Infant Child Care Quality in Portugal: Associations with Structural Characteristics

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Abstract

This study examines the quality of infant center care in Portugal through a multi-measure approach and investigates the associations among process quality dimensions and structural quality indicators. Ninety infant child care classrooms were observed during two full mornings with the ITERS-R, the CLASS-Infant and the CIS. Results revealed that a two-factor structure of process quality with the domains (a) Relationships and (b) Use of Space and Materials provided the best fit to the data. Of the structural indicators that were examined, teacher training showed the most robust relation to both process quality domains. In addition, classrooms with smaller groups and in centers located in non-urban areas were likely to show more sensitive relationships between teachers and infants. These findings have implications for public policy and professional development efforts on infant center care.

Keywords: Infants; Early childhood education and care; Process quality; Structural quality

Infant Child Care Quality in Portugal: Associations with Structural Indicators

Early childhood education and care (ECEC) for very young infants has increased in many parts of the world (Organization for Economic Co-operation and Development [OECD], 2011). Maternal employment, combined with limited maternal leave in some countries, has created a high demand for ECE. Consequently, an increasing number of infants in many countries spend a substantial amount of time in out-of-home care, much of it center-based (OECD, 2001; Ruhm & Waldfogel, 2011; White, Peter, & Redder, 2015). This study examines dimensions of quality of infant center care in Portugal, using multiple quality measures that have been used in several other countries. The first goal was to understand the level of classroom quality for Portuguese infants entering center care at about 6 months of age, especially as compared to other nations. The second goal was to study the relations among different quality measures by using a new measure along with two of the most widely used observational tools. The third goal was to assess the degree to which structural indicators predict different indices of quality in infant classrooms, with an intent to inform program improvement efforts via policy and professional development.

The sections below describe the need for and context of infant care in Portugal and the increasing interest in quality. This is followed by a brief review of the literature on infant care quality and relations among structural and process quality indices.

The Need for Infant/Toddler Care

Across Europe, the provision of quality ECEC for very young children has been emphasized, not only to support parents' labor market participation but also as a means to enhance child development (European Commission/EACEA/Eurydice/Eurostat, 2014). Most European countries are committed to improving its access and affordability. However, particularly for infants and toddlers, the demand for ECEC is

higher than supply in some regions. In addition, in some countries, such as Portugal, ECEC for infants and toddlers is not considered part of the educational system. Portugal has two different systems of ECEC: one for children between 3 years old and the beginning of mandatory school (6 years old), regulated by the Ministry of Education; and one for children under 3 years old, regulated by the Ministry of Solidarity, Employment and Social Security.

In Portugal, over 60% of children live with parents who are both working full-time (OECD, 2011). By the time their child is 3 years old, a much larger percentage of Portuguese mothers are in the workforce (76%) compared to the European Union (EU) overall (57%). Unlike most EU countries, Portuguese mothers' economic activity after maternity leave remains stable regardless of their children's age (Eurydice, 2009). In Portugal formal child care settings for children under 3 years old include both center-based care and home-based care, although the latter is considerably less used. In 2013, places in these formal settings were available for 46.2% of children younger than 3 years old (Gabinete de Estratégia e Planeamento / Ministério da Solidariedade, Emprego e Segurança Social, n.d.a), a much higher proportion than the European average of approximately 30%, but still not sufficient (European Commission/EACEA/ Eurydice/Eurostat, 2014). Availability varies by district; specifically, in larger urban areas such as the district of Porto where this study took place, demand is still higher than supply. The area of Porto is also distinct as it has one of the highest proportions of children under 3 in the country.

The growing numbers of infants and toddlers in ECEC has occurred during the same period of time that neuroscience research has highlighted the impact of environmental factors in brain development at young ages (e.g., Lenroot & Giedd, 2011). Although change can occur throughout life, it is during the first five years that

most of the brain development occurs (Lee & Hoaken, 2007), and especially in the first two years of life. Shapiro and Applegate (2002) highlight that this period is a critical time as neurobiological foundations of adaptive capacity are in the formative stages of development. Furthermore, it has also been acknowledged that disparities in cognitive, social, behavioral, and health status between children from low-income and from higher income families appear as early as 9 months of age (Halle et al., 2009). In these first years of life, high-quality ECEC might reduce the negative impact of poverty, low maternal education, and other risk factors associated with negative child outcomes (e.g., Duncan, Brooks-Gunn, & Klebanov, 1994; Huston, McLoyd, & Coll, 1994; Love et al., 2005; National Institute on Child Health and Human Development [NICHD] Early Childhood Research Network, 2005).

Quality of ECEC for Infants and Toddlers

Extensive child care literature documents the quality of preschool ECEC in many parts of the world, such as in the US, Australia, and several European countries, demonstrating that children who experience higher quality care show higher levels of academic, social, and executive function skills (Burchinal, Magnuson, Powell, & Hong, 2015; Bryant et al., 2003; NICHD Early Childhood Research Network, 2000, 2006; Peisner-Feinberg & Burchinal, 1997; Peisner-Feinberg et al., 2001; Schweinhart, & Weikart, 1988). Evidence also suggests the importance of quality of care in infant and toddler classrooms for child outcomes (e.g., Burchinal, Roberts, Nabors, & Bryant, 1996; De Schipper, Van Ijzendoorn, & Tavecchio, 2004; Love et al., 2005; NICHD Early Childhood Research Network, 2000, 2006; Pessanha, Pinto, & Barros, 2009; Pinto, 2006; Pinto, Pessanha, & Aguiar, 2013; Ramey et al., 2000; White et al., 2015).

Despite the importance of quality of care, the studies that have examined infant ECEC raise questions about the quality of the education and care experiences provided

to infants and toddlers, especially in terms of the quality of caregiver-infant relationships. In Portugal, a previous study of toddler ECEC found that only 39% of the 160 observed classrooms provided quality that minimally met custodial care needs and basic developmental needs (Barros & Aguiar, 2010). In the US, although quality levels are generally higher, concerns about ECEC for infants and toddlers are also evident (NICHD Early Childhood Research Network, 2000, 2005; Phillipsen, Burchinal, Howes, & Cryer, 1997). More recently, a small US study of 30 infant classrooms revealed that global quality and teacher-child interactions were in the medium range (e.g., Jamison, Cabell, LoCasale-Crouch, Hamre, & Pianta, 2014; La Paro, Williamson, & Hatfield, 2014).

Across studies, quality has been conceptualized and measured from different perspectives. Important issues in the study of quality are the distinction between structural and process quality and whether process quality is a comprehensive construct or a multidimensional one with inter-related components (Dickinson, 2003).

Conceptualizing and Measuring Quality in Infant/Toddler Classrooms

Research on the quality of ECEC typically assesses two types of variables: structural indicators and process indicators (e.g., Bryant, Burchinal, & Zaslow, 2011; Cryer, 1999; Howes et al., 2008; Vandell, 2004). Structural indicators refer to aspects that are usually more quantitative and easily measured or observed, and that can be regulated, such as teacher education levels, child:adult ratios, and group size (Peisner-Feinberg & Yazejian, 2010). Structural indicators are usually regulated at the state or country level and are considered as providing the conditions for process quality (Cryer et al., 1999).

Process indicators refer to children’s direct and daily experiences in the classroom, such as the frequency and type of interactions children have with their caregivers and

peers and the activities and materials with which they interact (Phillipsen et al., 1997; Vandell, 2004). Process quality is considered the more proximal quality measure (Helmerhorst, Riksen-Walraven, Vermeer, Fukkink, & Tavecchio, 2014). Importantly, the specific indicators that are considered crucial and the way process quality is operationalized have varied, contributing to a lack of consensus on what are the core dimensions of process quality.

