interaction quality across activities (H5). Results from the Sobel's Test revealed that adult facilitation partially explained differences between emergent academic activities and meals in both Emotional and Educational Support in Finnish classrooms, respectively, $z = -4.26$, $p < .001$ and $z = -3.94$, $p < .001$, and in Polish classrooms, $z = -2.62$, $p = .009$ and $z = -3.23$, $p = .001$. This means that interaction quality scores were different across both activities due to variations in time spent facilitating the activity. An additional finding related to social grouping in Portuguese classrooms, $z = 2.00$, $p = .045$, suggested that differences between emergent academics and free play could be partially explained by teachers' more frequent use of whole group during emergent academic activities.

Discussion

This study aimed to examine whether teacher-child interaction quality differed as a function of the type of activity across common activities in toddler classrooms in four countries. It further examined whether interaction quality was associated with specific activity settings, namely levels of adult active facilitation, use of whole group, and children's engagement with materials, and whether these features could explain quality differences across activities. Findings indicated that there were important variations across activities in all countries, suggesting that the quality of teacher-child interactions varied with the changing circumstances of the classroom. Furthermore, particular activity settings partially explained differences in interaction quality across activities, although patterns varied by country.

Variations in Teacher-Child Interaction Quality in Four European Countries

Overall, there was substantial variation in teacher-child interactions across children's daily activities, confirming H1 and suggesting that different types of activities set different conditions for high-quality interactions. Past research in preschool has indicated that the quality of teacher-child interactions is variable across activities (Booren et al., 2012; Cabell et al., 2013; Fuligni et al., 2012). Findings from this study add to this body of research by showing that the quality of teacher-child interaction also varies by type of activity in toddler classrooms. It seems that different classroom activities provide various opportunities for teacher-child interactions that shape teachers' responsiveness, sensitiveness, and attention to stimulating interactions. Our findings thus further support the notion that consideration of different activities across the day can result in a more nuanced understanding of interaction quality in ECEC (Fuligni et al., 2012; Thorpe et al., 2020).

Variations Across Emergent Academics and Free Play Activities

Current debates in ECEC have raised the concern that a strong focus on emergent academic activities may limit children's opportunities to engage in developmentally appropriate learning experiences, as teachers may be more directive and less responsive to children's interests and initiatives (e.g., Van Laere & Vandenbroeck, 2018). Our findings partially supported this concern, by showing that emotional support was lower in emergent academic activities compared to free play in Portugal and in Poland, but not in Finland or the Netherlands. Thus, hypothesis H1a was only partially supported.

Possible explanations for variations across countries may be due to country ECEC systems and general levels of support afforded to teachers to develop age-appropriate interactions. First, Finland stood out as showing little variation across classrooms in regard to interaction quality. It may be that the existence of a binding curriculum, developed through a thorough and shared process with the active involvement of teachers, contributed to a shared pedagogical understanding toward organizing ECEC and the interactions within it. Indeed, according to a recent evaluation by the Finnish National Education Evaluation Centre (Repo et al., 2020), teachers usually follow a holistic approach to learning and teaching in ECEC, through which emergent academic activities are implemented through play-based pedagogy, without formal instruction or teacher-directed teaching. It is therefore possible that the shared agreement among professionals, based on clear curriculum guidelines, provides support for interaction patterns during emergent academic activities similar to the ones found during free play, through which teachers stay close to children, showing interest and engaging with them, according to their needs and demands. In the Netherlands, where we also found similar levels of Emotional Support across emergent academic and free play activities, recent investments towards strengthening the educational role of ECEC (Slot, 2018; Wysłowska & Slot, 2020) may have contributed for teachers to approach emergent academic contents while being sensitive and responsive to children and integrating their interests into the activities. In Dutch classrooms, there has been a growing

recognition of the importance of providing emergent academic activities to support children's overall development and school readiness, particularly in an attempt to support the development of children from socially disadvantaged backgrounds (Slot, 2018). The growing emphasis on emergent academics may have contributed to develop age-appropriate emergent academic activities.

