OECD Education Working Papers No. 176

Structural characteristics and process quality in early childhood education and care: A literature review

Pauline Slot

https://dx.doi.org/10.1787/edaf3793-en

OECD

Organisation for Economic Co-operation and Development

EDU/WKP(2018)12

Unclassified **English - Or. English**

12 July 2018

DIRECTORATE FOR EDUCATION AND SKILLS

Structural characteristics and process quality in early childhood education and care: A literature review

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Pauline Slot, Utrecht University

This working paper has been authorised by Andreas Schleicher, Director of the Directorate for Education and Skills, OECD.

Pauline Slot, Utrecht University, E-mail: P.L.Slot@uu.nl

JT03434513

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Acknowledgements

This paper was prepared by Dr. Pauline Slot, researcher at the department of Educational and Learning Science of Utrecht University, as an external consultant for the OECD Directorate for Education and Skills. Clara Barata, Arno Engel, and Victoria Liberatore, from the OECD team for Early Childhood Education and Care, provided comments and feedback on draft versions of this paper and helped guide the development of the research and publication. Coordination was initially provided by Éric Charbonnier. Many thanks to Mernie Graziotin for her valuable support in both editing and preparing the working paper. Administrative support was provided by Rachel Linden. The author is also grateful to members of the OECD Network on Early Childhood Education and Care who provided feedback on a draft version of this paper.

This document has been co-funded by the European Union. The opinions expressed and arguments employed herein do not necessarily reflect the official views of the European Union, OECD member countries or OECD Early Childhood Education and Care (ECEC) Network members. This work has also been produced with the financial support of the Jacobs Foundation Switzerland.

Information on the OECD's work on Early Childhood Education and Care is available at: http://www.oecd.org/education/school/earlychildhoodeducationandcare.htm.

Abstract

This literature review investigated relations between structural characteristics and process quality in centre and family daycare provisions for children from birth to age 5. Structural characteristics were examined at system, organisational, classroom, and staff levels. The strongest evidence concerned the positive relations between staff' pre-service and professional development and process quality. Smaller group sizes and child-staff ratios were also generally positively related to process quality. At the system level, quality rating and improvement systems appeared to be associated with higher process quality, although most systems lacked sensitivity in differentiating between fine-grained levels of quality. Evidence on relations at the organisational level was scarce. Furthermore, there was evidence of a complex interaction of structural features at different levels that jointly predicted process quality, but more research is warranted. Overall, most studies were focused on centre-based provisions for children aged 3 to 5, whereas less evidence was available for provisions for children aged 0 to 2 and family daycare.

Résumé

La présente étude documentaire porte sur les relations entre caractéristiques structurelles et qualité des processus en matière d'accueil des enfants dès la naissance jusqu'à 5 ans en centre et à domicile. Les caractéristiques structurelles ont été examinées aux niveaux du système, de l'organisation, des classes et du personnel. La constatation la mieux étayée est la corrélation positive entre formation initiale et continue du personnel et qualité des processus. De même, l'incidence de la taille des groupes et du taux d'encadrement sur la qualité des processus a été généralement établie. Au niveau du système, les systèmes d'évaluation et d'amélioration de la qualité semblent être associés à une meilleure qualité des processus, bien que la plupart des systèmes ne permettent pas d'établir une distinction suffisamment précise entre les différents niveaux de qualité. Peu de données sont disponibles au niveau organisationnel. En outre, plusieurs éléments ont permis de mettre en évidence une interaction complexe entre plusieurs caractéristiques structurelles à différents niveaux qui, ensemble, ont une incidence sur la qualité des processus, mais de nouvelles recherches sont nécessaires. Globalement, la plupart des études se sont concentrées sur l'accueil des enfants âgés de 3 à 5 ans en centre, alors que l'on dispose de données plus limitées concernant l'accueil des enfants âgés de 0 à 2 ans et l'accueil à domicile.

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List of abbreviations and acronyms

BA degree	Bachelor's degree
CARE	Curriculum and Quality Analysis and Impact Review of European Early Childhood Education and Care
CIS	Caregiver Interaction Scales
CLASS	Classroom Assessment Scoring System
EACEA	Education, Audio-visual and Culture Executive Agency
ECE	Early Childhood Education
ECEC	Early Childhood Education Centre
ECERS	Early Childhood Education Rating Scale
ELLCO	Early Literacy and Language Classroom Observation
ERS	Environmental Rating Scales
Eurydice	Education Information Network in Europe
EYFS	Early Years Foundation Stage
FCCERS-R	Family Child Care Environment Rating Scale - Revised
ITERS-R	Infant Toddler Environmental Rating Scale - Revised
NICHD	National Institute of Child Health and Human Development
OECD	Organisation for Economic Co-operation and Development
ORCE	Observational Record of the Caregiving Environment
PD	Professional development
Pre-K	Pre-kindergarten
QRIS	Quality Monitoring and Rating Improvement Systems
US	United States

1. Introduction

This literature review focuses on quality of early childhood education and care (ECEC) provision for children aged 0 to 5, with a distinction between younger (aged 0 to 2) and older children (aged 3 to 5) when appropriate and intends to cover the most common types of provisions in different countries, including: childcare, "crèches", kindergarten, nursery or preschool, integrated centre-based ECEC for the entire ECEC age group, and family daycare. The majority of research has been done in centre-based care for children aged 3 to 5 hence this will be reflected in the literature reviewed. However, the available evidence for younger children and family daycare provisions will be addressed explicitly, also to identify gaps in the current knowledge base. The main aim of the review is to provide a comprehensive overview of what is known in the (grey) literature concerning all aspects of quality in ECEC across the world in order to identify the important quality dimensions for children's well-being, development and learning.

ECEC quality is a multidimensional concept and broadly defined aims at promoting children's well-being and positive developmental outcomes (Layzer and Goodson, 2006[1]). A common distinction is made between structural characteristics, process quality and staff's beliefs (Howes et al., 2008[2]; NICHD Early Child Care Research Network, 2002[3]; Pianta et al., 2005[4]; Sylva et al., 2006[5]; Thomason and La Paro, 2009[6]). Structural quality entails the distal and regulable factors, such as child-staff ratios, group size and staff training/education (Abbott-Shim, Lambert and McCarty, 2000[7]; Burchinal et al., 2010[8]; Barros et al., 2016[9]; Howes et al., 2008[2]; NICHD Early Child Care Research Network, 2000[10]; Thomason and La Paro, 2009[6]). Structural quality is partly determined by legislation, policy and funding and are a major factor in the macroeconomic costs of ECEC. Process quality concerns the more proximal processes of children's everyday experiences and involves the social, emotional physical, and instructional aspects of staff-child and peer interactions while being involved in play, activities or routines (Anders, 2015[11]; Barros et al., 2016[9]; Ghazvini and Mullis, 2010[12]; Howes et al., 2008[2]; Pianta et al., 2005[4]; Slot, Lerkkanen and Leseman, 2015[13]).

Structural features are considered to be important preconditions for process quality, which in turn is most strongly related to child development, well-being and learning (Vandell et al., 2010[14]). In view of enhancing process quality the focus so far has been mostly on improving the structural quality aspects hence it is essential to gain a better understanding as to which structural features matter the most for process quality.

As will be extensively reviewed the scientific evidence concerning the relations between structural and process quality are somewhat mixed. There are several plausible reasons for this inconsistency in the literature. A first explanation concerns the (strong) statutory regulation within a given country that reduces the variance and thus, for statistical reasons, might result in weak or inconsistent relations (Love et al., 2003[15]). Another explanation relates to the limited set of structural features that are investigated. To date most studies have focused on the so-called iron triangle characteristics (i.e. child-staff

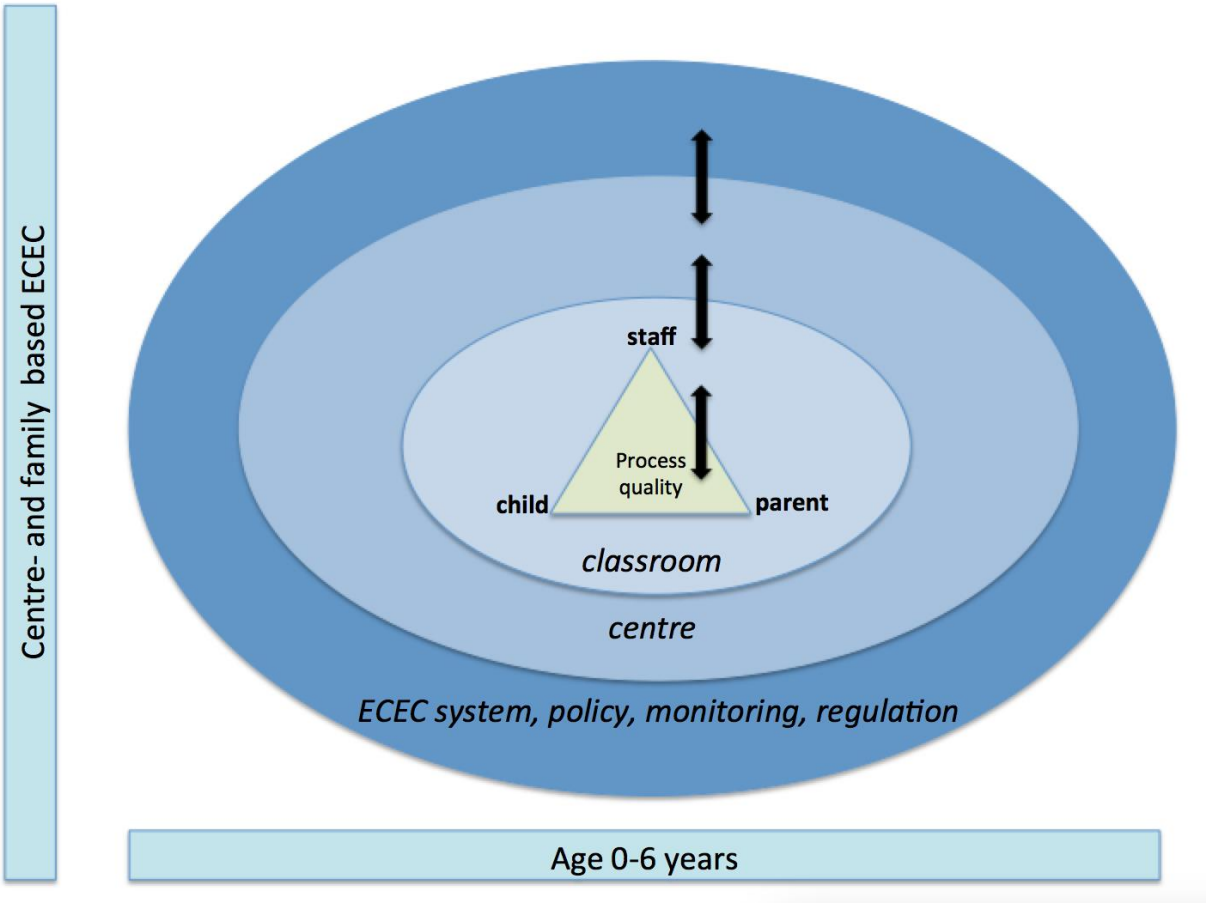
ratio, group size, and staff's pre-service qualifications) whereas other features might play an important role as well. Finally, the majority of studies have focused on relationships between single variables (e.g. the relation between group size and process quality), whereas reality is more complex (Slot, Lerkkanen and Leseman, 2015[13]). Children's experiences, development, well-being and learning are embedded within a system of classroom, staff, centre and system characteristics (see Figure 1.1).

All these features interact and jointly influence children's development, well-being and learning. The way children's experiences and interactions are shaped within the classroom are most likely affected by a combination of different characteristics represented at the different levels. Therefore to gain a better understanding of which factors contribute to process quality these different levels and the possible interactions between these levels need to be taken into account. The current literature review aims to provide a starting point in reviewing the literature from this dynamic systems perspective, by summarising the available evidence and pinpointing to gaps in our current knowledge base.

Figure 1.1 shows the conceptual model that will guide the literature review. The triangle in the middle depicts the core of process quality in ECEC and shows that this is an interaction between the child, staff and parents and their characteristics. Features of the staff, such as their educational qualifications, additional in-service training work and experience, may influence their practices, thus will be part of the review. The heart of these interactions lies in the classroom, which can have features that directly or indirectly affect children's experiences, such as the group size, child-staff ratios or the group composition. At a more distal level the classroom is part of a centre and some features such as leadership and organisational climate, can influence the staff' practices. Finally, the ECEC system, policy, monitoring, and regulation at the regional or national level provide the basic framework a centre and its staff operates in.

ECEC systems differ between countries concerning the age range and governing body responsible. About 50% of OECD countries have a unitary system for the age range 0 to 5 or sometimes until 8 years of age (Guerriero, 2017[16]), and in these countries the Ministry of Education is the responsible governing body. In countries with a split system, starting at age three, the Ministry of Education is usually responsible for the preschool provisions, whereas the Ministry of Social Affairs or the like is responsible for provisions for children aged 0 to 2 (Guerriero, 2017[16]; Slot, 2016[17]). In addition to that the level of centralisation differs between countries with some countries having a strong decentralised policy at the state level rather than the national level, such as the United States and Germany (Guerriero, 2017[16]). Moreover, countries adopt different policies in addressing educational inequalities with some countries applying targeted approaches, such as the United States and the Netherlands. Consequently, selection effects in the usage of provisions exists as well as differences in quality (Freitas, Shelton and Tudge, 2008[18]; Slot, Lerkkanen and Leseman, 2015[13]).

Figure 1.1. Conceptual model for the literature review



1.1. Contribution of the current literature review

The current literature review will include western and non-Western countries and incorporate a broad and comprehensive approach to ECEC quality.

First, it will focus on all types of ECEC provisions and whenever possible distinguishing between them. For instance, a distinction will be made based on the age of children (aged 0 to 2 and aged 3 to 5), and type of provision (including family daycare).

