Stability and change in teacher–infant interaction quality over time

Article *in* Early Childhood Research Quarterly · September 2017

DOI: 10.1016/j.ecresq.2016.10.003

CITATIONS
9

READS
342

7 authors, including:

Manuela Pessanha
Polytechnic Institute of Porto
29 PUBLICATIONS **212** CITATIONS
SEE PROFILE

Carla Peixoto
Polytechnic Institute of Porto | University Institute of Maia – ISMAI
38 PUBLICATIONS **103** CITATIONS
SEE PROFILE

Sílvia Barros
Polytechnic Institute of Porto
36 PUBLICATIONS **211** CITATIONS
SEE PROFILE

Joana Cadima
University of Porto
67 PUBLICATIONS **638** CITATIONS
SEE PROFILE

Early Childhood Research Quarterly 40 (2017) 87–97

Contents lists available at ScienceDirect

Early Childhood Research Quarterly

Stability and change in teacher-infant interaction quality over time

Manuela Pessanha[a,*], Carla Peixoto[a,e], Sílvia Barros[a,b], Joana Cadima[c], Ana Isabel Pinto[b,c], Vera Coelho[c], Donna M. Bryant[d]

[a] Polytechnic Institute of Porto, School of Education, Rua Dr. Roberto Frias, 602, 4200-465 Porto, Portugal
[b] Center for Psychology at University of Porto, Rua Alfredo Allen, 4200-135 Porto, Portugal
[c] University of Porto, Faculty of Psychology and Educational Sciences, Rua Alfredo Allen, 4200-135 Porto, Portugal
[d] Frank Porter Graham Child Development Institute, 105 Smith Level Road, Chapel Hill, NC 27516, USA
[e] University Institute of Maia, Avenida Carlos de Oliveira Campos - Castêlo da Maia / 4475-690 Maia, Portugal

ARTICLE INFO

Article history:
Received 29 July 2015
Received in revised form 7 October 2016
Accepted 31 October 2016

Keywords:
Infants
Early childhood education and care
Process quality
Stability and change

ABSTRACT

Given that an increasing number of infants spend part of the day in center-based childcare in many countries, understanding infants' education and care experiences in these settings is essential. The aims of this study are to examine change in teacher-infant interaction quality over time, and to determine the extent to which teacher and classroom structural characteristics are associated with change in teacher-infant interaction quality. Ninety infant childcare classrooms from the greater metropolitan area of Porto, Portugal, participated in this study. Each classroom was observed twice (6-month interval between Time 1 and Time 2) by trained and reliable observers using the Infant/Toddler Environment Rating Scale – Revised (ITERS-R; Harms et al., 2006), the Classroom Assessment Scoring System – Infant (CLASS-Infant; Hamre et al., 2014), and the Caregiver Interaction Scale (CIS; Arnett, 1989). Additionally, teachers provided demographic information about themselves and structural characteristics of the classroom. Overall results indicated that the quality of teacher-infant interactions changed over time, with a general trend toward lower quality at Time 2. The increase in infant:adult ratio from Time 1 to Time 2 was an important predictor of process quality levels at Time 2, after controlling for prior quality and other structural characteristics. These findings can be informative for policymaking as group size and number of adults per classroom are regulated features of childcare in many countries, including Portugal.

In western and most industrialized societies, the ecology of early childhood development has been significantly changing in the last decades. An increasing number of children spend part of the day in out-of-home care (Organization for Economic Co-operation and Development [OECD], 2011), for a variety of demographic, social and economic reasons. Portugal is not an exception, having a high rate of full-time early childhood education and care (ECEC) provisions for infants (Gabinete de Estratégia e Planeamento/Ministério da Solidariedade, Emprego e Segurança Social, n.d.a, 2013; OECD, 2011).

As a substantial number of children experience the transition from home to childcare during the first year of life, the quality of ECEC experienced by infants is a concern for their parents and for policymakers (e.g., Jamison, Cabell, LoCasale-Crouch, Hamre, & Pianta, 2014; La Paro, Williamson, & Hatfield, 2014; Ruzek, Burchinal, Farkas, & Duncan, 2014). The relevance of analyzing the quality of infant education and care experiences in childcare is further underlined by international findings, mainly in the U.S. and in some European countries, documenting the effects of ECEC quality on child development. However, such research is still scarce in other countries, such as Portugal. Additionally, research has been largely focused on the preschool period, with fewer studies exploring quality in infant/toddler care.

Regarding younger children, relationship quality has been particularly emphasized as a crucial feature of ECEC quality, and stability of care has been highly recommended (e.g., Cryer et al., 2005; ZERO TO THREE, 2009). However, research focusing on the quality of adult-child interactions in infant care is limited and data on the stability and change of that quality is scarce. The present study examines the nature of change in teacher-child interaction quality in infant classrooms over a 6-month interval, and how those changes are associated with teacher and classroom structural characteristics, aiming to contribute further understanding of infant education and care experiences in Portuguese childcare settings in the first year of life.