In contrast, in Portugal and in Poland, emotional support was of lower quality in emergent academics compared to free play. It appears that, in these countries, during emergent academic activities, teachers were not as warm, responsive, or supportive of positive social interactions. Portuguese ECEC teachers' preservice training has been criticized for its stronger focus on pre-school-aged children rather than on infants or toddlers, contributing for teachers' difficulties in working with this early age group (Araújo, 2017). In Poland, the educational role of teachers in toddler classrooms is considerably new (Wysłowska & Slot, 2020). Relatedly, it has been found that Polish caregivers consider educational goals of less importance in comparison to social, emotional, physical, and personal goals (Wysłowska, 2017). Polish teachers value emotional and social goals and may underestimate the educational aspect of the ECEC provision (Wysłowska & Slot, 2020). Prior research has suggested that teachers' lack of recognition of the importance of learning and cognitive development with infants and toddlers influenced how they planned activities and inter-acted with children (Brownlee et al., 2009). Moreover, provision of emergent academic activities has not been a primary concern of Polish training programs; hence, teachers may not be prepared to organize such activities. Both Portuguese and Polish initial training programs, which entitle professionals to work in toddler centers, appear to rarely focus on the develop-mental needs of children within this age range (Araújo, 2017; Wysłowska & Slot, 2020). The lack of curriculum guidelines, low awareness of professionals' regarding the importance of educa-tional goals in toddler settings, and insufficient training of professionals can translate in less clear pedagogical guidelines to develop emergent academic activities in age-appropriate ways and through emotionally supportive interactions (Wysłowska & Slot, 2020). In sum, our mixed findings may be attributed to country differences associated with curriculum guidelines for 0–3 and preservice training focusing on 0–3, among other factors.

Importantly, regarding educational quality, in Finnish, Portuguese, and Polish classrooms, there were no differences in the extent to which free play and emergent activities allowed children to engage in cognitively and linguistically stimulating interactions. These results can contribute to discussions on the teachers' role during free play activities. Our findings are in agreement with researchers arguing that teachers can take an active role in order to enrich children's play, through supportive and responsive interactions (Kontos, 1999; Pramling Samuelsson & Johansson, 2006). Our results suggest that, in all countries, teachers were mainly actively involved in free play, facilitating toddler's play. Teachers commonly joined children's play, with free play activities also presenting good opportunities for facilitating and extending learning and supporting cognitive and linguistic development. Our findings are in contrast with some findings from preschool in China and in the USA suggesting that teacher-directed activities such as emergent academics provided more opportunities than free play for teachers to use rich vocabulary, ask open-ended questions, and be linguistically responsive to children (Cabell et al., 2013; Chien et al., 2010; Hu et al., 2016). Overall, our findings highlight that free play may foster many opportunities for stimulating interactions and conversational exchanges, supporting constructivist pedagogical positions that pinpoint how influential an adult can be through active scaffolding and rich interactions in both play and emergent academic activities (Goble & Pianta, 2017; Mashburn et al., 2008).

Variations Across Emergent Academics and Meals

Our findings further showed that overall, and as expected (H1b), the emotional and educational quality of teacher-child interactions during meals were lower than in emergent academic activities. Past research has shown that routines consistently show lower levels of teacher sensitivity and cognitive stimulation than other activities, despite the innumerous calls for individualizing care and

fostering learning opportunities within routines (Bussey & Hill, 2017; Dalli et al., 2011; Degotardi, 2010; Norris & Horm, 2015; Thorpe et al., 2020). Our findings are consistent with prior evidence and suggest that routines may be especially difficult moments for teachers to establish warm and cognitively challenging interactions with children. It also may be that teachers do not see meals as powerful moments for sensitive interactions with children (Norris & Horm, 2015), missing opportunities for interacting closely and individually with children.