Second, the current review will explicitly pay attention to cross-national studies that have been conducted in the past two decades as these studies can provide more insights into how differences in national or regional ECEC contexts might play a role in structural and process quality. Cross-national research most likely increases the variation in structural characteristics that can be found as it is not confounded by national statutory regulations allowing for a better comparison of which features matter for process quality.

Third, the review will address two new approaches. As outlined above, structural characteristics are assumed to be indirectly related to child development, well-being and learning, illustrating a mediational mechanism operating through process quality. Although this is commonly accepted among scholars, there is hardly any empirical

evidence to support this notion (Melhuish et al., 2015[19]). The current review will address the few studies that have investigated this relationship (Connor et al., 2005[20]; NICHD Early Child Care Research Network, 2002[3]; Slot et al., in press[21]). Finally, to date, there are only a few studies that have investigated the complex interplay of different structural features in jointly influencing process quality. One cross-national study has investigated interaction effects and there are some studies that have investigated 'profiles' of quality that can contribute to our understanding of the complex mechanisms that might explain some of the inconsistent findings (Slot, Lerkkanen and Leseman, 2015[13]).

Although central to the project, the investigation of the relations between quality and child development, well-being and learning is not part of the current review, but rather part of the meta-analysis. Nevertheless, a section has been included summarising the documented indirect associations between structural quality and child development, well-being and learning, given its policy relevance.

2. Early childhood education and care quality across the world

ECEC quality varies between countries, which can be related to the their specific cultural characteristics history of the ECEC system, the policy context and regulations concerning quality and quality monitoring, and funding spent on ECEC and relatedly whether ECEC is a public or private provision (Lokteff and Piercy, 2012[22]). Countries organise their ECEC systems differently with some countries having a public sector that provides universal access from a certain age, such as the Nordic countries, whereas other countries have a private sector for daycare provisions (usually only for children aged 0 to 2) or a mix between the two.

A recently published meta-analysis compared process quality across the world focusing on ECEC for children from birth to 5 (Vermeer et al., 2016[23]). This meta-analysis included 72 studies from 23 countries that have used the observational tool the Environmental Rating Scales (ERS), such as the Infant Toddler Environmental Rating Scale (ITERS) or Early Childhood Education Rating Scale (ECERS), to assess process quality. The ERS scales are an example of comprehensive process quality measures including a wide range of features of the environmental quality, such as furnishing and materials, the provision of variety of activities (i.e. fine and gross motor, creative, language), aspects of the interactions and programme structure.

To date, these measures are the most common used observational instruments hence allowing for international comparison. The results show that, on average, the level of process quality as measured with the ERS scales is mediocre with a score of almost 4 on a 7-point rating scale. However, significant differences were found between countries across the world with Australia scoring the highest with almost a 5 and Bangladesh, the Netherlands Antilles, and South Korea scoring the lowest (i.e. below 3). Concerning geographic regions, quality was higher in North America than in Europe, South America, and Asia, but the variation was also larger in North America compared to Europe and Asia.

Another process quality measure that is being increasingly used across the world is the Classroom Assessment Scoring System (CLASS). This measure focuses exclusively on the quality of interactions between staff and the children and distinguishes between emotional support, classroom management and instructional support. Table 2.1 shows a comparison of ECEC quality in different countries and across different age ranges using the same (CLASS). Although it is not intended to provide an exhaustive overview, it reveals a consistent pattern of mid-to-high range scores for emotionally supportive classroom interactions and lower support for children's development and learning across all age ranges and provision.

Overall, the findings for the preschool age (using the Classroom Assessment Scoring System for preschool classrooms or CLASS Pre-K) show mid- to mid-high quality for Emotional support in all countries, with somewhat lower scores for Spain and Portugal and higher scores for Denmark and Finland. However, the variation within countries is substantial, ranging from a half to one scale point on the measure, and overall appears to

be roughly equal to or smaller than the variation between countries (as indicated by the Standard Deviation) For Classroom organisation the scores are lower than for Emotional support in most countries (except for one German study), but the difference is smallest in People's Republic of China, Denmark, Finland and the Netherlands and the largest in the United States, although again the variation within countries was substantial and comparable to the variation in Emotional support. Overall, the quality of Instructional support is in the low range for the majority of countries and only entered the mid-range in Finland, the Netherlands, and Portugal, but with considerable within-country variation.

Although the number of studies involving infant and toddler classrooms is limited, the results reveal a similar pattern as for the preschool age. Emotional process quality in infant and toddler classrooms is in the higher end of the mid-range, although the developmental stimulation is considerably lower and in the low to mid-range. For infants, the support for development and learning was the highest in the United States, whereas for toddlers this appeared to be the case in the Netherlands.

A recent study in the Netherlands in a small, but random sample of ECEC provisions for infants and toddlers reveals the same pattern. Emotional quality is in the high end of the mid-range, whereas support for children's development and leaning is in the low end of the mid-range (Slot et al., 2017c[24]).

Despite the fact that the studies reported in Table 2.1 show considerable variation in sample size and geographical spread in countries, and as such cannot necessarily be considered as representative for the quality in the particular country, the overall findings do indicate a global trend of higher emotional and behavioural support and lower quality of developmentally stimulating interactions. Moreover, the variation within countries appears to be as large as or larger than the variation between countries.

To summarise, there is evidence that process quality differs between countries, although the within-country variance also seems substantial. European countries appear to score (slightly) higher on process quality compared to the other regions, including the United States, but the scores for instructional support vary greatly within Europe. The following review aims to provide more insights in the explanatory factors of these differences.

Box 2.1 describes commonly used measures to evaluate process quality.

Box 2.1. Global quality measures

Environmental Rating Scales (ERS): these observational tools evaluate the overall quality in ECEC encompassing a wide range of quality aspects based on the following subscales: space and furnishing, personal care routines, language-reasoning, activities, interaction, programme structure, and parents and staff. Different versions have been developed for infant and toddler classrooms (ITERS-R; (Harms, Cryer and Clifford, 1990[25]), preschool classrooms (ECERS-R; (Harms, Clifford and Cryer, 1998[26]), family child care (FCCERS-R; (Harms, Cryer and Clifford, 2007[27]). In addition, an extension of the ECERS was developed by (Sylva, Siraj-Blatchford and Taggart, 2003[28]) (2003; ECERS-E) to capture aspects of the curriculum with a focus on literacy, math, science and diversity.

Quality of interactions

Caregiver Interaction Scales (CIS (Arnett, 1989[29]): this scale measures teacher's sensitivity, harshness, detachment and permissiveness in the interaction with children.

Classroom Assessment Scoring System (CLASS): this measure evaluates emotional, behavioural and instructional aspects of the teacher's interactions with children and the way the teacher fosters interactions with materials and peers. There are several different age versions available for infant classrooms (CLASS Infant; (Hamre et al., 2014[30]), for toddler classrooms (CLASS Toddler; (La Paro, Hamre and Pianta, 2012[31]), and for preschool classrooms (CLASS Pre-K; (Pianta, La Paro and Hamre, 2008[32]).

Observational Record of the Caregiving Environment (ORCE); (NICHD Early Child Care Research Network, 1996[33]): this instrument measures caregiver-child interactions, with a few items addressing language and cognition.

Early Literacy and Language Classroom Observation (ELLCO; (Smith, Dickinson and Sangeorge, 2002[34]): this measure focuses on classroom interactions, but also has a more domain-specific focus on emerging literacy activities.

Table 2.1. Comparative descriptive results from research using the Classroom Assessment Scoring System (CLASS).

Country	Reference	N	Sample	Age range	Domain	Mean	SD
Australia	(Tayler et al., 2013[35])	254	Two states	Preschool	Emotional support	5.13	.92
					Classroom organisation	4.60	.92
					Instructional support	2.07	.76
Belgium	(Hulpia et al., 2016[36])	167	Stratified random sample	Infant	Relational climate	5.11	.80
					Teacher sensitivity	4.86	1.02
					Facilitated exploration	3.33	1.14
					Early language support	2.97	1.22
		233	Stratified random sample	Toddler	Emotional and behavioural support	5.22	.84
					Engaged support for learning	2.66	.88
Chile	(Leyva et al., 2015[37])	91	At-risk, 4 municipalities in Santiago	Preschool	Emotional support	4.65	.54
					Classroom organisation	4.29	.63
					Instructional support	1.75	.55
China	(Hu et al., 2016b[38])	180	Stratified, random sample	Preschool	Emotional support	5.03	.69
					Classroom organisation	4.80	.81
					Instructional support	2.12	.61
Denmark	(Slot et al., in press[21]), under review	402	Purposive sample at-risk children	Preschool	Emotional support	5.85	.42
					Classroom organisation	5.69	.47
					Instructional support	2.45	.55
Germany	(Stuck, Kammermeyer and Roux, 2016[39])	61	One state	Preschool	Emotional support	5.88	.57
					Classroom organisation	6.15	.61
					Instructional support	1.61	.49
Germany	(von Suchodoletz et al., 2014[40])	63	One state	Preschool	Emotional support	5.32	.75
					Classroom organisation	4.82	1.02
					Instructional support	2.47	.78
Finland	(Pakarinen et al., 2010[41])	49	Semi-rural and urban sample	Preschool	Emotional support	5.54	.69
					Classroom organisation	5.34	.66
					Instructional support	3.97	.92
Netherlands	(Slot et al., 2017a[42])	269	Semi-rural and urban sample	Toddler	Emotional and behavioural support	5.37	1.02
					Engaged support for learning	3.29	1.28
Netherlands	(Veen and Leseman, 2015[43])	133	Semi-rural and urban sample	Preschool	Emotional support	5.34	.73
					Classroom organisation	5.03	.85
					Instructional support	3.27	.89
Poland	(Wyslowska and Slot, 2018[44])	30		Toddler	Emotional and behavioural support	5.79	.86
		30			Engaged support for learning	2.84	1.02
Portugal	(Barros et al., 2016[9])	90	Metropolitan area Porto	Infant	Relational climate	4.62	.76
					Teacher sensitivity	4.20	.88
					Facilitated exploration	2.58	.75
					Early language support	2.62	.76
	(Cadima, Leal and Burchinal, 2010[45])	64	Metropolitan area Porto	Preschool	Emotional support	4.60	.88
					Classroom organisation	4.11	.90
					Instructional support	3.04	1.13

Country	Reference	N	Sample	Age range	Domain	Mean	SD
Spain	(Sandstrom, 2012[46])	25	Random sample in one city	Preschool	Emotional support	4.79	.63
					Classroom organisation	4.32	.67
					Instructional support	2.16	.49
Switzerland	(Perren, Frei and Herrmann, 2016[47])	35	Different ECEC provisions	Toddler	Emotional and behavioural support	5.44	.76
					Engaged support for learning	3.23	1.07
United States	(Jamison et al., 2014[48])	30	One state	Infant	Relational climate	5.07	.98
					Teacher sensitivity	5.13	.93
					Facilitated exploration	4.02	1.08
					Early language support	3.89	1.02
	(La Paro, Wiliamson and Hatfield, 2014[49])	101	One state	Toddler	Emotional and behavioural support	4.82	.99
					Engaged support for learning	2.83	1.07
	(Hamre et al., 2013[50])	4035	Multi- state and mutli-sample	Preschool	Emotional support	5.23	.88
					Classroom organisation	4.66	.93
					Instructional support	2.58	.88

3. Early childhood education and care quality for children aged 3 to 5

The vast majority of research regarding structural and process quality concerns provisions for preschoolers. The review will address empirical relations between structural features and process quality at different levels, starting with the most distal level, the system or policy level, up to the most proximal level of the staff's characteristics directly affecting children's day-to-day experiences in the classroom.

3.1. Early childhood education and care for children aged 3 to 5 at the system or policy level

3.1.1. Accountability or Quality rating and improvement systems

A recent review of studies that investigated the use of Quality Monitoring and Rating Improvement Systems (QRIS) in the United States showed that overall there appear to be associations between higher QRIS ratings and alternative measures of quality that were usually based on the ERS scales and sometimes the CLASS (Karoly et al., 2016[51]). Some correlations were reported for all eight studies, but the magnitude of the associations appeared weak.

A comparative study investigated process quality in participating and non-participating centres in QRIS in the United States. There appeared a positive relation between staff participating in QRIS and process quality as measured with the Early Childhood Education Rating Scale (ECERS), Classroom Assessment Scoring System (CLASS) and Early Literacy and Language Classroom Observation (ELLCO) (Jeon, Buettner and Hur, 2014[52]). Participation and also QRIS rating were related to higher emotional and instructional support, and also aspect of the language and literacy environment and curriculum (Jeon, Buettner and Hur, 2014[52]). Also, an intervention study in which the intervention group was provided with grants and funding for quality improvement and professional development as well as on-site coaching, showed improvement in process quality compared to the control group (Boller et al., 2015[53]). Other US studies also reported that star ratings or quality levels of the existing state-level QRIS were related to process quality as observed with commonly used measures, such as the ECERS, CLASS Pre-K or CIS, although it mainly distinguished the lowest from the highest quality centres and did not reveal differences across all star or quality levels (Hestenes et al., 2015[54]; Lahti et al., 2015[55]; Lipscomb et al., 2017[56]). A more detailed investigation of staff characteristics measured by the QRIS showed that particularly director's qualifications were related to higher process quality, more than classroom staff qualifications (Lipscomb et al., 2017[56]).

Also studies in Australia and China showed relations between the use of QRIS and process quality as measured by observational tools, such as ECERS. Fenech, Sweller and Harrison (2010[57]) showed that in a study from Australia there appeared moderate correlations between ratings with the measure of the Quality Improvement and Accreditation System and the ITERS/ECERS. The associations were, although the

strongest for centres providing the lowest quality. Also, in China significant associations between the quality level based on the QRIS and the observed process quality (using the ECERS) were found, although it did not differentiate well at the lowest levels in one study (Hu, Vong and Mak, 2015[58]) and between the highest levels in another study (Pan, Liu and Lau, 2010[59]).