* Corresponding author at: Escola Superior de Educação do I.P.P, Rua Dr. Roberto Frias, 602, 4200-465 Porto, Portugal.
E-mail address: pessanha@ese.ipp.pt (M. Pessanha).

http://dx.doi.org/10.1016/j.ecresq.2016.10.003
0885-2006/

1. Quality of ECEC and child development

There is no consensus about the framework and methods used in studies of quality of ECEC. However, most studies consider two broad dimensions of quality: structural and process (e.g., Bryant, Burchinal, & Zaslow, 2011; Howes et al., 2008). Structural features include variables that can be regulated, such as caregiver education and training, group size, and child:staff ratios. Process characteristics include variables related to children's direct experiences in classrooms, such as teacher-child interactions (e.g., Bryant et al., 2011; Helmerhorst, Riksen-Walraven, Vermeer, Fukkink, & Tavecchio, 2014; La Paro et al., 2014), which are frequently regarded as the core of process quality (Helmerhorst et al., 2014). Indeed, both developmental theory and empirical studies have established that teacher-child interactions can be understood as critical proximal processes (e.g., Hamre & Pianta, 2007; Jamison et al., 2014; La Paro et al., 2014; Mortensen & Barnett, 2015), and are considered the primary mechanisms of human development if they are regular and occur over extended periods of time (Bronfenbrenner & Morris, 1998). These processes can vary substantially depending on the characteristics of the developing person and of contexts, both closer and more distant, as well as on the periods of time during which these processes occur (Bronfenbrenner & Morris, 1998). Proximal processes involve the interaction between the individual and the persons, objects and symbols in the immediate environment (Bronfenbrenner & Evans, 2000).

Currently it is acknowledged that ECEC quality has modest, but important effects on children's development (Burchinal, Kainz, & Cai, 2011). Results of a large number of studies indicate positive immediate effects of higher-quality ECEC on preschoolers' cognitive, executive function and social skills (e.g., Head Start Family and Child Experiences Survey, 2001; NICHD Early Child Care Research Network, 2006; Peisner-Feinberg et al., 2001; Weiland, Ulvestad, Sachs, & Yoshikawa, 2013), with some studies specifically suggesting that quality of care also predicts outcomes for infants and toddlers (e.g., Burchinal, Roberts, Nabors, & Bryant, 1996; NICHD Early Childhood Research Network, 2000; Pessanha, Pinto, & Barros, 2009). Research has also found positive effects of high-quality ECEC on long-term success indicators such as higher employment rates, less delinquency/criminality, and fewer adolescent pregnancies (e.g., Campbell, Ramey, Pungello, Sparling, & Miller-Johnson, 2002; Ramey et al., 2000; Reynolds, Miedel, & Mann, 2000; Vandell, Belsky, Burchinal, Steinberg, & Vandergrift, 2010). Furthermore, it has also been acknowledged that high-quality ECEC in the first years of life might reduce the negative impact of poverty, low maternal education, and other risk factors associated with negative child outcomes (e.g., Burchinal, Vandergrift, Pianta, & Mashburn, 2010; Leseman & Slot, 2014; Peisner-Feinberg & Yazejian, 2010; Pessanha, 2008). Although many research studies have examined associations between quality of ECEC and child outcomes, less empirical evidence is available on the quality of *infant* classrooms, especially in Portugal (Barros et al., 2016; Jamison et al., 2014).

2. Quality of teacher-infant interactions

The quality of teacher-child interactions has an important role in children's learning and development, but is especially relevant for infants. Early nurturing relationships between young children and caregivers have the potential to provide a strong foundation for future development in all domains (Shonkoff & Phillips, 2000). Indeed, as Edwards and Raikes (2002) noted, "through the pleasure and emotional sharing of a warm, loving, reciprocal exchange with an emotionally available caregiver, a baby learns about people and the world and grows cognitively, socially, and emotionally in tiny, manageable steps" (p. 10). Therefore, as children develop so quickly in all domains (physical, cognitive, social and emotional) during infancy, they require positive, responsive, stimulating and stable interactions with caregivers (e.g., National Association for the Education of Young Children [NAEYC], 2009; Shonkoff & Phillips, 2000; Wittmer & Petersen, 2006; ZERO TO THREE, 2009). Relationships are particularly important for developing several competencies, such as self-awareness, social competence, and emotional regulation (Shonkoff & Phillips, 2000). Though most of current evidence regarding early relationships is based on the parent-child relationship literature, some studies suggest that, as children enter childcare, teachers play a critical and unique role in shaping infants' development and learning (Hamre, LaParo, Pianta, & LoCasale-Crouch, 2014). In fact, in center-based care, adults must acknowledge the foundational role of relationships for human development, and consider not only children's developmental characteristics and needs, but also their emotional needs (NAEYC, 2009; ZERO TO THREE, 2009).