For many years, the Infant/Toddler Environment Rating Scale (ITERS/ITERS-Revised; Harms, Cryer, & Clifford, 1990, 2003, 2006) has been the standard quality measure in both research and policy studies. The ITERS/ITERS-Revised has been considered mainly to be a process quality measure (e.g., Phillipsen et al., 1997; Vandell & Wolfe, 2000), and it encompasses a broad range of indicators, including the interactions between caregivers and children, the care routines and activities, and physical features of the environment such as quantity and availability of materials in the classroom. Although ITERS includes static aspects of the classroom such as space and materials, item scores rely upon the observation of how they are actually used by adults and children. Of note is that process quality as operationalized by the ITERS/ITERS-R is broader than other measures of process quality that specifically focus on teacher-child and peer interactions. Specifically, the authors assume that physical environment, child relationships with other children and with adults and instruction features are intertwined (Harms, Clifford, & Cryer, 1990). Thus, process quality as defined by this authors includes the interactions between staff and children, the interactions children have with the materials and activities in the classroom, as well as other features, namely space, schedule and materials, that support these interactions (Tietze & Cryer, 2004; Harms et al., 2006). While ITERS is intended to represent a global measure of process quality (Harms et al., 1990), empirical studies have sometimes found more than a one-factor

solution (Barros & Leal, 2011; Hestenes, Cassidy, Hegde, & Lower, 2007; Tietze & Cryer, 2004). These results raise questions of whether process quality can be described as a global construct or whether there are several core domains that, even though interrelated, should be differentiated (Dickinson, 2003).

Moreover, the ITERS-R provides a broad, overall picture of what some researchers believe is the core of process quality, specifically the quality of caregiver-child interactions, which are likely to be particularly important for infants. Therefore, some authors consider that teacher-child interactions should be studied in more detail and separately from other indicators, and thus new measures of process quality have been developed (Jamison et al., 2014).

An observational measure that focuses specifically on the teacher-child interactions is the Caregiver Interaction Scale (CIS; Arnett, 1989). The CIS covers the infant to preschool age range and has been frequently used over the years. It focuses on teacher's warmth, sensitivity, and discipline style. However, some authors have raised questions concerning its relevance given that it does not include the most recent knowledge regarding caregiver-infant interactions (Jamison et al., 2014). A widely used preschool measure, the Classroom Assessing Scoring System (CLASS; LaParo, Hamre, & Pianta, 2012; Pianta, LaParo, & Hamre, 2008) has been recently adapted for use in infant classrooms to study specific dimensions of teacher-child interaction.

The study reported here includes all three of the above-mentioned measures. They each purport to assess "process quality", although their subscales and factors home in on more specific and somewhat different aspects of the early learning environments. The use of multiple measures will allow for a more comprehensive assessment of process quality and more accurately and appropriately measure its core features (Dickinson, 2006; Ishimine & Tayler, 2014). In addition, as Burchinal, Kainz, and Cai

(2011) have highlighted, the use of a wider set of classroom indicators can help examine the core dimensions of process quality, which is a particular interest in this study.

Importantly, a stronger emphasis on the quality of the interactions between caregivers and children has been recently placed (Jamison et al., 2014; La Paro, Williamson, & Hatfield, 2014). Framed by an ecological and developmental perspective (Bronfenbrenner & Morris, 1998), recent conceptualizations of process quality consider that the daily interactions between children and caregivers are the primary mechanisms producing development. Following this perspective, both theory and empirical studies document that infants must rely on their caregivers to meet even their most basic needs, and for infants to thrive, those caregivers must be responsive and sensitive to children's needs and interests (La Paro et al., 2014). For young infants, the sensitivity and responsiveness of the caregivers is probably the most critical dimension of environmental quality in both the home and ECEC setting (e.g., National Association for the Education of Young Children [NAEYC], 2009).

However, infants' direct experiences in the classroom do not include only interactions with teachers, but also with toys and materials. The interactions of the infants with materials with or without the support of a teacher are likely to be important for learning and development as well (Helmerhorst et al., 2014; Vandell, 2004). It is widely believed that the opportunity for diverse age-appropriate activities, especially those involving a caregiver, is important for early development (NAEYC, 2009). Also the interactions that infants have with materials with different levels of complexity can be viewed as proximal mechanisms that can boost learning and development (Bronfenbrenner & Morris, 1998). In particular, although physical features of the environment could be considered more static and thus less process-oriented than caregiver-child interactions, children's access to them and their actual usage are highly

dependent upon a particular activity or set of strategies, and are likely to vary across the day (Helmerhorst et al., 2014). In addition, young children, especially non-mobile infants, are enabled to engage with toys and learn from classroom materials only via the actions of their caregivers. Therefore, the interactions between infants and materials can be viewed as dynamic, process-oriented features with teachers' ongoing actions playing an important role in sustaining those types of interactions. In this study, we take this comprehensive view of process quality and consider both the quality of the relationships between caregivers and infants and the quality of the experiences that infants have with materials and within activities (Helmerhorst et al., 2014; Vandell, 2004). This study attempts to examine whether these two core dimensions or an overall domain will most comprehensively capture the process quality.

Structural indicators of quality

Structural quality indicators are also thought to be important for infants' ECEC, especially in many European countries in which the governance and regulation of services for infants/toddlers falls under the responsibility of welfare and social security authorities, rather than education (Gregoriadis, Tsigilis, Grammatikopoulos, & Kouli, 2015). Because of this, regulations regarding education guidelines and staff qualifications are not as strict as those for older children, thus introducing greater variation in the structural indicators. This is particularly important in the case of Portugal where, due to the less restrictive regulations, it is possible to find low quality structural conditions that may impact process quality. Understanding the associations between structural indicators and process quality can help determine the indicators that should be targeted for improvement. In this study, we examined five structural indicators: group size and adult:child ratio, staff qualifications, caregiver experience, and location (urban vs. rural/suburban).

Regarding the number of adults and children, not surprisingly, it is widely accepted that group size and adult:child ratios will limit the quality of infant ECEC (Goelman et al., 2006; Phillips, Mekos, Scarr, McCartney, & Abbott-Shim, 2000). The provider whose class consists of too many infants will not be able to establish sensitive interactions with each child, and may not even be able to provide adequate custodial care. Some studies have examined associations between group size and process quality in infant and toddler ECEC. The quality of relationships between provider and infants was higher when group size was lower (Deynoot-Schaub & Riksen-Walraven, 2005) and when ratios were also lower (Barros & Aguiar, 2010; Cost, Quality, & Child Outcomes Study Team, 1995; Jamison et al., 2014). Moreover, higher caregiver sensitivity was found to be related to a higher number of adults in the classroom (Goelman et al., 2006). International professional recommendations for ECEC for infants under the age of 12 months include a group size of 6 and provider-child ratio of 1:3 (American Academy of Pediatrics & American Public Health Association, 2002). In Portugal, both ratios and group size are very high when compared to other countries, specifically, the Portuguese legislation allows infant classrooms to have up to 10 infants with a 1:5 adult:child ratio (Portaria n.º 262/2011, August 31st).

Regarding staff qualifications, caregiver formal education has been one of the most important mechanisms used to increase child care quality (Burchinal, Cryer, Clifford, & Howes, 2002; Norris, 2010; Shin, 2015) although the evidence to link more college credits to better quality is mixed (Pianta, Hamre, & Downer, 2011). Associations between a higher level of teacher formal education and global quality in ECEC have been found in some studies (e.g., NICHD Early Child Care Research Network, 1996; Phillips et al., 2000; Phillipsen et al., 1997), though not in others (e.g., Early et al., 2007; van IJzendoorn, Taveccio, Stams, Verhoeven, & Reiling, 1998). In a study

involving infants, toddlers and preschool classrooms, Burchinal et al. (2002) reported that higher formal education and in-service training (workshop attendance) were associated with higher quality. In another study conducted in Portuguese toddler classrooms, teacher education level was also related to ECEC quality (Barros & Leal, 2011), but these associations have not yet been examined in infant classrooms. Importantly, the variations of staff qualifications in infant classrooms are even greater when compared to toddler classrooms. In fact in Portugal, caregivers working in infant classrooms are not required to have any specific education in ECEC, thus the possibility that infant caregivers may only a have primary school education.