Based on the initial evidence from the Australia, China and the United States, it seems that quality rating and improvement systems contribute to higher process quality, although to a certain extent. It appears that a QRIS is not specific enough to distinguish different levels of the QRIS as compared to measures of process quality, but merely provides a rough estimate of quality or a distinction between low and high quality (Fenech, Sweller and Harrison, 2010[57]; Jeon, Buettner and Hur, 2014[52]; Lahti et al., 2015[55]; Tout et al., 2011[60]).

3.2. Early childhood education and care centre context

The organisational level is an understudied topic in ECEC, while this level provides the basis for staff's working conditions and thus is most likely to affect their classroom practices. Structural aspects, such as the size of the organisation or the type of organisation (public vs private, non-profit vs for-profit) or the location of the centre (urban vs rural, in a school or in a daycare centre), likely affect the working conditions for staff and hence may also relate to process quality. In addition, leadership in the organisation, the extent to which staff feel supported and feel part of the team, and the degree to which there is a joint vision and mission in the organisation all contribute to staff's practices and thus process quality.

3.2.1. Structural centre characteristics

There is limited evidence on the relations between size of the organisation and process quality. However, there is some evidence on the relations between size and other centre characteristics, such as organisational climate. For instance, in smaller organisations, staff perceived more autonomy and support to show leadership, exchange their vision with colleagues and more opportunities to participate in decision-making in for instance curriculum-related aspects (Ho, Lee and Teng, 2016[61]).

3.2.2. Type of centres

In some countries ECEC provisions are public, whereas in other countries these are private provisions or there is a mix. This could result in differences in structural characteristics. For instance, a US study showed that staff working in the public sector was on average more highly educated (Coley et al., 2016[62]; Fuligni et al., 2009[63]) and also received less monitoring (Fuligni et al., 2009[63]). A Chinese study corroborates these findings and showed that staff in public provisions was higher educated and earned higher salaries (Hu et al., 2016a[64]).

Public settings provided higher process quality in China, Portugal, and the United States as measured with the ECERS (Coley et al., 2016[62]; Hu et al., 2016a[64]; Slot, Lerkkanen and Leseman, 2015[13]). However, in Spain no significant differences were found between public or private preschools (Sandstrom, 2012[46]). Public settings in these countries received funding from different public sectors at the state, city or country level.

Note however that the Chinese study only revealed a significant difference between public and private provisions in a multivariate model that included centre characteristics

(e.g. the location of the centre, governmental funding, staff salary and child tuition). After adding staff characteristics, such as educational qualifications and work experience and classroom features, including group size and child-staff ratios, the type of provision no longer predicted differences in quality (Hu et al., 2016a[64]).

Also the geographical location of a preschool might be related to process quality. For instance, in rural areas there is less availability of ECEC and there is some evidence suggesting lower quality of ECEC in rural areas in China and the United States (Hu et al., 2016a[64]; Maher, Frestedt and Grace, 2008[65]).

Finally, the location of a preschool in schools or as part of daycare centres also appeared related to process quality. Studies from the United States and Finland indicated higher process quality for preschools located in schools (Pianta et al., 2005[4]; Slot, Lerkkanen and Leseman, 2015[13]). Staff working in classrooms located within elementary schools are likely to be more exposed to the curriculum, methods and culture of elementary school through contact and perhaps collaboration with elementary school staff. This might result in care and education practices more strongly resembling practices in elementary schools compared to independently operating ECEC centres. For example, research has shown that ECEC classrooms located in schools provide less free play and more whole group instruction (Pianta et al., 2005[4]). Staff working in ECEC centres that are part of a school may differ on other aspects as well. For instance, Clifford et al. (2005[66]) showed that staff working in classrooms located in schools had higher education levels and were paid more compared to staff working in independently functioning centres.

3.2.3. Organisational climate and leadership

To date, only a few studies have included these organisational characteristics on the centre level, such as the organisational climate or team collaboration/cohesion, and found these to be positively related to quality (Bloom and Bella, 2005[67]; Bloom and Sheerer, 1992[68]; Sylva et al., 2004[69]), with even stronger associations than for the usual classroom characteristics (Dennis and O'Connor, 2013[70]). Lower and Cassidy (2007[71]) revealed positive medium-sized correlations between the overall organisational climate and process quality as measured with the ECERS-R, specifically for the quality of (language) interactions.

A study from South Africa showed that management quality was the strongest predictor of process quality, above and beyond staff characteristics, including qualifications and work experience, and classroom features, such as child-staff ratios (Biersteker et al., 2016[72]).

3.2.4. Working conditions

Working conditions include staff working hours, workload and wages. Although these aspects have not been studies systematically, there is some evidence that staff receiving more salary provided higher process quality with large effects in China (Hu et al., 2016a[64]), but not in the United States (Pianta et al., 2005[4]). A possible explanation for these diverging findings could relate to other contextual characteristics. For instance, the Chinese study illustrated that staff earning higher wages were higher educated, more often worked in public provisions (with better resources) and in classrooms with more favourable child-staff ratios. The findings from the US study on the other hand showed that staff with better qualifications also earned higher wages, but there were no relations with the children-to staff ratios. Hence it is likely that the confounding effects of other

contextual characteristics affect the relation of wages and process quality, suggesting more complex interaction effects.

Also a cross-country comparison study showed positive associations between wages and process quality as measured with the ECERS in Portugal and the United States, but not in Germany and Spain (Cryer et al., 1999[73]). For Portugal this concerned a small to moderate effect for the wage of the director, whereas for the United States, it involved a small to moderate effect of staff' wage rather than the director. In both cases there appeared added value regarding the explained variance of the total multivariate model, which included a wide range of variables at the classroom and staff level as well.

To summarise, there appears to be some evidence supporting the importance of centre characteristics in predicting process quality. To date, the evidence is limited concerning the role of these more distal characteristics and some of the findings show that more proximal characteristics, such as staff or classroom features, have more impact on process quality than these centre structural aspects. It is important to keep in mind the possible confounding between these characteristics. For instance the study from China showed that urban centres received full governmental funding, which provided them with more resources (Hu et al., 2016a[64]). It is likely that the working conditions are better in these centres, which was supported by the correlational pattern found in this study, showing that urban centres attracted higher qualified staff who receive higher salaries and the child-staff ratios was more favourable in these centres.

3.3. Early childhood education and care classroom context

Concerning classroom features, child-staff ratios and group size are the most commonly studied aspects, but the evidence shows mixed findings. The meta-analysis by Vermeer et al. (2016[23]) with 21 studies from Europe and North America reported no significant differences in the mean group size and child-staff ratios between Europe and North America. The mean group size across countries was around 15 with a range of 9.1 to 30.0 and the child-staff ratio was on average 8.60 with a range of 3.1 to 25.0. Further, the analysis based on 17 studies revealed no significant relations between group size and process quality as measured with the ERS, but a small-sized correlation between children-to staff ratio and process quality, indicating that fewer children per caregiver was associated with higher quality.

Smaller ratios and group size have been found to be related to higher overall process quality in the United States, China and Portugal (Barros and Aguiar, 2010[74]; Burchinal et al., 2002[75]; Hu et al., 2016a[64]; Mashburn et al., 2008[76]; Philips et al., 2000[77]; Phillipsen et al., 1997[78]) and with responsive, warm and positive staff-child relations in particular (Burchinal et al., 2002[75]).

However, other studies have not found these associations between child-staff ratios and process quality in European countries, including Denmark, Spain and the United States (Pianta et al., 2005[4]; Sandstrom, 2012[46]; Slot et al., in press[21]) or group size and process quality (Sandstrom, 2012[46]).

A cross-country comparison revealed inconsistent evidence with positive correlations of small group sizes and a favourable ratio to process quality in some countries, but not in other countries (Cryer et al., 1999[73]). The findings revealed that a smaller child-to-teacher ratio was correlated with higher process quality in Germany and the United States, but not in Portugal and Spain, as measured with the ECERS. However, in the United States a larger child-to-staff was correlated with higher process quality as

measured with the CIS contradicting the correlational pattern found for the ECERS. In addition, a negative correlation was found between group size and overall process quality for Spain, but, remarkably, a positive correlation was found for Germany. Note that the average group size in Spain was much bigger and showed stronger variation than in Germany (with a mean group size of 23.64 and a standard deviation of 6.38 and a mean of 20.42 and standard deviation of 5.48 respectively), which may explain these contradictory results. In the multivariate model, including other structural features at the staff and centre level, child-staff ratios remained a significant predictor of process quality with a stronger association in Germany than in the United States, corroborating the correlational pattern. However, group size was not included in the multivariate model, thus it is unclear whether the inconsistent relations between group size and process quality hold when a wider range of predictors is included.

With regard to classroom composition a number of studies have investigated effects of several classroom features, such as the mean age in the classroom or ethnic classroom composition on process quality (Early et al., 2010[79]; Lehrl, Kuger and Anders, 2014[80]; Leseman et al., 2017[81]; Wishard et al., 2003[82]). Mocan et al. (1995[83]) found no relations between mean age in the classroom and process quality, but a recent study by Kuger et al. (2015[84]) showed that process quality was higher in classrooms with, on average, older children.

Most research has shown that process quality was lower in classrooms with higher proportions of ethnic minority or multilingual children, for instance in Denmark (Slot et al., in press[21]), Germany (Kuger et al., 2015[84]; Leu and Schelle, 2009[85]; Lehrl, Kuger and Anders, 2014[80]; Slot, Lerkkanen and Leseman, 2015[13]) and the United States (LoCassale-Crouch et al., 2007[86]; Tonyan and Howes, 2003[87]). However, another study from the United States showed that instructional process quality was not related to the number of children with limited English proficiency (Justice et al., 2008[88]). This might reflect a selection effect that results from cultural and social barriers in availability or accessibility for disadvantaged families (Eurydice/EACEA, 2009[89]). Another reason that has been suggested is that working with disadvantaged children is more challenging and that additional resources might be needed to counteract these challenges (Pianta et al., 2005[4]).

Altogether the findings concerning classroom characteristics show that there appears to be quite some evidence for the positive relations of smaller child-staff ratios and process quality. For group size the evidence is a little more mixed, but the majority of studies indeed show that smaller group size is associated with higher process quality.

3.4. Staff characteristics

3.4.1. Pre-and in-service education and continued professional development

Pre-service education concerns the training staff has engaged in before entering the job, whereas in-service training concerns additional training while working in the ECEC field. In-service training is part of the broader concept of continuous professional development. Professional development has received growing attention, which is evident from several meta-analyses that were conducted to evaluate its effectiveness. Professional development in the broad sense can include in-service training as well, but also involves coaching, mentoring, (video) feedback or other activities, thus is discusses separately in the current review.

A higher pre-service training level has been shown to be associated with higher levels of process quality in European countries, such as Germany, Denmark, Portugal, and the United States (Barros and Leal, 2011[90]; Cryer et al., 1999[73]; Guo et al., 2010[91]; Pianta et al., 2005[4]), which in Denmark, Portugal and the United States meant having a Bachelor's degree. However, the evidence base is not consistent. In a large-scale multi-site and multi-state study, Early et al. (2006[92]) found that having a degree above the bachelor level was related to higher process quality, but there were no differences below a bachelor degree. In the same vein, other studies reported null findings (Philips, Gormley and Lowenstein, 2009[93]) or contradictory results based on a large-scale comparative review in the United States (Early et al., 2007[94]) and cross-country comparison studies (Cryer et al., 1999[73]; Slot, Lerkkanen and Leseman, 2015[13]). In a comprehensive review, Tout, Zaslow and Berry (2006[95]) revealed that pre-service training showed stronger relations with process quality if the training included early childhood and education content, such as child development.

Also, in-service training has shown to be beneficial for process quality in the United States as well as European countries, including Denmark and Portugal (Fukkink and Lont, 2007[96]; Hamre et al., 2012[97]; Justice et al., 2008[88]; LoCassale-Crouch et al., 2011[98]; Slot et al., in press[21]; Slot, Lerkkanen and Leseman, 2015[13]; Zaslow et al., 2010[99]), even over and above formal pre-service qualifications (Philips et al., 2000[77]). A meta-analysis by Fukkink and Lont (2007[96]) revealed medium-sized average effects on caregivers' interaction competence of specialised training focusing on staff-child interactions.

Egert (2015[100]) conducted a systematic literature review to evaluate the effectiveness of professional development (PD) across different quality measures and found inconsistent evidence. The impact of PD on quality assessments with the ERS and the CLASS showed mixed results, with some studies reporting positive effects on the total scores, whereas other reported null findings or only on subscales. For the ELLCO, which is measuring language and literacy specific quality, the results appeared overall positive. Egert (2015[100]) provided several explanations for the inconsistent results. One aspect that affected the impact of PD was on-site support, such as mentoring, coaching or consultation. Another aspect concerned curriculum implementation that was often part of the PD, which makes it difficult to disentangle the PD effects from the curriculum implementation. In a follow-up analysis Egert (2015[100]) conducted a meta-analysis and showed an overall medium-sized positive effect of PD on quality ratings across 36 studies with 42 treatments. She reported that coaching was an important moderator of effect, such that interventions including coaching were up to three times as effective as interventions without coaching. Also the amount of training appeared to moderate the effects indicating that training with an amount of 45 to 60 hours was more effective than other trainings.

A recent meta-analysis investigated the effects of PD on two quality outcomes: process quality and the physical classroom environment targeted at language and literacy development (Markussen-Brown et al., 2017[101]). The review showed medium effects on process quality and even large effects for the physical classroom environment. Courses, as part of PD, appeared beneficial particularly for process quality, but not for the physical environment, whereas coaching was associated with both quality outcomes.