Variations Across Emergent Academics and Arts-Related Activities

Findings also provided some insights regarding differences between emergent academic and arts-related activities. These differences, however, varied by country. In the Netherlands and in Finland, both emotional and educational support were lower in arts-related activities in comparison to emergent academic activities. In contrast, in Poland, emotional support was higher in arts-related activities compared to emergent academics and, in Portugal, there were no differences in quality levels. Several possible explanations have been already provided, namely the stronger focus on emergent academics in the Netherlands and the opposite focus in Poland. Regarding Finland, findings from the recent evaluation by the Finnish National Education Evaluation Centre (Repo et al., 2020) revealed that, according to ECEC staff self-reports, there were shortcomings in implementing the contents of art education and expression along the goals determined in the National Core Curriculum, particularly in groups below three years old. Based on our results, arts activities in Finnish classrooms were observed to be less intentional, with less awareness of children's expressions, ideas, and autonomy, whereas emergent academic activities were more intentional in terms of teachers' active facilitation, materials, language prompts, and feedback. Results for arts-related processes in Finnish classrooms may suggest that the general phrasing of the goals in the curriculum document may not provide sufficient specific support for the staff in implementing pedagogy in arts-related practice (see also Repo et al., 2020).

Activity Settings and Teacher-Child Interaction Quality in Four European Countries

In this study, we also aimed to understand differences in interaction quality across activities by examining features of the activity that could explain such differences. Three activity settings were investigated, namely levels of active facilitation, social grouping, and children's engagement with materials. Findings showed that active facilitation was positively related to both emotional support and educational quality in all countries, thus confirming our expectations (H2). This finding is not surprising, as active facilitation is well aligned with underlying conceptual perspectives of the CLASS (La Paro et al., 2012). Nevertheless, our findings are consistent with views that overall levels of active involvement may be a starting point for teachers to develop more responsive and stimulating interactions (Goble & Pianta, 2017). When teachers engage consistently and frequently with children, they may be more available to genuinely listen, appreciate, and understand the child, accessing valuable information on the needs and interests of children, which can help them develop interactions that are relevant and meaningful. Findings from this study are aligned with results from studies conducted in preschool, in which higher levels of adult involvement were related to higher levels of process quality (Goble & Pianta, 2017; Singer et al., 2014; Tonyan & Howes, 2003). In addition, levels of adult facilitation explained differences across activities, particularly regarding differences between emergent academic activities and meals. Our findings showed that teachers spent less time in active facilitation during meals, possibly reflecting teachers' focus on managerial tasks, such as serving food, cleaning, and aiding children in eating, with less attention devoted to developing respectful, reciprocal, and responsive interactions. Thus, increasing the amount of time on active facilitation could be a means to improve interaction quality in meals.

Regarding group arrangement and children's engagement with materials, we found limited support for their associations with interaction quality. Therefore, H3 and H4 were mostly not supported.

Empirical evidence for group arrangements in preschool has been equally mixed, with some studies supporting the use of small group (e.g., Bratsch-Hines et al., 2019), and others finding the opposite (Ansari & Purtell, 2017; Cabell et al., 2013). Nevertheless, it is worth noting that in the Portuguese context, whole groups provided less opportunities for teachers to be responsive to children's interests and needs. Further, in Portuguese classrooms, group arrangement partially accounted for differences across activities. In contrast to free play, emergent academic activities tended to be organized in whole group, which is aligned with research in Portuguese preschool classrooms showing that teachers tend to organize academic activities in whole group, with detrimental effects on child engagement (Coelho et al., 2019). It seems that conducting the activity in whole group limited teachers' opportunities to be more responsive and attentive, or to consider children's ideas and interests. Small group can therefore be a relevant strategy in Portuguese classrooms to help teachers develop more emotionally supportive interactions. Regarding children's engagement with materials, although there have been several theoretical stances about their importance for child engagement, few studies have examined its associations with process quality. Findings from our study showed that children's engagement with materials was associated with emotional support only in the Polish classrooms. Overall, these findings partially confirmed H5, suggesting that the activity settings examined here may be important for particular cultural contexts, under a specific set of circumstances, possibly reflecting the interrelatedness of structural features at multiple levels.