The associations between caregiver's years of experience in ECEC and global quality have been also examined in infant and toddler classrooms, however findings are somewhat inconsistent. While in some studies the associations have been negative (e.g., Pessanha, Aguiar, & Bairrão, 2007; van IJzendoorn et al., 1998), in one recent study a positive moderate association was found between relational climate and number of years teaching infants (Jamison et al., 2014).

Possible differences in ECEC quality along the urban-rural continuum have also been hypothesized (Bratsch, 2011; Grace, Zaslow, Brown, Aufseeser, & Bell, 2011). Results from a large, nationally representative sample of US infants followed into school showed differences in urban, suburban, and rural children's early academic skills that were differentially related to poverty, home environments, parental knowledge and/or use of home versus center-based child care (Miller & Votruba-Drzal, 2013). Also in the US, rural children have been found to have fewer available center-based care services and lower attendance rates (Gordon & Chase-Lansdale, 2001; Grace at al., 2006). Moreover, in a five-state study, infants in rural areas were more likely to experience higher child:teacher ratios (Maher, Frestedt, & Grace, 2008), indicating that

these might be lower quality settings. In Portugal, rural and urban areas are highly dissimilar regarding the available resources and opportunities. For instance, the population of the inland of the country, characterized as more rural, has lower levels of education (Pordata, 2011) and higher rates of unemployment (Nunes & Barros, 2010), when compared with the urban centers. Regarding child care, attendance rates are lower in the Portuguese rural areas (Equipa de Estudos e Políticas, 2013).

In summary, research has identified several structural indicators that can affect process quality in infant classrooms, but findings on the associations between structural and process quality are far from conclusive. Because there is considerable variation on structural features across settings in Portugal, due to the lower regulatory standards, examining the associations between structural and process quality in infant classrooms in Portugal can contribute to an enhanced understanding of the most important structural aspects to improve process quality.

The current study

This study addresses three aims. First, this study intends to describe the quality of infant ECEC in Portugal using comprehensive tools that allow comparison to other countries. Compared to other European countries, Portugal has a higher proportion of infants and toddlers in center-based care and lower regulatory standards. This study includes two widely used and one recent observational measure of infant ECEC quality, specifically the ITERS-R, CIS, and CLASS-Infant, in order to contribute to more infant-specific knowledge to the field.

Second, through the use of multiple observational tools measuring broad as well as specific aspects of classroom quality, the study intends to examine the core dimensions of infant ECEC quality. Guided by the bioecological model and prior research (Vandell, 2004), we hypothesize that two core domains will best describe process quality in infant

classrooms, (a) teacher-infant interactions and relationships, and (b) engagement with materials and within activities. By providing a comprehensive characterization of the process quality through the lenses of three distinct observational measures, this study provides a unique look into core aspects that are shared by these measures.

Third, we aim at investigating the relation of structural characteristics to process quality in infant classrooms, to determine whether our results replicate other US and European results, and to learn whether certain structural characteristics should be targeted for improvement via policymaking and professional development.

Method

Participants

Data for this paper are part of a broader study about infants' transition into center-based care and education. Ninety infant child care classrooms from the greater metropolitan area of Porto, Portugal, were observed in this study. From the 418 institutions (147 private for-profit and 271 private nonprofit) registered at the Ministry of Solidarity, Employment and Social Security website (Gabinete de Estratégia e Planeamento / Ministério da Solidariedade, Emprego e Segurança Social, n.d.b) in May, 2013, only 232 (41 for-profit centers and 181 nonprofit centers) had an infant classroom. These centers were randomly sequenced and contacted. The first 90 centers that met the project criteria, namely having at least one family who registered their infant aged between 4 and 9 months to start attending child care between September 2013 and February 2014, and agreed to participate were recruited into the study. These criteria were requirements of the broader project, given its focus on infants' transition into childcare. Overall, the consent rate was 72.6%, respectively 75.2% and 53.3% for the nonprofit and for the for-profit centers. Specifically, among the non-profits contacted following the random sequence, 82 centers participated in the study and 27

refused to participate. Among the for-profit centers contacted, eight participated in the study and seven did not agree to participate. Of the 90 centers, 49 (54.4%) were located in urban areas (city of Porto or other smaller cities included in the greater metropolitan area of Porto); the others were suburban or rural.

Informed consent was obtained from directors and from the teacher responsible for the infant classrooms. The Portuguese Data Protection Authority approved the project and all data collection procedures.

Table 1 provides descriptives of the structural characteristics. Regarding mean group sizes and ratios computed from data collected in two days of observation, the average number of children varied between 1 and 10.50 (M = 5.25, SD = 1.97), the average number of adults varied between 1 and 3.63 (M = 1.91, SD = 0.53) and the average infant:adult ratio varied between 0.5 (i.e., two adults and only one child) and 7.00 (M = 2.65, SD = 1.20). The ages of children in these classrooms varied between 3 and 9 months and, on average, the youngest child in the classroom was 4.99 months and the oldest 10.79 months.

Although in Portuguese the word teacher (i.e., “educador”) is reserved for those adults who have a degree, in this paper, all adults who work in the classroom will be mentioned as teachers. Portuguese legislation (Portaria n.º 262/2011, August 31st) does not require child care centers to have a trained teacher working in classrooms for infants. The following information concerns the lead teacher, the adult who is responsible for the group. In these 90 classrooms, 28 (31%) had a trained lead teacher with a university-level degree in Early Childhood Education (ECE), although only 15 of these trained teachers (17%) worked full time in the infant classrooms. These teachers were assigned to more than one classroom, and thus were not full time in the infant classroom. In the other 62 classrooms, most of the lead teachers (51%) had basic

education (9 years of schooling), 39% had a high-school degree (12 years of schooling) and 10% had only completed elementary school (4 years of schooling). All lead teachers were females; all but one were Portuguese; their age ranged between 20 and 64 years old (M = 42.53, SD = 9.97); and their experience of work in child care ranged between 1 month and 37 years (M = 8.36, SD = 6.51). Staff usually works full time in the child care centers, with an equal number of hours across the week days. Regarding teachers' monthly salary, the majority of non-trained teachers (n = 55) had salaries between 482€ and 580€, and none earned more than 680 euros. Trained teachers' salaries showed more variability, from "less than 482€" ($548 USD, approximately) to "between 1781€ and 1880€" ($2,025 USD - $2,138 USD), although only three teachers earned more than 1080€ ($1,228 USD).

Measures

Each classroom was observed during two full mornings of 3 to 4 hours to score the ITERS-R, the CLASS-Infant and the CIS. One set of data collectors rated ITERS-R on one day, and a different set of data collectors coded the CLASS-Infant and CIS on a different day within 3 days after or previous to the ITERS-R observation. The ITERS-R observation was followed by a brief interview with the lead teacher. The group size and number of adults were observed during data collection in two days of observation, and the number of adults, children and ratio (i.e., children per adult) were then averaged across the two days. Teachers were asked to complete a short questionnaire about their training, education, experience, and classroom enrollment. All data were collected between September 2013 and March 2014. Measures are described below, including training and reliability of data collectors.

Process quality.