A study from China showed that having attained specific PD, with resulting a special social status that is related to higher governmental salaries and benefits, was related to higher process quality with a medium effect size (Hu et al., 2016a[64]).

3.4.2. Well-being/job satisfaction

Jennings (2015[102]) investigated several aspects of staff-reported well-being, depression, burn out and self-efficacy and relations with observed classroom quality in the United States. The findings showed moderate negative correlations between aspects of depression and burn out with process quality. This study also demonstrated moderate positive associations between staff's positive affect, as indicator of well-being, and process quality. However, a Finnish study did not find any relations between staff stress and observed process quality (Pakarinen et al., 2010[41]).

3.4.3. Work experience

Some studies have shown positive relations between staff' work experience and process quality in Germany and the United States across preschool classrooms (LoCassale-Crouch et al., 2007[86]; Kuger et al., 2015[84]). However, other US studies have shown negative relations (Connor et al., 2005[20]; Wilcox-Herzog, 2004[103]) or no relations at all in China and the United States (Hu et al., 2016a[64]; Justice et al., 2008[88]; Philips, Gormley and Lowenstein, 2009[93]; Pianta et al., 2005[4]). Likewise, two cross-country comparison studies have shown mixed findings with positive relations in some countries and no or negative relations in other countries (Cryer et al., 1999[73]; Slot, Lerkkanen and Leseman, 2015[13]).

These inconsistent findings might point to the role of other staff or classroom level variables that play a role. For instance, Pianta et al. (2005[4]) showed that more experienced staff had a less favourable child-staff ratio. Likewise, Connor et al. (2005[20]) revealed that more experienced staff had a larger group size of children. This might suggest that the presence of other staff or classroom features masks the effects of work experience and points to interaction effects.

3.5. Brief summary of findings

Table 3.1 summarises the results of the literature review for each level and common indicator according to the direction (i.e. negative, neutral, positive) of the association found in the literature between the structure indicator and the process quality indicators in provisions for children aged 3 to 5. A capital X indicates that there is strong evidence for this feature based on the number of studies that reported results for this aspect. A small x indicates weaker evidence for that particular feature.

At the system or policy level one important feature is the use of Quality monitoring and rating improvement systems (QRIS). Many countries have some kind of quality monitoring system in place (see (OECD, 2015[104]) for a comprehensive overview), but scientific evidence on the relations between the use of QRIS and process quality is limited to the United States, China and Australia. Overall, the results support that taking part in QRIS or having higher ratings with the QRIS is associated with higher process quality. However, the evidence indicates that QRIS mainly distinguish between low and high quality and perform less well in differentiating between different levels of process quality. One exception concerns the QRIS that are based on existing quality measures, such as the ERS, which were then used to observe quality, thus showing strong alignment between the QRIS and process quality measures.

At the centre level, consistent positive associations were found between centre organisational climate, leadership and working conditions with process quality, although the number of studies that have included these aspects is limited. In particular, there is

evidence that staff working in centres with a better organisational climate provided higher process quality. Centres located in rural settings appeared to provide lower process quality, but the number of studies is limited. Overall, it seems that the centre level has not been well investigated yet, but that these aspects, particularly concerning the organisational climate, warrant further research to enhance our understanding of how this level might affect process quality in the classroom.

At the classroom level, the majority of studies showed that a smaller group size and fewer children per staff member was related to higher process quality, although there were some mixed findings. Further, there appeared consistent negative associations between the percentage of immigrant or bilingual children in the classroom and process quality in Denmark, Germany and the United States, albeit with one exception in the United States.

At the staff level, overall it appeared that higher pre-service qualifications were related to higher process quality, although some studies showed mixed findings. Consistent positive associations were found between staff in- service training (or professional development) and process quality, and especially if the training included ECE content. For staff work experience, the findings appeared to be inconsistent. 40% of the studies reported null associations between staff work experience and process quality and the remainder showed either positive or negative relations.

To the best of our knowledge only a few studies distinguished the explained variance of structural features for the different levels separately. For instance the cross-country comparison study by Cryer et al. (1999[73]) showed that the majority of the explained variance was located at the staff and classroom level (ranging from 9 – 27%), whereas the explained variance at the centre level was smaller and non-significant for Germany and Spain (ranging from 2 – 10%).

Table 3.1. Summary of main findings for provisions for children aged 3 to 5

Associations with process quality	-	0	+	Scope of research	Comments
System or policy level					
Accountability/Quality monitoring and rating improvement systems (QRIS)			X	6 US studies, 2 studies from China and 1 study from Australia	Despite consistent positive relations. QRIS mainly distinguish rough indicators of low vs high quality and show less consistent evidence in more fine-grained comparisons
Centre level					
Type is public		x	X	4 studies	Positive relations in China, Portugal and the US, but no differences between public and private in Spain
Rural	X			1 US study and 1 study from China	Less availability of ECEC in rural areas and lower quality in China
Located in school			x	1 study from the US and 1 study from Finland	
Organisational climate			X	3 US studies and 1 study from England	
Leadership			x	1 study from South Africa	
Working conditions, e.g. salary		x	x	1 US study and 1 study from China	Positive effects of salary in China, but not in the U.S.
Classroom level	-	0	+		
Child-staff ratio	X	x		12 studies across the world, including 2 cross-national comparison studies and 1 meta-analysis	Mostly consistent evidence towards smaller ratios (also based on the meta-analysis) and only 3 studies showed null associations
Group size	X	x	x	12 studies across the world, including 1 cross-national comparison study and 1 meta-analysis	Most consistent evidence towards smaller group size. 2 studies showed null associations (including the meta-analysis) and only 1 study indicating opposite relations
Mean age of children		x	x	1 US study and 1 study from Germany	No relations in U.S. and positive relations in Germany
% immigrant or multilingual children	X	x		4 studies from Germany, 2 US studies and 1 study from Denmark	Mostly consistent evidence that a higher share of immigrant children is related to lower quality, except for null associations in 1 U.S. study
Staff level					
Pre-service qualifications		x	X	12 studies across Europe and the US	The majority of studies indicate positive effects (9 out of 12)
In-service training/Professional development			X	11 studies across Europe, China and the US, including 3 meta-analyses	Overall, positive relations between PD and quality, although there are some inconsistencies within studies depending on type and amount of PD
Job satisfaction/well-being		x	x	1 US study and 1 study from Finland	
Work experience	x	X	x	10 studies across the world, including cross-national comparisons	2 studies (1 US) showed positive relations, 4 (3 US) reported null associations and 2 US revealed negative relations. 2 cross-national studies showed mixed findings

Note: - indicates a negative association, 0 indicates null associations and + indicates positive associations. A capital X indicates stronger evidence and a small x indicates weaker evidence

4. Implications of the results and next steps

Overall, the findings of the review for Early Childhood Education and Care (ECEC) provisions for children aged 3 to 5 revealed that research into the organisational or centre level is still scarce. The few studies that have investigated aspects like the organisational climate or leadership indicated that these aspects matter, but in some cases the predictive value diminished after adding more proximal, classroom or staff level, aspects. However, more research is needed to further unravel the role of centre level features in process quality.

Concerning the classroom and staff level, there is general support for the importance of group size, child-staff ratio and staff' pre-service qualifications, also referred to as the iron-triangle, and staff work experience, but there also appeared some inconsistencies. A few explanations are possible.

First, Love et al. (2003[15]) have suggested that a restricted range of variance within countries could explain inconsistent results. This appears plausible as most countries have (strong) quality regulations and monitoring systems in place, particularly for a couple of the most commonly studied characteristics, such as staff qualifications, group size and child-staff ratio (Resa et al., 2016[105]). However, even cross-national studies have shown that there was considerable variance in some characteristics both within and between countries [e.g. Cryer et al. (1999[73]), Slot, Lerkkanen and Leseman (2015[13])].

Another possible explanation could be related to methodological and statistical choices made or the study design (experimental vs. observational studies) of the reviewed studies. Investigating relations from a univariate perspective (looking at relations between single aspects, e.g. correlation between group size and process quality) or multivariate perspective (looking at relations between several aspects in which the relations between single aspects are controlled for the contribution of the other aspects, e.g. a regression analysis looking at group size and process quality while controlling for the number of adults present) can affect the outcomes of the analyses. For instance, based on single correlations the cross-country comparison study by Cryer et al. (1999[73]) showed that several centre level aspects (such as opening hours, educational qualifications or work experience of the director) were correlated with process quality, but a multivariate model no longer showed that these aspects were significantly related to process quality, but that features at the staff or classroom level appeared more important. This complicates the comparison of findings across studies, but it also points to the fact that all these characteristics, at different levels, most likely affect each other and jointly contribute to process quality, hence illustrating the need to address these relationships in a different way to more closely fit the dynamic nature of these relations in everyday life.

Further investigation of some of the inconsistencies reported in the current review showed that the classroom and staff features were interrelated (i.e. a negative correlation between staff work experience and child-staff ratios), which resulted in null findings or a different pattern of results as it can mask some of the relationships, particularly when a supposedly positive feature (i.e. more work experience) is correlated with a supposedly

negative feature (larger child-staff ratios), with null associations as a result. This points to more complex relations or interaction effects, which will be addressed in the following section.

4.1. Constellations of structural classroom or staff characteristics

There are several approaches to investigate constellations of structural characteristics and the relations with process quality. One way is by looking at interaction effects in which the interaction between two structural features can be modelled to investigate its joint relation with process quality. The most common way is to investigate two-way interactions, using two different variables, but also three-way or even four-way interaction effects can be studied, although the latter two are more difficult to interpret.

Another approach concerns profiles of quality using appropriate analysis methods, which allows for the inclusion of multiple aspects at the same time and takes into account their joint contribution. However, this approach has mainly been used for identifying profiles of process quality and its relations with children's developmental outcomes and to a lesser extent in constructing profiles of structural characteristics that predict process quality. The available empirical evidence for both approaches will be discussed below.

4.1.1. Interaction or moderator effects of structural characteristics on process quality

As part of the European Curriculum and Quality Analysis and Impact Review of European Early Childhood Education and Care (CARE) project, secondary data analyses were conducted using data from five European datasets: England, Finland, Germany, the Netherlands and Portugal (Slot, Lerkkanen and Leseman, 2015[13]). The results showed significant interaction effects for all countries and interestingly these interaction effects appeared stronger than most of the main effects. For England the Effective Provision of Pre-school Education (EPPE) data was used and the results showed that the type of provision (*educare* or more educationally oriented) appeared to moderate the relation between staff qualifications and process quality (as measured with the ECERS-R and ECERS-E). Thus staff working in educationally oriented provisions provided higher quality compared to their counterparts working in *educare* provisions with a moderate effect size and the strongest effect for lower qualified staff. Siraj-Blatchford et al. (2002[106]) illustrated that lower qualified staff that collaborated with higher qualified staff, which occurred more frequently in educationally oriented provisions, tended to model their behaviour. In addition, the working conditions, such as higher salary and more professional development opportunities, tended to be better in educationally oriented provisions. Thus, it seems that better working conditions that were provided in the *educare* provisions might have compensated for the lower staff qualifications.

For Finland, an interaction effect was found between the location of the preschool (in a daycare centre or in a primary school) and group size with process quality (i.e. Emotional support, Classroom organisation, and Instructional support) (Slot, Lerkkanen and Leseman, 2015[13]). For classrooms located in a primary school larger group size was associated with higher quality whereas the opposite pattern appeared for preschool classrooms located in a daycare centre. Working in school setting, thus appeared to compensate for an unfavourable group size. The authors' hypothesis was that working in a school provided additional compensatory benefits to for staff, such as being part of a team of primary school teachers.

For Germany, data showed an overall negative association of the proportion of immigrant children in the classroom with process quality (Slot, Lerkkanen and Leseman, 2015[13]). However, the staff's work experience appeared to mitigate the negative effect of a high share of immigrant children in the classroom. More experienced staff provided equal levels of quality regardless of the share of immigrant children in the classroom, whereas less experienced staff provided lower quality in classrooms with a larger share of immigrant children with a large effect size. A similar compensating effect of staff work experience on cultural classroom composition is also reported in a Danish study (Bleses et al., 2017[107]). This study also showed the mitigating effects of having a Bachelor's degree for staff working in diverse classrooms. Having a Bachelor's degree in ECE was related to higher quality in terms or Emotional support and Classroom organisation for staff working in classrooms with higher shares of non-Danish children with medium-sized effects.

For the Netherlands, several interaction effects appeared for educational and curriculum quality in centre-based ECEC provisions for children aged 2 and 3. For instance, having more work experience or more opportunities for professional development in the centre appeared to compensate for working with higher child-staff ratios in the classroom (Slot, Lerkkanen and Leseman, 2015[13]). For work experience, the reverse case also appeared: less experienced staff provided higher curriculum quality in classrooms with a more favourable ratio. The third finding relates to an interaction effect of work experience with opportunities for professional development on educational quality. More opportunities for professional development were related to higher quality, but only for more experienced staff, and the opposite was true for less experienced staff. This might reflect the need for more experienced staff to keep their knowledge and skills up-to-date, whereas for less experienced staff this might reflect that they are less susceptible to professional development activities as they rely more heavily on the recent training they received.

For Portugal, the results showed that the type of sector (public or private) was moderating between child-staff ratio and process quality (Slot, Lerkkanen and Leseman, 2015[13]). Quality was higher in classrooms with higher, unfavourable child-staff ratios, and lower with more favourable ratios, but only in the public sector. For the private sector no differences in process quality were found related to the ratio. This seems to point to a compensating factor of working in the public sector. A possible explanation suggested by the authors is that the working conditions are more attractive in the public sector or that this sector attracts more motivated staff.

The investigation of different structural characteristics interacting and jointly predicting process quality is still rare and more research is warranted to further unravel these complex relations.