The period of child transition and adjustment to childcare is a critical and complex period (Balaban, 2011; Daniel & Shapiro, 1996; Merrill, 2010; Rapoport & Piccinini, 2001), requiring infants to adapt to new spaces, routines, and adult caregivers (Datler, Ereky-Stevens, Hover-Reisner, & Malmberg, 2012; Fernandez, 2004). Daniel and Shapiro (1996) state that this period represents a major developmental challenge, since it requires that children build new relationships with other care providers in a completely different environment, at the same time they are still building relationships with the main caregivers in the home environment. Consequently, there must be a concern with ensuring conditions for the development of close relationships with caregivers in the childcare setting, namely, continuity in classroom staff and consistent and responsive interactions to the individual characteristics and needs of infants (Balaban, 2011; Daniel & Shapiro, 1996).

Despite its relevance to children's development and learning, findings from several studies suggest that access of very young children to high-quality care environments with responsive teacher-child interactions is limited. In Portugal, a previous study of toddler ECEC found that only 39% of the 160 observed classrooms provided quality that minimally met custodial care and basic developmental needs, let alone provided responsive teaching (Barros & Aguiar, 2010). In the U.S., although quality levels are generally higher, concerns about ECEC for infants and toddlers are also evident. In the Cost, Quality, and Child Outcomes in Child Care Centers Study, Phillipsen, Burchinal, Howes and Cryer (1997) reported low quality scores, indicating that the health and well-being of infants/toddlers was cared for only minimally, and warm and supportive relationships were observed less than half of the time. Similarly, in the NICHD Study of Early Child Care, 53.2% of the observed classrooms showed mediocre quality, and 8.1% low-quality (NICHD Early Childhood Research Network, 2000, 2005). More recently, a small study of 30 infant classrooms revealed that teacher-child interactions were only in the medium range (e.g., Jamison et al., 2014). For over two decades, the quality of adult-infant interactions has been measured with valid and reliable observational measures, such as the Caregiver Interaction Scale (CIS; Arnett, 1989) and the Infant/Toddler Environment Rating Scale (ITERS/ITERS-Revised; Harms, Cryer, & Clifford, 1990, Harms, Cryer, & Clifford, 2003; Harms, Cryer, & Clifford, 2006). Now a new measure, the Classroom Assessing Scoring System-Infant (CLASS-Infant; Hamre et al., 2014), is becoming more widely used.

2.1. Quality of teacher-infant interactions over time

Based on the foregoing, the quality of adult-child interactions seems to play an important role in child development and well-being (e.g., Edwards & Raikes, 2002; Hamre et al., 2014; Shonkoff & Phillips, 2000). In this context, several authors have explored the

stability of ECEC. However, "stability" can have different meanings. De Schipper, Van Ijzendoorn, and Tavecchio (2004), based on a literature review, have identified several aspects related to the concept of stability in care or caregiver stability, such as: (a) the amount of time spent by the caregiver with the child in daycare; (b) changes in the main caregiver; (c) staff turnover; and (d) the number of different facilities attended by the child. Cryer et al. (2005) consider that continuity in child care requires that children spend a substantial amount of time with the same teacher(s) during their first years in ECEC. These dimensions of stability are relevant for children's development; for instance, Cryer et al. (2005) found that changes in caregivers are associated with higher levels of distress, particularly among very young children. In another study, Ritchie and Howes (2003) concluded that children spending more time with their primary caregiver, and having more intense and sensitive interactions with them, tended to show a more secure caregiver-child relationship. A recent quasi-experimental study in toddler classrooms also highlighted the importance of continuous caregiver relationships with children, indicating that children in classrooms with greater teacher continuity received more interactive caregiving and showed fewer behavior problems when compared with toddlers in noncontinuity of care classrooms (Ruprecht, Elicker, & Choi, 2016).

Although considerable evidence has supported the relevance of the stability of caregiver-child relationship, far less attention has been devoted to another important issue: how the quality of teacher-child interactions changes over time, particularly across children's first year of life. As Recchia and Shin (2012) argue, "creating and sustaining a responsive learning environment for infants and toddlers requires a continuous process of change in line with children's growth, development, and emergent interests" (p. 1546). The bioecological model of Bronfenbrenner and Morris (1998) has contributed to the understanding of the mechanisms underlying the stability or change in the quality of adult-child interactions and the influence of these processes on children's later development. In this model, which considers the joint influence of four interrelated components in human development, time stands out as particularly relevant for the present study. Indeed, the interaction processes that occur in a consistent manner and on a regular basis over extended periods of time will have greater impact on development than those occurring in a sporadic or inconsistent manner (Bronfenbrenner & Morris, 1998).