Infant/Toddler Environment Rating Scale – Revised (ITERS-R; Harms, Cryer, & Clifford, 2006). The Portuguese translation of the ITERS-R (Harms, Cryer, & Clifford, 2012) was used to assess classrooms' global quality. The ITERS-R includes 39 items organized under seven conceptually defined subscales: Space and Furnishings, Personal Care Routines, Listening and Talking, Activities, Interaction, Program Structure, and Parents and Staff. The seven items of the Parents and Staff subscale were not included in the analyses, following other studies (Bisceglia et al., 2009; Cárcamo et al., 2014). Each item is scored in a 7-point scale. The instrument presents detailed descriptors for 1 (*inadequate*), 3 (*minimal*), 5 (*good*), and 7 (*excellent*). As the ITERS-R applies to both toddler and infant classrooms, some items are applicable to toddler but not to infant classrooms. Specifically, for classrooms with children under 12 months of age, a score of "Not Applicable" (NA) is allowed for the items 17 (Art), 19 (Blocks) and 21 (Sand and water play). Additionally, following the ITERS-R instructions, items 23 (Use of TV, video, and/or computer), 31 (Group play activities) and 32 (Provisions for children with disabilities) are scored NA if the situation they describe does not happen in that classroom. Therefore, those six items were excluded from the analyses, following the procedure of previous studies (e.g., Barros & Aguiar, 2010; Hestenes et al., 2007; Tietze, Cryer, Bairrão, Palacios, & Wetzel, 1996). Cronbach's alpha coefficient was .78 for the overall scale and .81 for the overall scale excluding the Staff and Parents' items. Training, reliability and ongoing supervision of data collectors were provided by a supervisor who had attended the FPG Short Course training on the ITERS-R. Following the authors' recommendations (Harms et al., 2006), all observers scored and discussed the ITERS-R training video (Harms & Cryer, 2003). Then they all scored and discussed a Portuguese video prepared for training purposes, and conducted live observations in groups of two or three. During their first observation for data collection

purposes, observers had the supervision of the master coder. To assess inter-rater reliability during data collection, in 23 of the 90 classrooms (i.e., 25.6%) ITERS-R was scored independently by the gold standard observer and another observer. These observations were spread throughout the data collection period, with frequent meetings to discuss scores. Across reliability sessions, the exact agreement averaged 89.5%, within-one point agreement averaged 92.2%, and weighted kappa averaged 0.73.

Caregiver Interaction Scale (CIS; Arnett, 1989). The CIS is an observational measure of the interactions between caregivers and the children in their care. It assesses the emotional tone, discipline style, and responsiveness of the adults in the classroom (Arnett, 1989). Observers are to consider all caregivers who interacted with children in their ratings on 26 items on a scale ranging from 1 (not at all), to 4 (very much). This is a widely used measure with established validity and reliability, including in Portugal (Cadima, Peixoto, & Leal, 2012; Colwell, Gordon, Fujimoto, Kaestner, & Korenman, 2013; Cryer, Tietze, Burchinal, Leal, & Palacios, 1999). The original scale comprises four dimensions, Sensitivity, Harshness, Detachment, and Permissiveness. However, results from large-scale studies support other factor structures, namely two- or three-factor solutions, and exclude the fourth factor (Permissiveness) due to the reduced number of items and to their skewness (Colwell et al., 2013). In Portugal, the three-factor solution has been replicated for older children (Cadima et al., 2012; Cryer et al., 1999). The Sensitivity/Positive Interaction dimension (e.g., “Speaks warmly to the children”) concerns the warmth, level of enthusiasm and developmental appropriateness of the teacher’s interactions with children. The Harshness/Punitiveness dimension (e.g., “Seems unnecessarily harsh when scolding or prohibiting children”) considers teacher’s hostile behavior, threatening, and harshly critical tone of interactions. The Detachment dimension (e.g., “Spends considerable time in activity not involving interaction with the

children") concerns teacher's lack of involvement and interest towards children (Arnett, 1989). Internal consistencies for these dimensions have been shown to be adequate (Cadima et al., 2012; Cryer et al., 1999). In this study, we excluded 4 items which were extremely skewed. Two of these items were on the Permissiveness scale. The internal reliability coefficient for the Total Mean Score, based on 22 items, was .94.

An experienced user of the CIS conducted sessions in which observers scored and discussed training videos. Next, eight videos were independently coded by each observer and interobserver agreement was computed. Observers achieved at least 97% of within-one agreement with the master coder. Exact agreement ranged from 72 to 97%. Supervision during the first data collection observation with the CIS was conducted to finalize the training process. During data collection, 25.6% of the CIS observations were doubly coded by the expert observer. The exact agreement averaged 68.2%, within-one point agreement was 99.0%, and weighted kappa was 0.42.

Classroom Assessment Scoring System - Infant (CLASS-Infant; Hamre, LaParo, Pianta, & LoCasale-Crouch, 2014). The CLASS-Infant was used to measure the quality of interactions among teachers and infants in classrooms. The measure consists of one construct with four dimensions, that are based on developmental theory and recommended early child care practices. The Relational Climate dimension was designed to capture the extent to which teachers and infants share a close, positive relationship, the degree of general happiness and playfulness, the respect shown by the teacher to infants, and the absence of negativity on the part of the teacher. Teacher Sensitivity dimension captures teacher's awareness and responsiveness to all children in the room. Facilitated Exploration dimension targets the extent to which teachers are actively involved with infants, whether opportunities are provided for exploration, and teachers' encouragement. The Early Language Support dimension aims to capture the

extent to which teachers provide frequent, high-quality language; expand and extend infants' communication attempts.

Following instructions in the manual of the CLASS-Infant (Hamre et al., 2014), observers weighed the behaviors of all adults in the classroom according to the amount of time and number of infants they interacted with, then scored the interactions on a 7-point Likert scale from low (1, 2), middle (3, 4, 5) to high (6, 7). The manual includes specific behavioral indicators for each dimension and provides extensive examples that serve as guidelines for scoring. This infant classroom observational measure was developed in the US based on a widely used preschool classroom measure called the CLASS-Pre K. The use of the CLASS-Pre K has been extended to several European countries, with studies showing that it provides reliable, valid assessments in different sociocultural contexts (Buyse, Verschueren, Doumen, Van Damme, & Maes, 2008; Cadima, Leal, & Burchinal, 2010; Curby et al., 2009; Hamre, Pianta, Mashburn, & Downer, 2007; Pakarinen et al., 2010). For the present analysis of the CLASS-Infant version, the average score of the four dimensions achieved an adequate level of internal consistency, $\alpha = .89$.

Because the measure is not yet published, the training process was directly discussed with the authors. According to their suggestion (and once all observers were already certified observers in the CLASS-Pre K), observers participated in online training sessions with video rating tasks and discussion of scores, led by one of the scale authors. Individual video ratings followed by group discussion of the scores were also part of the training. Finally, each observer took an online test involving the scoring of at least five 15-minute videotapes of infant classrooms. All observers reached the reliability criterion of 80%. Similar to the ITERS-R and CIS training, observers had the supervision of a master coder during their first data collection observation. During data

collection, 25.6% of the CLASS-Infant observations were doubly coded by the expert observer. The mean exact agreement was 65.22%, within-one point agreement was 99.18%, and weighted kappa was 0.70.

Structural quality measures.

Infant Classrooms' Structural Characteristics Questionnaire (QSC-E; Barros, Pessanha, Pinto, & Cadima, 2013). This questionnaire was designed to collect child care structural indicators, such as number and education of teachers in the classroom (e.g., years of education, whether teachers had a university-level degree in ECE), teacher experience in child care (years of experience), teacher salary per month, and center location (urban vs. non-urban). Data on lead teacher was included in the analyses, as this teacher has a greater responsibility over the group.

During both the ITERS-R and CLASS-Infant/CIS observations, data collectors recorded the number of children and adults in the classroom, and children's age. The group size and ratio were computed from the mean of the observed group size and ratios registered on two days of observation, in a total of five records. Teachers´ training was coded as 1 if the classroom had a trained teacher, with a university-level degree in ECE, and as 0 if the classroom did not have a teacher with training in ECE.