4.1.2. Profile analysis

A study in Kosovo investigated staff profiles and relations with process quality using latent class analysis (Uka and von Suchodoletz, 2017[108]). This type of analysis constructs profiles based on empirical data, in this case based on different characteristics of staff: age, salary, coping strategies and physiological stress. Highest scores on instructional support were found among young staff with low income, good coping strategies and low levels of physiological stress. The second best scoring group was older staff with a moderate income and good coping strategies, but with high levels of stress. Thus, the results support the assumption that instructional quality varies depending on specific patterns of staff characteristics. The findings suggest that psychological

characteristics (such as staff stress) may differently affect instructional quality, depending on the combination with other staff characteristics.

Another study from the United States used a person-centred approach of staff characteristics and process quality by conducting a latent profile analysis (Jeon, Buettnet and Hur, 2016[109]). Three distinct profiles of a combination of work experience, attitudes towards the work and process quality emerged. The first profile showed the highest process quality as measured with the CLASS and concerned teachers with more work experience and mixed job attitudes (strong job commitment, but also slightly higher work stress). The other two profiles concerned staff with less work experience and either more positive work attitudes or less positive attitudes, but both profiles showed lower quality compared to the first profile. The profile with the highest quality showed QRIS higher ratings and more favourable child-staff ratios. Also staff' pay was higher and the director was more likely to have a specialised ECE background.

5. Provisions for children aged 0 to 2

Early education and care for infants and toddlers is less well researched in comparison to education and care for children aged 3 to 5. Usually some structural conditions are better than for older children, such as the group size or the child-staff ratio (Barros et al., 2016[9]; Jamison et al., 2014[48]; Slot et al., 2015[110]; Vogel et al., 2015a[111]; Vogel et al., 2015b[112]), as many countries have regulations in place adapted to the age range of children (OECD, 2006[113]).

There are some comparative studies that investigated the process quality in infant and toddler groups, which showed some differential patterns. For instance, a study from the Flemish Community of Belgium showed that the quality of the environment was lower for infants as compared to toddlers (Hulpia et al., 2016[36]). Although the basic environmental quality was the same, the materials, activities and experiences were not adapted to infant's needs as much as for toddlers.

A study from the United States also showed that the quality of the materials and activities for classrooms serving infants was lower compared to classroom serving toddlers (King et al., 2016[114]). However, the same study also revealed that the quality concerning basic safety and organisation and the quality of (language) interactions was higher for infants than for toddlers. Another US study showed lower process quality for infants and toddlers than for preschoolers based on the use of the ERS rating scales (Lahti et al., 2015[55]). Likewise an Australian study highlighted that process quality as measured with the ERS was comparatively lower for infants and toddlers than for preschoolers (Fenech, Sweller and Harrison, 2010[57]).

Research from the Netherlands has also shown that process quality appeared to be lower for infants than for toddlers. One study revealed no differences in staff's positive and sensitive interactions, but showed that the support for children's development, well-being and learning was comparatively lower for infants (Fukkink et al., 2013[115]), but another study reported lower quality on both emotionally supportive interactions and facilitation of children's development (Helmerhorst et al., 2014[116]). Based on a recent study there are indications that particularly mixed-age groups serving children aged 0 to 2 provide lower process quality (Slot et al., 2017c[24]).

5.1. Early childhood education and care for children aged 0 to 2 at the system or policy level

5.1.1. Accountability or Quality rating and improvement systems

A one-state study from the United States looking into the relations between ratings based on the QRIS and observed process quality failed to show significant correlations across five star levels with CLASS scores, but the QRIS did differentiate between the lowest and highest quality ratings in terms of the support for children's development, well-being and learning (Lipscomb et al., 2017[56]).

However, another US study conducted in two states showed a moderate correlation between the observed quality based on the ERS and CIS scores with the rated quality level across four levels (Lahti et al., 2015[55]). Likewise, a small-scale study using the CLASS Toddler reported positive medium to strong correlations with the QRIS star ratings for four out of six quality dimensions (Thomason and La Paro, 2009[6]). Aspects of negative climate in the classroom and staff' behaviour guidance were unrelated to the star rating.

An intervention study as part of the QRIS provided an intervention group with grants and funding for quality improvement and professional development as well as on-site coaching, which showed improvement in process quality compared to the control group (Boller et al., 2015[53]). The changes occurred in overall environmental quality, the quality of interactions and the quality of the curriculum and learning environment in particular. The child-staff ratio was also more favourable in the intervention group in comparison to the control group. The largest effect was for the quality of the curriculum and learning environment, whereas the smallest effect concerned the child-staff ratio and the quality of interactions.

5.2. Early childhood education and care centre context

5.2.1. Type of centre

In Portuguese infant toddler centres, no differences were found in process quality regarding for-profit or non-profit centres (Barros and Aguiar, 2010[74]). However, a US study revealed that non-profit provision scored higher on a number of quality features, including health, safety and furnishing and aspects related to provisions for staff, but no differences were found for the quality of interactions (King et al., 2016[114]).

In the Netherlands, two main types of provisions exist for children below the age of 4. Full day care exists for children from birth and often concerns mixed-age groups of infants and toddlers, whereas preschools or playgroups offer half-day care and accept 2 and 3 year-old children. Traditionally preschools have shown to adopt a stronger educational orientation than day care centres, as preschools are part of a targeted educational policy to combat early disparities in disadvantaged children. Based on observations in 276 classrooms in 2011 there appeared no differences between day care centres and preschools concerning emotionally supportive interactions, but preschools scored higher on supporting children's development and learning (Slot et al., 2017a[42]). Recent findings in a smaller sample also confirmed these differences (Slot et al., 2017c[24]).

In Portugal, staff working in non-urban centres showed more positive and sensitive interactions with children compared to staff working in urban centres (Barros et al., 2016[9]). The authors speculated that staff working in rural or suburban areas might have higher life satisfaction and lower levels of stress, which might have resulted in higher process quality.

5.2.2. Organisational characteristics and working conditions

A US study showed that centres that were affiliated with a professional organisation provided higher process quality compared to centres with no affiliation (Thomason and La Paro, 2009[6]). However, these findings are based on single correlations with particular quality dimensions and not on a multivariate model. The size of the relations was moderate to strong, which appeared slightly higher than correlations with staff pre-service

qualifications and more consistent than correlations with group size and staff qualifications.

A study from South Africa showed that management quality was the strongest predictor of overall process quality as measured with the ITERS, above and beyond staff characteristics, including qualifications and work experience, and classroom features, such as child-staff ratio (Biersteker et al., 2016[72]).

Working conditions include staff working hours, workload and wages. Although these aspects have not been studied systematically, there is some evidence that staff receiving more salary provided higher process quality as measured by the ITERS in Portugal (Pessanha, Aguiar and Bairrao, 2007[117]).

5.3. Early childhood education and care classroom context

Concerning infant and toddler classrooms, smaller group size and child-staff ratios were related to higher process quality in the Flemish Community of Belgium, the Netherlands, in Portugal and the United States (Barros and Aguiar, 2010[74]; Barros et al., 2016[9]; Deynoot-Schaub and Riksen-Walraven, 2005[118]; Hulpia et al., 2016[36]; Jamison et al., 2014[48]; NICHD Early Child Care Research Network, 2000[10]; Thomason and La Paro, 2009[6]). This particularly concerned emotionally supportive interactions with children.

However, two US studies and one Portuguese study found no associations between group size and child-staff ratios with observed classroom quality (Pessanha, Aguiar and Bairrao, 2007[117]; Vogel et al., 2015a[111]; Vogel et al., 2015b[112]). Both US studies concerned Early Head Start provisions with an average group size of 6 children (well within the maximum group size of 8 children) and an average child-staff ratio of 2.7 (which was also within the state regulation of 4 children). Hence, this could explain the lack of associations with process quality.

In another Dutch study, no association between observed group size and process quality was found, whereas higher child-staff ratio was related to lower process quality (Slot et al., 2017a[42]). A smaller ratio was associated with higher emotional support and support for children's development and learning with a slightly stronger effect for the latter. The average group size was based on the observed number of children during the observation cycle level, thus revealing more variation within one classroom depending on the type of observed activity setting. The average group size was 9.76, ranging from 1 to 25, and the observed child-staff ratio was 5.12, ranging from .33 to 16.

Another Dutch study reported effects of both group size and child-staff ratio. In an experimental study in the Netherlands two structured play situations were observed in which the number of children was manipulated (de Schipper, Riksen-Walraven and Geurts, 2006[119]). The quality of interactions was higher in the play situation with three children compared to the one with five children. Moreover, an interaction effect was found, showing that the relation between a smaller child-staff ratio and process quality was stronger for younger children. In this study, children's ages showed large variation and ranged from 10 months up to almost four years of age.

A cross-country comparison between Basque region of Spain and the Netherlands showed that group size was negatively related to process quality in Basque region, but unrelated to process quality in the Netherlands (Vermeer et al., 2010[120]). The average group size in Basque region was significantly higher with 15.4 compared to 12.1 in the Netherlands

with comparatively larger child-staff ratios (15.4 and 5.7 respectively), which could explain these differences.

With regard to classroom composition two studies have investigated relations between ethnic classroom composition and process quality, revealing opposite patterns of results. A study in the Flemish Community of Belgium showed negative associations of a higher share of children speaking another home language with emotional and educational support, with small-to-medium effects (Hulpia et al., 2016[36]). This association was only present for toddler care provisions and not for infants. However, the results from a Dutch study showed higher educational support in classrooms with a higher share of non-Dutch speaking children (Slot et al., 2017a[42]). The negative association was also found for provisions for children aged 3 to 5 and thus is in line with other research. The positive selection effect found in the Dutch case most likely reflects the targeted policy that is in place (Slot et al., 2017a[42]). In line with this targeted policy, disadvantaged children, including children speaking another home language, are more often enrolled in preschools, rather than daycare provisions, providing higher support for children's learning (Slot et al., 2015[110]).

5.4. Staff characteristics

5.4.1. Pre-and in-service education and continued professional development

A recent international meta-analysis showed positive correlations between staff pre-service qualifications and process quality as measured with the ERS scales with a small effect size (Manning et al., 2017[121]). The meta-analysis included 48 studies and showed the strongest associations between staff qualifications and aspects of the programme structure, the provision of activities and supportive language and reasoning interactions.

Several studies have illustrated the importance of staff' qualifications for process quality in Canada, the Flemish Community of Belgium, the Netherlands, Portugal and the United States (Barros et al., 2016[9]; Bigras et al., 2010[122]; Castle et al., 2016[123]; Hulpia et al., 2016[36]; King et al., 2016[114]; NICHD Early Child Care Research Network, 2000[10]; Slot et al., 2015[110]; Thomason and La Paro, 2009[6]; Vogel et al., 2015a[111]; Vogel et al., 2015b[112]). Four studies showed positive associations by looking at linear relations between pre-service qualifications and process quality (Barros and Leal, 2011[90]; NICHD Early Child Care Research Network, 2000[10]; Slot et al., 2015[110]; Thomason and La Paro, 2009[6]), whereas others showed positive relations from a certain level: either a two-year degree (King et al., 2016[114]; Vogel et al., 2015a[111]) or a Bachelor's degree (Barros et al., 2016[9]; Vogel et al., 2015a[111]). Some studies found associations when using a broad and comprehensive measure for quality assessment including different aspects of staff-child interactions (Barros et al., 2016[9]; NICHD Early Child Care Research Network, 2000[10]). While other studies used measures that distinguished emotionally supportive interactions from more educational and developmentally supportive interactions (Castle et al., 2016[123]; Hulpia et al., 2016[36]; Slot et al., 2015[110]; Thomason and La Paro, 2009[6]; Vogel et al., 2015a[111]; Vogel et al., 2015b[112]). The US study showed equally strong relations of staff qualifications with emotional and support for development and learning (Castle et al., 2016[123]), but the other studies showed different patterns. In a Canadian study, having specialised training in ECE was related to higher process quality for infants with a medium effect size (Bigras et al., 2010[122]).

Some studies found stronger evidence for emotional support. In the Netherlands and the United States, staff qualifications were most strongly related to emotional support, whereas it was unrelated to staff support for children's development and learning (Slot et al., 2015[110]; Thomason and La Paro, 2009[6]). Likewise in the Flemish Community of Belgium staff qualifications showed the strongest association with emotional support and the relation was smaller in magnitude for educational support (Hulpia et al., 2016[36]). However, these findings were only found in infant care and null associations appeared in care for toddlers.

One US study in Early Head Start reported only positive associations for staff qualifications with emotional support an no relations with support for development and learning (Vogel et al., 2015a[111]), whereas the other US study in Early Head Start reported the opposite pattern (Vogel et al., 2015b[112]). One explanation could be that in one study they investigated whether staff had a Child Development Associate (CDA) credential in ECEC (Vogel et al., 2015a[111]), whereas the other study included staff with a BA degree as well, which appeared to predict educational process quality (Vogel et al., 2015b[112]). Another explanation could be that both studies used a different set of variables in the multivariate models. The Vogel et al. (2015b[112]) study included more variables that involved three different variables for staff qualifications and a variable addressed at mentoring or coaching. Taken together, these findings show that having a BA degree appeared positively associated with adequately supporting children's development and learning.

However, another small-scale US study in infant care provisions found null associations between staff qualifications and process quality, based on a comparison of a minimum of a two-year degree compared to less than that, as measured with the CLASS Infant (Jamison et al., 2014[48]) Likewise a study from South Africa showed no associations between staff qualifications and process quality as observed with the ITERS (Biersteker et al., 2016[72]). This study included also staff work experience, child-staff ratio, weekly fee and a measure of management quality as predictor in the model and the latter appeared to be the strongest predictor.

Also additional in-service training or professional development has shown to be related to higher process quality in the United States and the Netherlands (Burchinal et al., 2002[75]; Slot et al., 2015[110]). A meta-analysis by Fukkink and Lont (2007[96]) revealed medium-sized average effects on caregivers' interaction competence of specialised training focusing on staff-child interactions.