Structural Features and Teacher-Child Interaction Quality in Four European Countries

Lastly, although it was not the main focus of the study, we found country-specific patterns on the associations between structural features and teacher-child interaction quality. Specifically, in the Netherlands, teacher qualifications were positively associated with educational quality, which is in line with prior studies (e.g., Manning et al., 2019). In contrast, in Portugal, and surprisingly, qualifications were negatively associated with emotional and behavioral support. These findings, however, must be interpreted with caution. First, in Portuguese classrooms, all teachers were highly educated and had a bachelor or a master's degree. Thus, differences were observed between these two levels of qualification. Second, Portuguese teacher qualifications and experience were negatively associated, meaning that highly qualified teachers had less experience and possibly had conducted their preservice training more recently. Indeed, it is now required a master's degree to become an ECEC teacher, but recent changes in ECEC preservice training, represented by the post-Bologna model, have accentuated a disciplinary logic, with a reduction in the induction period and little attention to holistic approaches for children under 3 years of age (Araújo, 2017). Although speculative, it is possible that teachers are less well prepared to follow holistic, integrated pedagogical approaches in this age group and to develop emotionally supportive interactions with all children. Nevertheless, the few associations found between common structural features and process quality were modest, which is aligned with prior research (e.g., Barros et al., 2016; Manning et al., 2019; Slot et al., 2015). Overall, our study highlights, on one hand, the need to consider country regulations and particularities and, on the other hand, the importance of examining more carefully the content of preservice training that ECEC teachers are currently receiving, regardless of the qualification levels.

Limitations and Implications

This study had several limitations. First, although similar to other prior studies (e.g., Thomason & La Paro, 2009), sample sizes were relatively small, and classrooms were not randomly selected, which limits the generalizability of findings. Relatedly, confirmatory factor analyses and measurement invariance were conducted with a small sample size; larger samples would be needed to check the robustness of our findings. Questions about validity raise issues to be addressed in future research, including determining predictive validity. Second, associations were based on correlational data, preventing inferences regarding causation. Third, the study followed a cross-sectional design.

Relatedly, each activity was only videotaped once. More frequent observations throughout the year would have provided a more representative picture of the daily activities and have strengthened our conclusions. Moreover, other moments and group routines, such as naptime or transitions, were not observed, but they can represent important indicators of quality. Future research should include a broader range of activities to extend the present study findings. An additional limitation is that classroom schedules were not controlled for in the analyses. Although the four types of activities observed in this study were common and occurred daily, prior research has shown that the first moments of the day can be particularly important for subsequent interactions (Curby et al., 2010). Finally, this study was a first attempt to examine systematically three activity settings, but other features (e.g., space arrangements) can represent important sources of quality variation as well.

Despite these issues, this study has some important implications. First, findings suggest that analyzing types of activities and activity settings can provide additional information about classroom experiences that is not captured by widely used measures of process quality. Therefore, it is possible that global measures of process quality miss information relevant to children's experiences in ECEC classrooms. Recent studies in preschool (e.g., Thorpe et al., 2020) challenge assumptions that underpin dominant standard assessments of ECE process quality. Findings from this study add to prior research by showing that CLASS scores in toddler classrooms seem conditional on the content and format of the activity during which the observation was made. As such, comparing CLASS scores between classrooms may be highly unreliable if activities differ (Thorpe et al., 2020). Therefore, it can be relevant to extend process quality assessment to incorporate more dynamic aspects of children's microsystems, such as within-day variations.

Moreover, findings can add some insights into why modest associations between process-type measures and child outcomes are usually found in the literature (Burchinal, 2018). There have been recent calls to increase the precision of quality assessment (Burchinal, 2018), and greater attention to activity types and settings may be a means to enhance comparability. For instance, it has been recently suggested (Thorpe et al., 2020) that standardization of format and content of an observation may present a more reliable method of assessment. More systematic attention to the types of activities observed can add valuable data to inform discussions about mixed findings in the field.

Lastly, this study can contribute to ongoing debates over the importance of teacher-led and child-led activities, suggesting that, as it has been recently argued (Goble & Pianta, 2017), the debate could shift from an "either or" position to focus on how teachers can take advantage of the many opportunities offered by different types of activities to engage with children positively. Our findings suggest that emergent academics, free play, meals, or arts-related activities can be conducted meaningfully, and teachers, with adequate support, can perhaps build on the varying opportunities that different types of activities provide to develop meaningful, stimulating, and sensitive interactions.

Disclosure Statement

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