Data Analyses

Structural Equation Modeling (SEM) analyses proceeded in two phases: a measurement phase and a structural phase. In the measurement phase, confirmatory factor analyses were performed to test the factor structure of the three measures, CLASS-Infant, CIS and ITERS-R. In the structural phase, SEM examined the association between the structural quality indicators and the quality latent variables identified in the first phase.

The measurement phase examined the process quality measures by first looking within measure and then across measures. The confirmatory factor analysis for each measure was evaluated by examining the model fit, as indicated by the $\chi 2$, Root Mean Square Error of Approximation (RMSEA), Comparative Fit Index (CFI), and the Standardized Root Mean Square Residual (SRMR). RMSEA and SRMR values less than .08 indicate adequate fit and values less than .05 indicate good fit. CFI values greater than .90 indicate adequate fit and values greater than .95 indicate good fit (Hu & Bentler, 1999; Kline, 2005).

To evaluate whether process quality could be conceptualized as an overall, unitary construct across measures, several models were then considered through examining both model fit and comparing the fit across models. First, the latent factor structure of process quality was performed, with all indicators of the three measures loading on a single common factor, and tested against alternative models. Next, additional alternative models were performed and tested. To compare model fit across models, a likelihood ratio difference test was used. Because in these models all quality measures were included, model complexity was very high relative to the number of participants in the study. Therefore, taking into account the large number of items and limited sample size, and following Coffman and MacCallum's (2005) recommendations, we used parcels as indicators of each latent variable. This option reduces the number of model parameters to be estimated and offers several advantages, including less biased parameter estimates, greater reliability, higher communality, and less influence of idiosyncratic features of the items (Bandalos & Finney, 2001; Coffman & MacCallum, 2005). The items were randomly assigned to the parcels and each latent variable was represented by three parcels, each containing one to four items.

In the second phase, the structural phase, after retaining a best-fitting model for

process quality, the structural indicators, specifically caregiver training and experience, group size and center location (urban or rural/suburban), were entered into the model to examine their associations with the process quality dimensions. Mplus (Version 6; Muthén & Muthén, 1998–2010) was used to perform the analyses. Complete data for all the variables of interest were available.

Results

Measurement Models and Confirmatory Factor Analysis within each Quality Measure

CLASS-Infant. To determine the factor structure of the CLASS, we tested a one-factor model representing the hypothesized theoretical model (Hamre et al., 2014; Jamison et al., 2014). The fit of the model was adequate, $\chi 2$ (4) = 16.57, p = .002, RMSEA = .093, SRMR = .023, CFI = .98. The factor loadings were all significant, and the proportion of variance in the individual scores explained by the latent variables varied from .58 to .63. Internal consistency for the CLASS-Infant was .89.

CIS. To determine the factor structure of the CIS, because prior research has found different factor solutions (Colwell et al., 2013), we tested a two-factor model, in which Positive Relationship and Harshness were considered, and a three-factor model, in which Detachment was also considered. We did not test the original four-factor model because half of the items from the Permissiveness scale were excluded from the analyses as they were extremely skewed (see Appendix A for a complete list of items). Both the two-factor model and the three-factor model fitted the data adequately, respectively, $\chi 2$ (188) = 227.501, p = .00, RMSEA = .048, CFI = .911, and $\chi 2$ (186) = 224.382, p = .00, RMSEA = .048, CFI = .913. Based on the parsimony principle, and taking into account the extremely high correlation between Positive Relationship and Detachment, r = -.92, we selected the two-factor model as the best fitting model. All

factor loadings in the two-factor model were highly significant and internal consistency was adequate, .92 and .82 respectively, for Positive Relationship (14 items) and Harshness (7 items).

ITERS-R. To determine the factor structure of the ITERS-R, following prior research, mainly with the ECERS-R (e.g., Sakai, Whitebook, Wishard, & Howes, 2003), a one- and a two-factor model were tested. From the 26 items considered in the analyses, 12 items were excluded from the model due to high skewness. Specifically, the mean scores of the excluded items varied between 1.04 and 2.00, indicating that (a) in most classrooms materials and activities related to books, nature/science, diversity, and free play were not available or were insufficient, and (b) the minimum conditions of health and hygiene as stated by the manual were not observed. In addition, three items were removed based on their low factor loading. The two-factor model fitted the data adequately, $\chi 2\ (64) = 87.497$, $p = .003$, RMSEA = .064, SRMR = .066, CFI = 0.909, whereas the fit of the one-factor model was inadequate, $\chi 2\ (65) = 123.96$, $p < .001$, RMSEA = .100, SRMR = .09, CFI = .771. Furthermore, the two-factor model fitted the data significantly better than the one-factor model, $\chi 2\text{diff}\ (1) = 34.46$, $p < .001$, and therefore the two-factor solution was retained. All factor loadings in the two-factor model were statistically significant. The first factor – Interactions and Supervision – included items regarding the extent to which caregivers were responsive and sensitive to children's needs, the extent to which they supported child language, and used positive discipline, and actively supervised children and acted in order to assure infant safety. The second factor – Use of Space and Materials – included items related to: (i) the conditions for relaxation and comfort, including that non-mobile infants can interact in a cozy area, protected from active play and that the area is used for reading or other quiet play; (ii) the use of furniture for routine care and play to promote autonomy; (iii) variety

and possibility of child independent use of age-appropriate fine motor materials; (iv) the extent to which active physical activity is promoted and age-appropriate materials, space and equipment are used for active physical play; (v) the extent to which the use of indoor space encourages free movement and play (see Appendix B for a complete list of items). Internal consistency was .80 for the first factor and .59 for the second. The relatively low internal consistency for the latter dimension calls for some caution when interpreting the composite score.

Classroom process quality. To examine levels of infant classroom process quality, we computed means and standard deviations based on the factor structures obtained in the CFA models, which are summarized in Table 1. In general, mean scores for the CIS domains indicated that most classrooms exhibited relatively high levels of positive, close relationships, and low levels of punitive relations. However, the mean score across all four dimensions of the CLASS-Infant were in the medium range of quality, suggesting that in most classrooms, although teachers were positive and sensitive, the opportunities to expand infants' experiences and to support their communication were less common. Mean scores for the ITERS-R domains indicated minimal quality in regard to Interactions and Supervision, as well as Space and Materials.

Bivariate correlations among process quality dimensions are also summarized in Table 1. The associations were in the expected directions. In general, the four measures of teacher-child relationship, namely the CLASS-Infant, CIS domains, and ITERS-R Interactions and Supervision, were more strongly correlated with each other than they were with the ITERS-R Use of Space and Materials. It is important to underline that CLASS-Infant and ITERS-R were rated by different observers, with moderate, positive associations, indicating robustness of the measures. Associations between structural indicators and process quality dimensions were in the expected direction but relatively

modest. Teacher training was positively associated with CIS Positive Relationship, CLASS-Infant and ITERS-R Use of Space and Materials; group size was negatively associated with ITERS-R Interaction and Supervision and ratio was negatively associated with ITERS-R Use of Space and Materials. Classrooms located in rural/suburban areas were likely to show higher levels of quality on CIS Positive Relationships and CLASS-Infant than urban area classrooms.

Next, CFA was used to determine the number of domains in the five process quality measures. We hypothesized there would be two latent factors, teacher-child relationships and engagement with materials and activities quality. CFA analyses compared the fit of the hypothesized two-factor model with a single-factor model and the original five-factor model. We performed the CFA models using the parcels of the five latent variables (CLASS-Infant, CIS Positive Relationship and Harshness, ITERS-R Interactions and Supervision and Use of Space and Materials), and tested them against the original five latent variables. For these analyses, as explained earlier, parcels were used as indicators of each latent variable. Measurement errors of the same latent variables were allowed to covary (Kline, 2011).