5.4.2. Work experience, well-being, job satisfaction

Several studies have demonstrated positive relations between work experience and process quality for the United States and the Netherlands (Jamison et al., 2014[48]; King et al., 2016[114]; NICHD Early Child Care Research Network, 2000[10]; Phillipsen et al., 1997[78]; Slot et al., 2017a[42]; Vogel et al., 2015a[111]). The studies from the Netherlands and one study from the United States revealed only significant associations with the provided support for children's development, well-being, and learning (King et al., 2016[114]; Slot et al., 2017a[42]). A study from Flemish Community of Belgium found borderline positive associations between staff work experience and process quality, specifically concerning sensitive and emotionally supportive interactions, in infant groups (Hulpia et al., 2016[36]). Other US studies found that work experience was only related to emotional support (Vogel et al., 2015a[111]).

However, two Portuguese and other US studies revealed no significant associations between staff work experience and process quality (Barros et al., 2016[9]; Castle et al., 2016[123]; Pessanha, Aguiar and Bairrao, 2007[117]; Vogel et al., 2015b[112]).

A US study showed positive relations between staff' well-being and observed emotional support in the classroom (Cassidy et al., 2017[124]). Well-being was operationalised by measuring two aspects, including the perception of the fairness of their wage in comparison to other in their organisation and other staff in the profession and staff' perceived autonomy in their work regarding the hiring of staff. Another US study showed that staff's job satisfaction and a lack of depressive symptoms was positively related to process quality (Vogel et al., 2015a[111]).

5.5. Brief summary of findings

Table 5.1 summarises the results of the literature review for each level and common indicator according to the direction (i.e. negative, neutral, positive) of the association found in the literature between the structure indicator and the process quality indicators in provisions for children aged 0 to 2. A capital **X** indicates that there is strong evidence for this feature based on the number of studies that reported results for this aspect. A small **x** indicates there is weaker evidence for that particular feature.

At the system or policy level one there are only few studies that have investigated the relations between the use of quality monitoring and quality rating and improvements systems (QRIS) and process quality. Scientific evidence on the relations between the use of QRIS and process quality is limited to the United States and provides some initial evidence for the importance of a QRIS. The results of the three studies showed that taking part in QRIS or having higher ratings with the QRIS is associated with higher process quality although, for one study the QRIS mainly distinguished between low and high quality. One intervention study, as part of the QRIS programme, showed improvement of quality on several domains compared to a control group.

At the centre level, it appeared that only few studies addressed one of the variables of interest. Given the small number of studies no clear conclusions can be derived from the results.

At the classroom level, the majority of studies showed that a smaller group size and fewer children per staff member was related to higher process quality, although there were a few studies showing null associations. Furthermore, only two studies looked at the share of children speaking another home language and relations with process quality and showed opposite results. However, considering that only two studies investigated these particular features, no clear conclusions can be drawn from this.

At the staff level, there was consistent evidence supporting the higher pre-service qualifications of staff for process quality. Likewise, consistent evidence for positive associations of staff' in- service training or professional development with process quality was reported, although the number of studies was limited. Concerning staff work experience, the findings appeared to be more mixed. Although slightly over half of the studies reported positive relations, another 40% also reported null associations. This inconsistent evidence appears to be in line with the findings reported for staff working in provisions for children aged 3 to 5.

Table 5.1. Summary of main findings for provisions for children aged 0 to 2.

	-	0	+		
System or policy level					
Accountability/Quality monitoring and rating improvement systems (QRIS)		x	x	3 US small-scale studies	2 studies showed moderate associations between QRIS rating and process quality. 1 study failed to show correlations, but distinguished between lower and higher quality
Centre level					
Type non-profit		x	x	1 US study and 1 Portuguese study	The U.S. study showed higher quality in not-for-profit provisions, but the Portuguese study showed no differences
Type is rural			x	1 Portuguese study	
Type is daycare	x			2 Dutch studies	
Affiliation professional organisation			x	1 US study	
Management quality			x	1 study from South Africa	
Working conditions, e.g. salary			x	1 Portuguese study	
Classroom level					
Child-staff ratio	X	x		13 studies across the world (5 US)	The majority of studies (10 out of 12) showed a significant negative relation between ratio and process quality (3x the Netherlands, 2x Portugal, Canada and Flemish Comm. of Belgium)
Group size	X	x		13 studies across the world, including 1 cross-country comparison study (5 US)	The majority of studies (8 out of 13) showed a negative association between group size and process quality (3x the Netherlands, 2x Portugal, Flemish Comm. of Belgium)
% immigrant or multilingual children	x		x	2 studies	1 Dutch study and 1 Flemish study showing opposite results
Staff level					
Pre-service qualifications		x	X	12 studies across the world (6 US), including 1 meta-analysis across countries	The majority of studies (10 out of 11) including the meta-analysis showed positive relations between staff qualifications and process quality (Canada, Flemish Comm. of Belgium, Portugal, the Netherlands)
In-service training/Professional development			X	3 studies (1 US), including 1 meta-analysis	
Work experience		x	X	10 studies across the world (6 US)	6 studies (5 US) showed positive relations and 4 studies reported null associations (2x Portugal and 2x US)
Well-being, job satisfaction			x	2 US studies	2 studies showed positive associations between broad measures of staff well-being and process quality

6. Family daycare provisions

Family-based provision in the current review refers to publicly regulated ECEC provision that is delivered in the provider's home (sometimes in the home of the child as can be the case in the Netherlands). Regulations usually require providers to meet minimum health, safety and nutrition standards and sometimes also minimum educational requirements for caregivers.

According to the OECD (2006[113]) and European Commission et al. (2014[125]) many European countries have regulated family daycare. The use of family daycare is especially prevalent for children aged 0 to 2. For instance, n Denmark around 40% of 1-year-olds are enrolled in family daycare, whereas in France this applies to about 30% of the children aged 0 to 2 (Boogaard, Bollen and Dikkers, 2014[126]; European Commission et al., 2014[125]). In Iceland, 31% of children below age 2 are enrolled in family daycare (European Commission et al., 2014[125]). In the Netherlands about 9% of children aged 2 and 3 are enrolled in family daycare (OECD, 2016[127]).

Families have different reasons for choosing family daycare (e.g. (Porter et al., 2010b[128]). Trust, parent flexibility, cost and a belief that children receive more personal attention are mentioned as the most important reasons for preferring family daycare, according to studies from the United States (Anderson, Ramsburg and Scott, 2005[129]; Brandon et al., 2002[130]; Bromer, 2006[131]; Li-Grining and Coley, 2006[132]; Paulsell et al., 2006[133]; Porter et al., 2010b[128]). Another reason concerns the flexibility of family daycare, especially for parents working non-standard hours. Finally, affordability and accessibility remain important explanatory factors, even in middle- or high-income countries with well-established ECEC systems. Use of licensed family daycare appears particularly important in France, the Flemish Community of Belgium, England, Germany and Luxembourg. Research suggests that in some countries, such as the United States, particularly low-income families rely on family daycare for infants and toddlers (Brandon, 2005[134]; Ehrle, Adams and Tout, 2001[135]), resulting in selective use of provisions.

Family-based provisions differ in many respects from centre-based provisions. Home-care providers typically work alone (Porter et al., 2010a[136]) and the group size and child-staff ratio is usually more favourable (e.g. (Burchinal, Howes and Kontos, 2002[137]; Coley et al., 2016[62]; Hulpia et al., 2016[36]; NICHD Early Child Care Research Network, 2000[10]; OECD, 2006[113]). However, a cross-national comparison of the way family daycare is organised in Flemish Community of Belgium, Denmark, France, Germany, United Kingdom, Switzerland and the Netherlands showed large variation in the maximum group size. In the Flemish Community of Belgium home-caregivers are allowed to take care for up to eight children, whereas this is only six in United Kingdom and the Netherlands, five children in Denmark, Germany and Switzerland and two-to-four children in France (Boogaard, Bollen and Dikkers, 2014[126]). Studies from the United States reported an average group size of six (Burchinal, Howes and Kontos, 2002[137]).

Staff educational qualifications tend to be lower for home-care providers compared to staff working in centre-based care, both in terms of the level of attainment and the specialisation of the training as was evident in studies from Australia, Canada, the Netherlands, and the United States (Bigras et al., 2010[122]; Coley et al., 2016[62]; Fuligni et al., 2009[63]; Groeneveld et al., 2010[138]; Ishimine and Tayler, 2012[139]). A European cross-country comparison showed that only Belgium and the Netherlands require a minimum level of educational training for family daycare providers, albeit of a low level, whereas the formal requirements only concerns a basic course, ranging from 18 to 160 hours, in Denmark, France, Germany, Switzerland and United Kingdom (Boogaard, Bollen and Dikkers, 2014[126]). Moreover, home-care providers have fewer opportunities for professional development (e.g. (Boogaard, Bollen and Dikkers, 2014[126]; Fuligni et al., 2009[63]). In most countries further professional development is not mandatory, although some exceptions exist in Belgium, Switzerland and some German federal states and Danish municipalities, although the number of hours varies greatly (Boogaard, Bollen and Dikkers, 2014[126]). An overview by the OECD (2006[113]) showed that the requirements for licensed family daycare tend to be lower than for centre-based ECEC.

A large survey among almost 600 family daycare caregivers in England showed that there was great diversity among staff, concerning the educational qualifications, specialised training, knowledge about the national curriculum (i.e. Early Years Foundation Stage; EYFS) and the extent to which they are taking part in networks for family daycare caregivers (Fauth et al., 2011[140]). Based on cluster analyses it appeared that staff with the highest qualifications also were the most knowledgeable on the EYFS and the most active in networks whereas staff with the most work experience had the lowest qualifications, had less knowledge on the EYFS and were less likely to be part of a network. Despite these differences the results showed that English family daycare caregivers reported the provision of a mix of activities, including reading counting and free play, on a daily basis.

Concerning process quality of family daycare, US research shows mixed findings. Most studies have revealed lower quality in family-based care. A recent review by Porter et al. (2010b) revealed that quality as measured with the FCCRS, an environmental rating scale, ranged from inadequate (Elicker et al., 2005[141]; Fuller et al., 2004[142]; Peisner-Feinberg et al., 2000[143]) to between minimal and good (Paulsell et al., 2008[144]; Shivers, 2006[145]) and quality in family daycare appeared comparably lower than quality in centre-based care (Coley et al., 2016[62]; Elicker et al., 2005[141]; Fuller et al., 2004[142]; Lahti et al., 2015[55]). Specifically the provision of learning activities was rated lower (Coley et al., 2016[62]; Fuller et al., 2004[142]), whereas no differences were found for the quality of interactions (Fuller et al., 2004). Caregiver's educational attainment was higher in centre-based care, which might explain the stronger focus on educational activities.

A Canadian study also revealed lower process quality (based on the FCCRS) in family daycare compared to centre-based care, which concerned in particular the provision of different activities and educational support of play (Bigras et al., 2010[122]). However, another Canadian study showed slightly higher process quality on the FCCRS compared to scores on its equivalent for centre-based care (i.e. ITERS/ECERS) (Côté et al., 2013[146]).

A study in the Flemish Community of Belgium showed mixed findings for children below age 3 years (Hulpia et al., 2016[36]) revealing that the quality of the environment in terms of the organisation of the space and variety in play areas was lower in family- care than in centre-based care, but home-care providers were better able to adapt the activities and experiences to children's interest and needs. Interestingly, there were no differences

in the provision of several play and learning activities between family- and centre-based care providers, except for the provision of cognitively stimulating activities, which was higher in family-based care. Similar mixed findings were reported in Australia, where the overall quality of the environment (based on the ECERS-R) was lower in family daycare compared to centre-based preschools, but no significant differences were found with an observational measure looking into the quality of interactions (i.e. CLASS Pre-K) (Tayler et al., 2013[35]).

However, US studies that have used other measures to assess quality, particularly aspects of caregiver-child interactions (e.g. the Caregiver Interaction Scale [CIS], (Arnett, 1989[29])) revealed few differences between family- and centre-based care (e.g. (Fuller et al., 2004[142]; Loeb et al., 2004[147]). Home-care providers showed adequate levels of warm and nurturing relationships and high levels of positive engagement with the children (e.g. (Paulsell et al., 2006[133]). The NICHD Early Child Care Research Network study (2000[10]) in the United States was one of the first to investigate quality in a large variety of care provisions by looking at caregiver's positive and sensitive interactions that supports children's development and learning, revealing mixed findings. For the youngest children, 15-month-olds, quality was higher in home- and family daycare provisions compared to centre-based care (NICHD Early Child Care Research Network, 2000[10]). For 2- and 3 year-olds the quality of interactions was only higher for in-home care (by relatives or a nanny) compared to centre-based care, but no differences were found for childcare homes. More detailed analyses taking into account the child-staff ratio revealed that these differences largely disappeared for the centre-based groups with a favourable ratio across all ages, suggesting an interaction effect.

Also, a recent study in the Flemish Community of Belgium revealed that for both infants and toddlers emotional and educational aspects of process quality (based on the CLASS Infant/Toddler) were rated higher in family daycare compared to centre-based care, although these differences were no longer significant when controlling for contextual variables such as group size (Hulpia et al., 2016[36]).

Other European studies in Germany, the Netherlands and Switzerland showed no significant differences in process quality between centre-based and family daycare provisions (Perren, Frei and Herrmann, 2016[47]; Slot et al., 2017c[24]; Tietze et al., 2013[148]). However the Swiss study suffered from a small sample size (Perren, Frei and Herrmann, 2016[47]), the German study used different measures to assess process quality (Tietze et al., 2013[148]) and the Dutch ample suffered from a selective response (Slot et al., 2017c[24]). Although both the centre-based sample and the family daycare sample were randomly selected in the Dutch study, the non-response was significantly higher in family daycare, hence potential bias in favour of the family daycare cannot be ruled out.

Taken together, the findings are mixed concerning the process quality of family-based care. Although some structural characteristics are beneficial, such as small group size and small child-staff ratios, other features can be less favourable such as staff's lower educational qualifications, lack of professional development and other support and resources. Hence further research is warranted to draw stronger conclusions.

6.1. Early childhood education and care system or policy level family-based care

6.1.1. Accountability or Quality rating and improvement systems

QRIS are wide implemented in the United States and also apply to family-based care. Results from a state-wide evaluation of its effectiveness in process quality in family

daycare showed that participation in the state-wide professional development programme, as part of the QRIS, was the strongest predictor of process quality, particularly for quality aspects that were strongly aligned between the content areas of the professional development programme and the targeted areas in the observational quality measure, such as health and safety or practices in teaching (Hallam, Bargreen and Ridgley, 2013[149]). Likewise, Lahti et al. (2015[55]) reported higher correlations between the QRIS quality levels and observed quality with the ERS scales, which the QRIS is largely based on, than between QRIS quality levels and observed interaction quality as assessed with the CIS.

Also another US study confirmed that family daycare providers with the highest star rating showed higher process quality as observed with the CLASS, specifically concerning the organisation of the environment, the support of children's development, behaviour, well-being and learning and the provision of (learning) activities (Lipscomb et al., 2017[56]). Interestingly, this US study reported lower QRIS ratings for family daycare providers than for centre-based care, although there were no significant differences in the observed quality (i.e. staff-child interactions as measured with the CLASS). The authors explained this finding by the fact that the QRIS places a lot of emphasis on formal policies and written procedures and on specific furnishing and materials, and these requirements are apparently harder to meet for family daycare providers.

6.2. Structural characteristics

6.2.1. Licensing and affiliation with an organisation

In the United States, licensed family daycare providers provided higher quality compared to providers that were merely registered, thus not monitored (Raikes et al., 2013[150]). Also, Doherty et al. (2006[151]) showed that staff' intentions to meet the standards was one of the strongest predictor of higher observed process quality in Canada. Moreover, the number of years as unregulated home-care provider was negatively related to process quality.

In the Flemish Community of Belgium all home-care providers are licensed and some are also affiliated with a professional organisation that mediates between the parents and the home-care provider, handles administration and financial issues and provides support for on-going professional development. Recent findings revealed no significant differences in process quality between affiliated and non-affiliated home-care providers (Vandenbroeck et al., 2018[152]). There might be two possible explanations for the lack of differences. One possibility is that the actual support home-based care providers receive is limited to financial and administrative support. At the same time the government has recently invested in providing pedagogical support to home-care providers that are not affiliated with an organisation. Altogether, the differences between both types of providers appear to be minimal regarding process quality.

In most countries family-care providers work independently from their own home with limited opportunities for collaboration or networking with other providers. Some European countries allow providers to jointly take care of children at the same location. For instance in France, some federal states in Germany, and United Kingdom family-care providers are allowed to collaborate and jointly take care of larger groups of children (Boogaard, Bollen and Dikkers, 2014[126]). In Denmark, family-care providers living in the same neighbourhood organise themselves in so-called 'playroom groups' and have regular meetings for children to play together and organise activities, such as music,

movement, or dance, and outings for the larger group of children. However there is no empirical evidence that addresses the effects on process quality.

There is one Canadian study that included aspects like formal and informal networks for family daycare providers. Doherty et al. (2006[151]) showed that informal networking was a predictor of higher process quality, although organised networking with other providers was not related to quality. It is not clear from the study what the explanation of this finding could be. One possibility could be that informal networking was a more accessible way of finding support and exchange with other providers at times providers need it, in comparison to more formalised meetings

6.3. Early childhood education and care group context

One study in the United States showed that group size was negatively related to process quality, with small associations (Colwell et al., 2013[153]), but no relations were found for child-staff ratio. Also another US study revealed no relations of child-staff ratio with process quality, concerning both overall environmental process quality and sensitive caregiving (Burchinal, Howes and Kontos, 2002[137]).

A study from the Flemish Community of Belgium also found negative relations between group size and the overall environmental quality of the provision with small-to-medium sized associations (Hulpia et al., 2016[36]). This study reported no associations between group size and the quality of interactions for infants and toddlers based on the CLASS, but there were negative relations between child-staff ratio and quality of interactions for toddler (Hulpia et al., 2016[36]). The average group size in family daycare was 5.06 ranging from 1 to 10, while the statutory maximum group size is 8 (only two groups had 10 children; (Daems et al., 2016[154])). The mean child-staff ratio was 4.99, ranging from 1 to 10 children.

The composition of children in the group has also shown to be related to quality. Specifically a Flemish study showed lower environmental quality in terms of the basic furnishing and equipment and caregiver's abilities to adapt objects, play and learning activities according to children's interests and needs in more diverse groups in terms of children's home language (Hulpia et al., 2016[36]).

6.4. Staff characteristics

6.4.1. Pre- and in-service education and professional development and work experience

Pre-service qualifications (mostly based on continuous scales) appeared a predictor of process quality in the United States revealing medium-sized associations when evaluated in multivariate models across multiple studies (Colwell et al., 2013[153]; Doherty et al., 2006[151]; Raikes, Raikes and Wilcox, 2005[155]; Schaack, Le and Setodji, 2017[156]). Moreover, interaction effects of pre-service educational qualifications were apparent. A four-state study from the United States showed that higher qualifications appeared to compensate for lower levels of state regulations, indicated by fewer home visits and lower requirements concerning pre-service qualifications and additional continued training or professional development (Raikes, Raikes and Wilcox, 2005[155]). This means that caregivers with higher pre-service qualifications were able to provide higher quality care even in the absence of strong state regulations, whereas lower qualified staff provided higher quality only in strongly regulated settings. In a Canadian study having

specialised training in ECE was related to higher process quality for infants with a medium effect size (Bigras et al., 2010[122]).

Furthermore, a Flemish study showed that family daycare caregivers with higher pre-service qualifications provided more diverse learning experiences and activities; and also demonstrated more active involvement and guidance in these activities compared to lower educated caregivers in family daycare for children aged 0 to 2 (Hulpia et al., 2016[36]). However, staff qualifications were not related to the quality of interactions in the Flemish Community of Belgium when investigating all family daycare provisions together. However, when distinguishing between licensed and registered providers, the results showed that for licensed providers a higher pre-service education was positively related to support for children's development an learning as measured with the CLASS, although only for infant and not for toddlers (Vandenbroeck et al., 2018[152]).

Professional development has shown to be positively related to process quality in family daycare. A review based on numerous studies across the world confirmed the benefits of professional development on process quality and highlighted that individualised support, including home visits by a professional, appeared the most promising way of professional development for family daycare caregivers (Bromer and Korfmacher, 2017[157]). However, they also stressed that a strong conceptual model for professional development was often lacking and deserves more attention in future research.

Several US studies showed that additional professional development was related to higher process quality (e.g. (Raikes, Raikes and Wilcox, 2005[155]; Schaack, Le and Setodji, 2017[156]). More specifically, two US studies that included measures of additional professional development showed that it was a stronger predictor of process quality than staff' pre-service education (Burchinal, Howes and Kontos, 2002[137]; Hallam, Bargreen and Ridgley, 2013[149]).

Likewise, a study from the Flemish Community of Belgium showed that staff receiving pedagogical support in the workplace showed higher levels of emotional and educational process quality in family daycare for infants with a medium-sized association, but no such association was found for care for toddlers (Hulpia et al., 2016[36]).

Furthermore, a Randomised Control Trial (RCT) study using a video feedback intervention in the Netherlands improved home-caregivers' global quality, as measured with a global environmental quality measure, but showed no differences in their sensitivity during interactions, compared to the control group (Groeneveld et al., 2011[158]).

However, one US study showed that participation in on-going training was unrelated to process quality. Important to note is that this concerned a crude measure (i.e. "yes/no") which did not distinguish between duration, length or topic of the training (Doherty et al., 2006[151]).

The evidence concerning staff work experience and relations with process quality is mixed. Two US studies reported null associations between work experience and process quality (Burchinal, Howes and Kontos, 2002[137]; Colwell et al., 2013[153]). However, a study from the Flemish Community of Belgium showed negative associations between staff' work experience and process quality in infant groups, but not in toddler groups when including the full sample of licensed and registered providers (Hulpia et al., 2016[36]). However, when looking at these groups separately it appeared that staff' work experience showed negative relations with process quality, but only for registered providers and not for licensed providers. More specifically, the results showed a negative

relation with emotional support for infants and with support for children's development and learning, for toddlers (Vandenbroeck et al., 2018[152]).

6.5. Brief summary of findings

Table 6.1summarises the results of the literature review for each level and common indicator according to the direction (i.e. negative, neutral, positive) of the association found in the literature between the structure indicator and the process quality indicators in provisions for children aged 0 to 2. A capital X indicates that there is strong evidence for this feature based on the number of studies that reported results for this aspect. A small x indicates there is weaker evidence for that particular feature.

Overall, the evidence for family daycare provisions is still scarce and largely based on US findings, which might not be representative for findings in Europe or other parts of the world. Generally, the findings converge with the evidence from centre-based provisions suggesting that similar structural features are contributing to process quality.

At the system or policy level, there are a few US studies that have demonstrated that participating in QRIS is related to higher process quality for family-based care. This appeared particularly important for staff with lower pre-service qualifications, illustrated as interaction effect in one of these studies.

At the system or policy level there is some initial evidence supporting the importance of quality monitoring and quality rating and improvements systems for process quality of family daycare in the United States. Participating in QRIS or in professional development activities related to the QRIS as well as star ratings appeared to be related to process quality.

There is not a lot of empirical evidence concerning the provider level, which in centre-based provisions was the centre level. Although most countries regulate family daycare (European Commission et al., 2014[125]; OECD, 2006[113]) to a certain extent there appear to be different ways of doing this. Some countries distinguish between registering family daycare providers, without any monitoring or supervision, and licensing of family daycare providers, which involves monitoring to a certain extent. However, there appears to be little empirical evidence supporting the added value in predicting process quality. One Canadian and one US study showed that licensed care providers offered higher process quality, but the findings from the Flemish Community of Belgium did not confirm this. Based on a sample of 100 licensed and 100 registered home-care providers no differences in process quality were found in the Flemish Community of Belgium. Vandenbroeck et al. (2018[152]) argued that the supervision for the registered home-care providers showed substantial variation, ranging from merely administrative support to pedagogical supervision, suggesting that, as a result, the differences between the licensed and registered home-care providers were not that big. The empirical finding that pedagogical support was a significant predictor of process quality only for the registered providers, lends some support to this hypothesis.

At the group level the findings are again limited and only pertain to one to three studies. Although the Canadian and Flemish study reported negative relations of child-staff ratio with process quality, the two US studies showed null associations. The findings were also not consistent with regard to group size. The US study showed negative relations with process quality whereas the Flemish study only reported a negative relation with environmental quality and not with the quality of interactions. A possible explanation

could be that considering the overall small group size in family daycare, other group or staff features matter more in providing high quality care.

At the staff level, the evidence on the importance of pre-service training appears to be more consistent. This aspect is the most commonly researched structural feature in family daycare provision with a total of seven studies reporting on the relations with process quality. The majority of studies showed that higher pre-service education was related to higher process quality, although for the Flemish study this only pertained to the overall environmental quality and not the quality of interactions. Two out of five US studies showed that pre-service education was not significant when additional in-service training was added to the equation. This relates to another finding that additional in-service training or professional development was predictive of higher process quality, although in the Flemish case again only for the overall environmental quality. Generally, family daycare providers appear to have lower educational qualifications compared to staff working in centre-based care, both in terms of the level of attainment and the specialisation of the training as was evident in studies from Australia, Canada, the Netherlands, and the United States (Bigras et al., 2010[122]; Coley et al., 2016[62]; Fuligni et al., 2009[63]; Groeneveld et al., 2010[138]; Ishimine and Tayler, 2012[139]). However, the consistent finding that professional development can contribute to higher process quality highlights the importance of investing in additional on-the-job training. The relations of staff work experience with process quality appeared to be slightly mixed. Overall, work experience was unrelated to process quality, except for family-based caregivers in the Flemish Community of Belgium. For family-based caregivers in the Flemish Community of Belgium, more work experience was associated with lower quality for infants, but no relations were found for toddlers. Moreover, there appeared a negative association with emotional support for infants and with support for children's development and learning, for toddlers, but only for registered caregivers and not for licensed providers (Vandenbroeck et al., 2018[152]).

In general, the evidence for family daycare closely resembles the evidence for centre-based care highlighting the importance of QRIS, staff' pre- and in-service training and continued professional development, and to a lesser extent smaller child-staff ratios and smaller group size in supporting higher quality.

There are a number of gaps in the current literature concerning family-based care. First of all, more empirical evidence is needed to enhance our understanding of which characteristics contribute to higher process quality. In a recent review of US research in Susman-Stillman and Banghart (2011[159]) highlighted that more research is needed to investigate the impact of family daycare on children's well-being, development and learning. Moreover they argued that more in-depth information is needed on the relations between personal, familial and contextual characteristics of caregivers and the children they care for. As pointed out, there is a tendency that disadvantaged families more often rely on family-based care. If family daycare is of poor quality with limited resources and opportunities for development and learning, these children are at double jeopardy.