Analyses supported the hypothesized two-factor model. The fit of the two-factor model that specified a latent variable consisting of the parcel from the CLASS-Infant, CIS, and ITERS-R Interaction and Supervision and a separate latent variable consisting of the parcels from the ITERS-R Use of Space and Materials was adequate, $\chi 2(93) = 149.652$, $p < .001$, RMSEA = .082; SRMR = .069; CFI = .935. The fit was not reliably different from the fit of the original five-factor model, $\chi 2\text{diff}(1) = 1.136$, $p = .286$, suggesting that the information in the original model was retained in this more parsimonious model. This model was, therefore, included in further steps of our analyses.

In contrast, the one-factor model did not provide as strong a fit. The fit of the one-factor model was adequate, $\chi 2(92) = 155.87$, $p < .001$, RMSEA = .088; SRMR = .069; CFI = .927, but resulted in a significant loss in model fit, $\chi 2\text{diff}\ (2) = 7.357$, $p = .025$, compared with the original five-factor model, $\chi 2(94) = 148.516$, $p < .001$, RMSEA = .080; SRMR = .067; CFI = .938, suggesting that the dimensions underlying the several process quality measures could not be appropriately integrated into one. In addition, the factor loadings of the parcels regarding ITERS-R Use of Space and Materials were very low and not statistically significant, indicating that this dimension would be more appropriately considered as a separate construct.

It is important to note that the second factor includes a mixture of more proximal process quality features, but also more static aspects that could be considered as structural ones. We nevertheless retained this factor because it includes infant interactions with materials and within activities and thus, it includes several process quality features. It also includes dynamic features such as how the materials and space are made accessible to infants, which rely on the caregiver's ongoing decisions (Helmerhorst et al., 2014). Considering our interest in understanding the associations between regulatory indicators and process quality, retaining this second factor could be very informative, given that the pattern of associations could vary with the core domain considered. Therefore, subsequent analyses were based on the two-factor model.

Structural Regression Models

To examine associations between structural indicators and the quality of care, we estimated a SEM model, in which caregiver training, caregiver experience, group size, and center location were entered as predictors of the two underlying constructs of quality, Relationships, and Space and Materials. Ratio was excluded from the models given its strong association with group size and because it didn't explain additional

variance. This final model showed an adequate fit, $\chi 2(149) = 213.64$, $p < .001$, RMSEA = .070; SRMR = .070; CFI = .928. Results are shown in Figure 1. More frequent and sensitive relationships between teachers and infants were observed when the caregiver had more formal schooling in early education, $B = .28$, $SE = .10$, $p = .005$, when classrooms had fewer infants, $B = -.20$, $SE = .10$, $p = .047$, and when centers were located in rural/suburban areas, $B = .28$, $SE = .10$, $p = .007$. Moreover, Use of Space and Materials quality was positively associated with teacher education, $B = .35$, $SE = .12$, $p = .004$. None of the other structural indicators were associated with the Use of Space and Materials domain.

Discussion

The current study examined core dimensions of ECEC process quality using a multi-measure approach. Three well known observational measures of quality were used to assess child care classrooms for infants: the ITERS-R, a measure commonly considered to represent overall or global classroom quality, and two measures that focus more specifically on teacher-child interactions, the CIS and the CLASS-Infant.

Considering the five domains of ECEC quality derived from the three measures, the CIS Positive Relationships domain indicated relatively high levels of quality on emotional relationships, whereas the mean score for the CLASS-Infant was in the medium range (scores of 3 to 5). This may indicate generally positive affect between teachers and infants, but low intentionality in teachers' practices and restricted opportunities to expand children's experiences and support their communication. In a small study in infant classrooms in the US, Jamison and colleagues (2014) also found medium range quality of teacher-child interactions as measured by the CLASS-Infant. Although CLASS-Toddler domains were not exactly the same, a study of toddler classrooms found similar results (La Paro, Williamson, & Hatfield, 2014). Bearing in

mind that infancy is a crucial period for brain development (e.g., Shapiro & Applegate, 2002), this lack of intentionality and, particularly, of practices promoting the expansion of children´s experiences and communication should be acknowledged as an area of concern for intervention and teacher training. In addition, it should be noted that higher results for the CIS have been found in other studies, suggesting that the CIS may not discriminate caregivers with high and moderate positive interactions (e.g., Colwell et al., 2013).

The relatively low scores on the ITERS-R Interactions and Supervision domain are also of concern with classrooms on average only meeting minimal requirements. This factor includes quality of interactions between adults and children in different specific activities, but also practices that promote language development and conditions for children's supervision. In Portugal, previous studies in toddler classrooms have also found minimal quality for the ITERS-R Interactions and Listening and Talking subscales (Barros & Aguiar, 2010; Barros & Leal, 2011). In line with other Portuguese studies, but in the opposite direction of La Paro and colleagues (2014), in the present study the ITERS-R Use of Space and Materials domain had, on average, lower scores than Interactions and Supervision.

It is also important to note that only a small set of items were part of the ITERS-R Use of Space and Materials domain. Several items related to materials and toys were excluded from the models because they were never observed. This situation is a concern, not just statistically, but because it means that the type of experiences provided to infants in this sample was very limited in terms of interactions with materials and toys. Most classrooms only provided children with a few very basic toys, such as grasping toys, nested cups, and some soft toys. It should be noted that classroom could have more materials and toys, but they were simply not used to actively engage infants.

In addition, the use of space and furniture seemed to assume a more important function than expected. Providing enough space to promote autonomy can characterize the classrooms that participate in the study. As mentioned, this domain captures the opportunities for child interactions with materials that highly rely on the caregiver's intentions and actions given the young ages of the infants (Helmerhorst et al., 2014). Therefore results suggest also the importance of enhancing caregivers' intentionality in the use of materials to promote infant development.

In general, results from this study are consistent with studies conducted in other countries that have used the ITERS-R in infant/toddler classrooms, and that have shown low to moderate quality, including studies in the US (La Paro et al., 2014), Canada (Goelman et al., 2006), the Netherlands (Vermeer et al., 2008), and United Kingdom (Mathers & Sylva, 2007).

Scores obtained on the process quality measures in the present study raise concerns about quality of infant education and care in out-of-home environments in Portugal. Considering a recent study showing that only high-quality settings seem to have a positive effect on child development (Burchinal et al., 2011), the moderate levels of quality indicate the need to increase the quality of center-based care for infants in Portugal, specifically in the above-mentioned dimensions of process quality.

Process Quality Dimensions: Relationships and Use of Space and Materials

In the present study, two core dimensions of process quality were identified: (a) Relationships, with four different factors, CIS Positive Relationships, CIS Harshness, CLASS-Infant, ITERS-R Interactions and Supervision; and (b) Use of Space and Materials.

Relationships between infants and caregivers included indicators from the three measures. Results suggest that there is considerable alignment among these three

measures on the crucial aspects that capture high-quality relationships. The ITERS-R, CIS, and CLASS appear to agree to some extent on the type of indicators used to assess interactions and relationships, a positive finding, given that this core dimension has been considered one of the most critical dimensions of process quality (NAEYC, 2009). These results suggest that there is considerable overlap among some aspects assessed by the measures indicating agreement.

Regarding the Use of Space and Materials, although it was not possible to include a more varied and diverse range of indicators, this domain of quality stood out as one distinct dimension. Of note is that this domain captures dynamic, process-oriented features that are part of the infants' daily experiences in the classroom and are intrinsically linked to teachers' ongoing decisions and actions. Apparently, one overall domain does not seem enough to capture all the relevant aspects conveyed by the three measures and that are adequate for our context. At least, two domains seem to better describe the process quality levels. These two aspects were only moderately interrelated. Although results suggest validity for each of the measures used and suggest that they are robust – particularly regarding the CLASS, as this study is among the first supporting convergent validity – the use of several measures contributed to determine two, rather than one, domains of process quality. Results from this study are consistent with Bryant and colleagues (2011) assumption that, given the diverse conceptual constructs involved in the concept of process quality, a single quality domain seems unlikely to adequately address all important aspects of education and care quality.