Table 6.1. Summary of main findings for family daycare provisions

Associations with process quality	-	0	+	Scope of research	Comments
System or policy level					
Accountability/Quality monitoring and rating improvement systems (QRIS)			x	3 US studies	Participation and star rating related to higher process quality
Provider level					
Licensing		x	x	1 US, 1 Canadian and 1 Flemish study	Positive association between (intention to apply for) licensing and process quality, but no difference between licensed and registered providers in Flemish Comm. (Belgium)
Affiliation with network			x	1 Canadian study	Positive relation of informal networking and process quality
Group level					
Child-staff ratio	x	x		2 US studies, 1 Canadian and 1 Flemish study	Canadian and Flemish showed negative relations, whereas the US studies reported null associations
Group size	x	x		1 US study, 1 Flemish study	Flemish study showed a negative relation with overall environmental quality, but no associations with quality of interactions
% immigrant or multilingual children	x			1 Flemish study	Negative relation with overall environmental quality
Staff level					
Pre-service qualifications		x	X	5 US studies, 1 Canadian and 1 Flemish study	The Flemish study showed a positive relation with overall environmental quality, but not with the quality of interactions. 2 US studies showed null associations with pre-service education, but rather with additional in-service training
In-service training/Professional development			X	4 US studies, 1 Flemish study, 1 Dutch study and 1 international meta-analysis	PD positively related to process quality. However, only positive relation for infant care and not for toddler care in the Flemish study
Work experience	x	x		2 US studies, 1 Flemish study	US studies showed no relations and Flemish study showed negative relations for infant care and null associations for toddler care

7. Relations between structural and process quality with child development, well-being and learning

The effects of ECEC quality on children's development, well-being and learning have been well established in the literature and generally there is consensus that besides the home environment, ECEC process quality is the primary driver of children's development (Melhuish et al., 2015[19]). Structural features might also directly influence children's development, well-being and learning. However, structural features are generally presupposed to create the conditions under which staff establish relationships in a way to nurture children's whole development and allow them to develop their potential. This reflects an underlying mechanism or mediation path in which process quality mediates the relation between structural quality and children's development, well-being and learning., . While the empirical evidence to support this hypothesis is weak, as will be detailed below, this assumption has implications for policy and practice in view of enhancing quality and ultimately children's development, well-being and learning.

7.1. Structural and process quality, and child development, well-being and learning

Commonly studied classroom characteristics are group size and child-staff ratio. A recent meta-analysis based on US ECEC programme evaluation studies published between 1960 and 2007 showed non-linear relations between group size and child-staff ratios with children's cognitive development and achievement (Bowne et al., 2017[160]) with an optimum of 7.5 children to 1 adult and a maximum group size of 15 children. The results were less clear for children's socio-emotional outcomes due to a small sample size.

Based on a large-scale survey study conducted in the United States, Blau (1999[161]) found that smaller group size during the preschool years was predictive of better vocabulary skills for children across Pre-K and elementary school and higher reading skills across elementary school from age 5 years onwards. The average group size was 5.9 (with a standard deviation of 6.7) and pertained to different centre-based and family daycare arrangements. Also other studies have shown that smaller group size in preschool was related to better literacy or vocabulary skills in Germany and the United States (Ebert et al., 2013[162]; Mashburn et al., 2008[76]). Another US study reported a small, positive effect of child-staff ratio on children's math scores, but not on reading or socio-emotional development (Colwell et al., 2013[153]). However, group size was positively associated with children's emotional and behavioural regulation, but not with reading or math.

However, other US studies revealed that group size and child-staff ratio were unrelated to children's language and literacy skills (Howes et al., 2008[2]; Mashburn et al., 2009[163]; Montie, Xiang and Schweinhart, 2006[164]) The two US studies reported an average child-staff ratio ranging from 6.92 to 8.02 and an average group size of 17.6. Both studies showed considerable variation in ratio and group size but the effects on child outcomes were modelled together with a measure for process quality and the latter appeared to be predictive of outcomes, which is in line with the literature suggesting that process quality

is a more direct and proximal determinant of children's outcomes compared to the more distal classroom features.

A cross-national study reported an average group size of 20 children (standard deviation of 8 and range 4 to 49 children) and explained the overall null associations by inconsistent relations between group size and child outcomes across countries, indicating country-specific patterns (Montie, Xiang and Schweinhart, 2006[164]). The study by Mashburn et al. (2008[76]) only reported a significant negative association between group size, with a cut-off point of 20 children or less in the classroom, and literacy skills, but no associations were found for language and cognitive skills and child-staff ratio was unrelated to all outcomes.

Classroom composition has shown to affect children's development as well. For instance, a German study demonstrated that preschoolers' vocabulary skills were lower and showed less growth over time in classrooms with a larger share of immigrant children (Ebert et al., 2013[162]). Likewise other studies from the Netherlands and the United States have shown that low-income children attending preschools with a larger share of other less affluent children made less progress in their language (Schnechter and Bye, 2007[165]) or literacy development (de Haan et al., 2013[166]) compared to their counterparts in more socio-economically mixed preschool classrooms.

Evidence on the importance of staff's pre-service qualifications is mixed. Some European studies and a cross-national study revealed that higher staff education was positively related to children's language (Bauchmüller, Grøtz and Rasmussen, 2014[167]; Montie, Xiang and Schweinhart, 2006[164]) and literacy outcomes (Sylva et al., 2004[69]).

However, studies from the United States showed mixed findings. Two studies showed null associations with children's language and literacy skills (Early et al., 2006[92]; Mashburn et al., 2008[76]), one of which distinguished four education levels and the other compared teachers with a Bachelor's degree versus teachers with lower qualifications. Another US study revealed positive correlations of staff' qualifications with literacy outcomes, but not with language, math and socio-emotional outcomes. However, when investigated in a multivariate model that included measures of process quality, a relation between having a Bachelor's degree with socio-emotional skills was the only significant association that remained (Howes et al., 2008[2]). Another US study showed mostly no relations between staff's years of education and children's language and literacy skills, except for one measure (Connor et al., 2005[20]). For a specific measure of children's literacy skills, namely decoding skills, a negative relation appeared. Lastly, another US study reported null relations of pre-service qualifications with children's math, reading and social competence, but small positive associations with emotional and behavioural regulation, attention and concentration (Colwell et al., 2013[153]).

A recently published meta-analysis revealed null associations between staff' educational qualifications and children's language and math outcomes (Falenchuk et al., 2017[168]). Several problematic issues occurred in the analysis, such as heterogeneity in how staff education was defined across studies (i.e. use of ordinal scales ranging from 3 to 6 categories and dichotomous variables with different cut point at the associate, bachelor or master level) and uncertainty or variability about whose educational qualifications were measured (i.e. head teacher, all teaching staff or an average of multiple teachers), which could at least in part explain the lack of significant findings. In a subset of more homogeneous studies a small positive relation occurred between staff' qualifications and language outcomes, but not for math.

The evidence base for additional training and professional development is more consistent and the results indicated a positive relation with children's developmental outcomes. Several recent review studies and meta-analyses showed small-to-medium effects of professional development interventions on children's language and literacy skills (e.g. Egert (2015[100]); Jensen and Rasmussen (2015[169]); Markussen-Brown et al (2017[101])).

One study looked at structural features of family daycare and reported no associations between caregiver's education level, group size and child-staff ratio with children's math, reading and three measures of socio-emotional development (Colwell et al., 2013[153]).

7.2. Indirect associations between structural quality and child development, well-being and learning

Despite the strong theoretical assumption that structural staff and classroom features affect children's development through process quality, the empirical evidence supporting this notion is scarce (Melhuish et al., 2015[19]). Thus far only three studies have investigated mediation effects in early childhood education and care. First, the large-scale study in daycare carried out by the NICHD Early Child Care Research Network (2002[3]) investigated two mediational paths using child-staff ratio and staff's qualifications as structural features. The results confirmed indirect paths of staff's qualifications and child-staff ratio through process quality to children's cognitive development, although the effects were small (β=.07 and β=-.02 respectively). These indirect effects were smaller than the direct effects of process quality, specifically aspects of emotionally supportive staff-child interactions on child development, well-being and learning reported in the same study (β =.10).

Furthermore, Connor et al. (2005[20]) also investigated indirect and direct effects of structural and process quality on first graders' vocabulary and reading skills. The findings revealed that higher teacher education only influenced children's vocabulary skills indirectly through staff's warmth and responsivity, although with a small effect.

A Danish study involving over 3,000 preschool children and 400 teachers showed that the indirect effects of structural characteristics on children's growth in language and pre-literacy skills were small with beta's of .02 (Slot et al., in press[21]). Process quality, specifically emotional support and classroom organisation, mediated between the proportion of non-Danish children in the classroom and children's language and pre-literacy skills. A possible reason for a lack of stronger results could be that structural staff and classroom characteristics, overall, explained little variance in observed process quality.

Lastly, the meta-analysis of Markussen-Brown et al. (2017[101]) also investigated mediation effects of professional development on child outcomes through process quality. Despite positive effects of professional development on process quality and positive associations with children's language and literacy outcomes, there appeared no significant mediation effect. It is important to note, however, that only a few studies (depending on the outcome measure ranging from five to eleven) included both process quality and child outcome measures, which could at least in part explain the null association. The authors underline the importance of more rigorous research into effects of professional development and the underlying theory of change.

The evidence concerning indirect effects of structural teacher and classroom features on children's well-being, development and learning remains scarce, but there are some first

indications that such relations exist. To date, this body of research has focused on only a few structural features (i.e. pre-service qualifications or child-staff ratio), thus more research is warranted to further investigate how structural and process quality affect children's well-being, development and learning.

8. Conclusions and future directions

The current literature review focused on relations between structural and process quality and aimed to contribute to the current body of knowledge by investigating structural features at different levels: the policy or system level; the centre or organisational level; the classroom level; and the staff level (see Figure 1.1 for the conceptual model). The first part of the review (Chapter 3) focused on evidence for provision for children aged 3 to 5 in centre-based care as the knowledge base is strongest for this age group. In the second part (Chapter 5) the evidence for the children aged 0 to 2 was addressed, followed by the evidence for family daycare (Chapter 6). The findings show considerable convergence across age ranges and type of provisions. Taking the conceptual model as starting point a few aspects will be highlighted.

At the policy or system level it appeared that quality monitoring and improvement systems, in the United States referred to as QRIS, can contribute to higher process quality. There is evidence across ages and types of provisions that taking part in QRIS or QRIS-related professional development activities or star ratings are related to higher process quality. An important caveat is, however, that QRIS seem to distinguish between low and high quality, but do not always appear sensitive enough to differentiate between levels of quality. Of course in view of inspection it is foremost important to eliminate low quality, but in order to improve quality, more sensitive measures might be necessary. There is some evidence that QRIS that are based on existing observational tools, which are consequently used to monitor and evaluate ECEC quality, appear more promising in differentiating between different levels of quality. Hence, a strong alignment between the system for quality monitoring and inspection with the measures used to evaluate process quality seems a good step forward in improving process quality. The United States already has a longer tradition of using the ERS and increasingly also the CLASS as basis for their quality monitoring. Recently also the Flemish Community of Belgium adopted this approach and uses the CLASS as basis for their quality monitoring and inspection for provisions for children aged 0 to 2.

The organisational or centre level appeared an understudied topic across all ages and types of provisions. However, initial evidence suggests that aspects like the organisational climate and leadership are important in predicting process quality. As centres also have an important role in providing the working conditions for staff, such as working hours, workload and wages. There is little research available on these aspects, but there is some initial evidence suggesting that higher pay is beneficial for process quality.

Numerous studies investigated the relations between classroom level characteristics, such as group size and child-staff ratio, and process quality. Generally, the evidence supports that smaller group sizes and child-staff ratios are related to higher process quality across the 0 to 5 age range in centre-based care. Concerning family daycare, the evidence appears to be more mixed. This could reflect the relatively low number of studies for family daycare that were not always comparable in the number and type of structural features that were included. However, also for the centre-based care there are a few

studies showing null associations of group size and child-staff ratio with process quality. Possibly other confounding structural features at the classroom or staff level played a role here.

Also at the staff level there is considerable research that addressed pre- and in-service education and work experience in relation to process quality. The majority of studies across the whole age range and across different types of provisions support that higher pre-service qualifications and additional in-service training or professional development is positively associated with process quality. However, there also appeared some inconsistencies regarding staff' pre-service education that might suggest that there is a certain threshold needed to provide higher process quality. Concerning work experience the evidence is more mixed. This could be due to other, confounding, structural characteristics or possibly point to the fact that this is not a linear relation. In the case of work experience it could be that there is a certain optimum somewhere in the midst of their career for staff to provide high process quality. Further research is needed to explore this option.

The conceptual model illustrated the different levels at which structural features can affect process quality. To date, the majority of research has focused on two of these layers, which are the most distal levels: the staff and the classroom level. The centre or organisational level and the system or policy level appeared to be understudied topics across all age ranges and types of provisions. However as we will elaborate on below, the findings of the current review highlight the importance of these levels, thus more research taking into account all different levels is needed to better understand how each of these levels contributes to process quality. This relates to another finding, which concerns the sometimes inconsistent results found in studies.

Although the majority of the research findings point into the same direction, there also appeared a few inconsistencies, which were particularly related to staff level features, such as work experience, and classroom level characteristics, such as group size or child-staff ratio. A possible reason for these inconsistent findings could be the interrelatedness of these features. For instance, some of the results showed that more experienced staff worked in classrooms with more children, which could mean that the positive effect of the one (work experience) masks the negative effect of the other (larger group size or unfavourable child-staff ratio). This means that in order to better understand the nature of the relationship between structural features and process quality, this complex interaction between structural features needs to be taken into account. Some examples already exist in which a cluster or profile approach is taken to see which combination of structural features is related to process quality. This also illustrates the contextual nature of these relations and more research is needed to find out if some common patterns can be identified.

Structural features are presupposed to affect children's well-being, development and learning indirectly through process quality, but the empirical evidence to support this relation is scarce. Based on the current review there are some first indications that such relations exist, but to date this body of research has focused on only a few structural features (i.e. pre-service qualifications or child-staff ratio). Thus more research is warranted to further investigate how structural and process dimensions affect children's well-being, development and learning.

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