Process and Structural Indicators

A third goal of this study was to investigate associations between process quality and structural indicators of classrooms. This goal was particularly important in this study, considering the less restrictive regulations for structural indicators in Portugal.

Importantly, because these two core dimensions of process quality were accurately and appropriately determined, the identification of structural indicators that were associated with high-quality process domains was particularly robust. Of the structural indicators that were examined, teacher education showed the most robust relation to both Relationships and Use of Space and Materials domains. Higher-quality interactions and materials were found in classrooms in which the lead teacher had a graduate degree in early childhood education or related field. These results are in line with previous studies in toddler classrooms that have shown positive associations between ECEC quality and teacher training (e.g., Barros & Leal, 2011; Phillips et al., 2000; Slot, Leseman, Verhagen, & Mulder, 2015). Findings from this study additionally show that the presence of teachers with high levels of education in contexts for infants is important to sustain higher levels of quality in two distinct but related domains of process quality. As Helmerhorst et al. (2014) note, caregivers appear to play a key role in assuring the process quality of care for infants and toddlers not only by affecting the children in direct caregiver–child interactions, but also by adequately choosing and arranging materials, physical space and activities. It seems that higher levels of formal training are associated with the caregiver ability to develop warm, sensitive, and responsive interactions with children. Initial training seemed also important to support teacher intentionality on the use of space and to create opportunities for stimulating interactions through materials.

Moreover, it has been suggested that initial training is associated not only with higher levels of quality in caregiver's interactions, but also with the way of thinking about the infants. In one study developed in Australia by Degotardi (2010), caregiver qualifications were positively correlated with both quality of their interactions and the complexity of their interpretations of infant behavior. The provision of theoretical

knowledge about children in formal training may contribute to more complex and multifaceted ideas about infants, helping caregivers to develop a richer, deeper understanding of the infant psychological states and development that may support higher process quality in several ways.

Our results are clearly important by suggesting initial training as a key predictor of process quality in infant classrooms. Of particular importance is that current regulation in Portugal does not require the lead teacher of infant classrooms to have a formal education at the graduate level in early childhood. In fact, in nearly 60% of the participating classrooms in this study, the highest level of formal training achieved by the lead caregiver was basic education (9 years of schooling). As expected, we did find a large variation in initial training in the participating classrooms, with results showing that the low levels of formal education were associated with low levels of process quality. It is possible that, in the Portuguese case, a more stringent regulation regarding formal educational requirements of the staff could represent an effective way of raising the levels of process quality.

It is also important to highlight that some trained teachers were assigned to multiple classrooms (i.e., floated between classrooms), and thus were not full time in the classroom for infants, yet even so, these classrooms showed higher levels of quality than classrooms where none of the teachers were formally trained. It is possible that the presence of a trained teacher in child care supports the quality of interactions of all staff through meetings or informal discussions, team planning, or through modeling within the classroom. This hypothesis can be sustained by a recent Dutch study (Slot et al., 2015) where a positive association was found between emotional and educational process quality (CLASS-toddler) and professional development activities at the center (e.g., staff regular meetings to discuss developmental and educational goals, discussing

child special needs, opportunities for in-service training). Further research would benefit from the exploration of interpersonal influences and dynamics among all staff members.

In this study, group size but not child:adult ratio, was related to the Relationships domain, indicating that the quality of teacher-child relationships was lower in classrooms with more infants. These results suggest that the presence of more adults in infant classrooms may not compensate for the negative effects of large group size on Relationships quality. Small group sizes seem to facilitate closer and more positive interactions and relationships. This result is in line with prior research conducted both in USA and Europe (Deynoot-Schaub & Riksen-Walraven, 2005; NICHD Early Childhood Research Network, 2000). This result is noteworthy in the case of Portugal given the less restrictive regulations regarding group size. In fact, as expected, we found a large variation in group size, from 1 up to 10 infants per classroom. Considering the low to moderate levels of process quality, it is possible that larger groups may hamper sensitive, responsive interactions. Regulations regarding group size in other countries are more stringent, with recommended group sizes up to 8 (NAYEC, 2009). In addition, as a cost-efficiency measure, recent changes in regulations for group size in Portugal were to increase, rather than decrease, the number of children in the classroom (Portaria n.º 262/2011). Our findings point to the need to bring process quality into the policy discussions and decisions about the best group size to prevent regulatory decisions that are taken at the expense of the quality of the infants' relational experiences.

An additional important finding from this study was the association found between center location and levels of Relationships quality. Contrary to our expectations and to the limited literature in this area, the quality was higher in rural/suburban centers than in urban ones. It is important to note that center location was not related to the other

structural indicators, with the exception of teacher experience with less teacher experience found in the urban core. Although speculative, possible explanations for this result may include life satisfaction of both families and staff, closer relationships between family and staff and lower levels of stress in rural/suburban areas. Also, even though centers were located in rural/suburban areas, they were nevertheless part of the greater metropolitan area of Porto, with relatively easy access to several central services. Another explanation may be that these centers are likely to be more recent, and thus the overall environment may help build more positive and caring relationships. A small study conducted in Portugal involving 60 preschool classrooms also showed higher levels of quality in smaller urban areas when compared to larger ones and thus it is possible that centers located in big urban areas offer lower quality (Fernandes, 2009). Clearly, differences between urban and rural/suburban areas have been insufficiently studied and more research is needed.

Limitations and Future Considerations

Some limitations of this study should be acknowledged when interpreting our findings. Although a random sampling procedure was used to select 90 classrooms, as a consequence of some strict requirements of the project concerning participants' characteristics, the eligible centers were reduced to those that had new infants attending child care in the first months of the school year and who were registered in the center with some months of advance notice. Additionally, the participation rate of private for-profit centers was lower than nonprofit centers and the study included centers only from the north of Portugal; both are conditions that should be considered when generalizing the results. Also, the restricted range of child:adult ratio may have limited the power to detect statistically significant associations between this variable and process quality features. In addition, the internal consistency for the Use of Space and Materials factor

was low. Further research could include additional indicators of the interactions between children and materials and space. For instance, measures of child engagement with toys and other materials, such as the Engagement Quality Observation System (E-Qual III; McWilliam & de Kruif, 1998), can provide relevant information, considering associations between process quality and child engagement (e.g, Aguiar & McWilliam, 2012; Raspa, McWilliam, & Ridley, 2001). The three measures used in the present study were not originally developed in Portugal, but two of them have been extensively used in Portugal, with findings indicating their adequacy to the Portuguese child care settings (Barros & Aguiar, 2010; Barros & Leal, 2015; Cadima et al., 2012; Cryer et al., 1999). Although this is the first Portuguese study that used the CLASS-Infant, the training procedure was conducted in close collaboration with one of the authors of the scale. In addition, other versions of the CLASS have been found to be reliable for the Portuguese context (Cadima et al., 2010). It should be also mentioned that the CLASS-Infant and the CIS were rated by the same observer in this study, and therefore there is a possibility of shared informant bias. The focus of this paper was on core dimensions of process quality in infant classrooms. In order to continue to study reliability and validity of quality measures, infant outcomes should be also considered.

In this study, we only include a small set of structural indicators. Other important indicators should be included in further research, namely characteristics at the center level regarding professional development. Nevertheless, the few structural indicators included in this study showed small to moderate associations with process quality, a noteworthy result, considering the inconsistent findings from the literature. An important finding from this study was the great variation in teacher qualifications and group size, which could have contributed to find statistically significant associations.

Overall, this study is among the first to elucidate the levels of quality offered in Portuguese infant classrooms. Given that child care centers are a regulated sector, and taking into account the associations between process quality and teacher education, requiring a teacher with a higher education level or some specific training in early childhood may be an important strategy to increase the levels of quality in infant classrooms. Nevertheless, an important path for further research is to examine specific variables of the ECEC environment and differential effects of specific domains of process quality on child development and families' quality of life, as well as to develop intervention programs capable of improving quality in a time that, due to the macrosystem demands, is particularly challenging for children, families and professionals.

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Table 1

Descriptives and correlations for the structural indicators and process dimensions

	1	2	3	4	5	6	7	8	9	10	*N*	*M*	*SD*
Process quality dimensions													
1. CIS Positive Relationships											90	3.00	0.45
2. CIS Harshness	-.52**										90	1.40	0.39
3. CLASS-Infant	.81**	-.57**									90	3.51	0.69
4. ITERS-R Interaction and Supervision	.46**	-.49**	.46**								90	3.50	1.02
5. ITERS-R Space and materials	.14	.02	.24*	.22*							90	3.32	0.86
Structural indicators													
6. Caregiver training (1 = university level degree)	.23*	-.20†	.32**	.15	.31*						90	0.31	
7. Caregiver experience	-.03	-.06	-.08	-.07	-.02	-.14					89	8.36	6.51
8. Group size	-.16	.20†	-.18†	-.24*	-.07	-.13	.14				90	5.25	1.97
9. Ratio	-.01	.10	-.19	-.19	-.25*	-.22*	.16	.68*			90	2.65	1.20
10. Center location (0 = urban)	.21*	-.13	.22*	.08	.10	-.02	-.27*	.11	.02		90	0.46	

† $p < .10$.* $p < .05$. ** $p < .01$

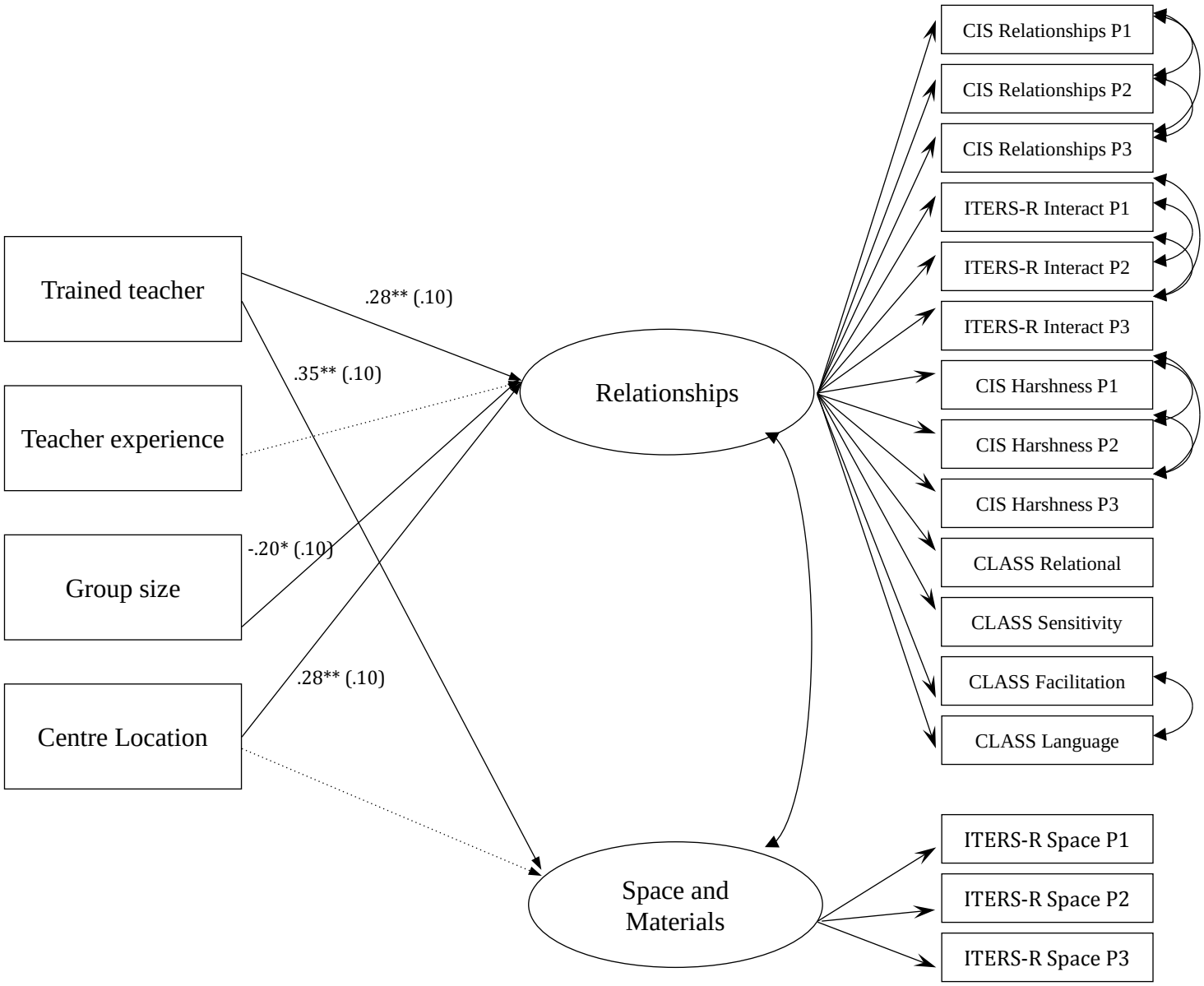

Figure 1. Structural Equation Model of the contributions of structural quality indicators to Interactions and Space and Materials.

Coefficients are standardized. Dashed lines represent non-significant associations.

Appendix A
List of items retained in Confirmatory Factor Analysis for the CIS Measure

Factors	
Positive Relationship	**Harshness**
1. Speaks warmly to children	2. Is critical of the children
3. Listens attentively when children speak to her	10. Speaks with irritation or hostility to the children
6. Seems to enjoy children	12. Threatens children in trying to control them
8. Encourages the children to try new experiences	20. Finds fault easily in children
11. Is enthusiastic about children's activities and efforts	22. Prohibits many of the things that children want to do
14. Pays positive attention to the children as individual	26. Seems unnecessarily harsh when scolding or prohibiting children
16. Talks to children on a level they can understand	7. When the children misbehave, explains the reason for the rule they are breaking
25. When talking to children kneels, bends, or sits at their eye level to establish better eye contact	
24. Expects children to exercise self-control (REVERSE)	
5. Is distant or detached from children (REVERSE)	
13. Spends considerable time in activities not involving interaction with children (REVERSE)	
21. Doesn't seem interested in children's activities (REVERSE)	
23. Doesn't supervise the children closely (REVERSE)	
18. Exercises firmness when necessary	

Note. Model fit statistics: $\chi 2$ (188) = 227.501, p =.00, RMSEA = .048, CFI = .911

Appendix B
List of items retained in Confirmatory Factor Analysis for the ITERS-R Measure

Factors	
Interactions and Supervision	**Space and Materials**
13. Helping children use language	3. Provision for relaxation and comfort
27. Staff- child interaction	15. Fine motor
11. Safety practices	1. Indoor space
28. Discipline	2. Furniture for routine care and play
12. Helping children understanding language	16. Active physical play
25. Supervision of play and learning	
4. Room arrangement	
6. Greetings/departure	

Note. Model fit statistics: $\chi 2$ (64) = 87.497, p =.003, RMSEA = .064, SRMR = .066, CFI = 0.909