In fact, the study of stability of teacher-child interaction quality over time can be of particular interest in providing a deeper understanding of infants' education and care experiences in child care settings and the importance of those interactions to child development (Curby, Grimm, & Pianta, 2010). The need to focus on such aspects has been highlighted by several authors, namely Mortensen and Barnett (2015) and La Paro et al., (2014), who considered that the consistency of teacher-child interactions during the early years must be examined, as well as children's experiences in ECEC over time. The preschool literature shows evidence of the critical role of the caregiving context for socioemotional development and the positive effects of stable levels of teachers' emotional support during preschool years on school readiness outcomes in preschool as well as social skills in kindergarten (e.g., Curby, Rimm-Kaufman, & Abry, 2013), stressing the need to focus on the first years of life. Thus, the present study intends to expand on earlier research by analyzing an aspect which has not been explored in previous studies of infant childcare – the stability of teacher-infant interaction quality over time.

Structural dimensions of quality, such as child-teacher ratio, group size, and staff qualifications may contribute to understanding how teacher interactions with infants vary over time. Previous research has highlighted associations between child-teacher ratio and group size and process quality in infant and toddler ECEC. Specifically, the quality of interactions between caregivers and infants was higher when group size was lower (Deynoot-Schaub & Riksen-Walraven, 2005), as well as when child-teacher ratio was lower (Barros & Aguiar, 2010; Cost, Quality & Child Outcomes Study Team, 1995; Jamison et al., 2014). Moreover, higher caregiver sensitivity was found to be associated to a higher number of caregivers in the classroom (Goelman et al., 2006). Additionally, several studies showed that higher levels of caregiver's formal education were associated with higher levels of global quality in ECEC (NICHD Early Child Care Research Network, 1996; Phillips, Mekos, Scarr, McCartney, & Abbott-Shim, 2000; Phillipsen et al., 1997). For example, in a study of 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. Similarly, in a Portuguese study of toddler classrooms, Barros and Leal (2011) found that teachers' education level was also related to ECEC quality. Given that previous studies have found associations between structural features of ECEC settings and process quality (e.g., Goelman et al., 2006; Phillips, Mekos, Scarr, McCartney, & Abbott-Shim, 2000), the present study intends to extend previous work, analyzing whether structural dimensions of quality, such as child:adult ratio, class size, and teacher education may contribute to explain change in teacher-infant interactions over time.

3. The current study

The present study aims to advance research on childcare quality in the early years of life by (a) analyzing change in teacher-infant interaction quality over time, and (b) determining the extent to which teacher and classroom structural characteristics are associated with change in the quality of teacher-infant interactions. Both systematic change and relative change are examined. First, we examine the average change across two time points (6-months interval between Time 1 and Time 2) and whether there is an overall increase or decrease on classroom quality from Time 1 to Time 2. Second, we examine the relative change, specifically the individual variation of change across classrooms. This approach helps to understand the extent to which classrooms change in the same degree. And last, we examine the effects of structural features on change, in other words, the extent to which structural features contribute to explain the relative change from Time 1 to Time 2. Research has found associations between structural and process features of child care quality and thus we hypothesized that change in structural features would predict changes in process quality.

4. Method

4.1. Participants

This study used data from a broader project conducted in the greater metropolitan area of Porto, Portugal, a study that investigated infants' transition and adaptation to child care in the first year of life. Ninety infant child care classrooms participated, randomly selected from the 223 institutions registered at the Ministry of Solidarity, Employment and Social Security website (http://www.cartasocial.pt/index2.php) and identified as: (a) having at least one classroom for infants (children under 12 months old or non-walkers); and (b) having children between 4 and 9 months of age at the time of entry into child care, and registered to begin attending child care between September 2013 and February 2014. These criteria were requirements of the broader project, given its focus on 4- to 9-month-old infants who were transitioning into childcare. Of the institutions registered at the Ministry of Solidarity, Employment and Social Security in the greater metropolitan area of Porto, 42 (18.8%) were private for-profit and 181 (81.2%) private nonprofit. In

2014, 74% of all Portuguese childcare centers were private nonprofit (Ministério da Solidariedade, Emprego e Segurança Social, 2014). Of the 90 centers in the study, 8 were for-profit centers and 82 nonprofit. The main reasons for the low rate of participation of the for-profit centers were that families delayed their infant's entrance into the childcare and missed the broader study time window, directors did not agree to participate, or centers did not answer in a timely manner. Of the 90 selected childcare centers, 49% were located in urban, central city areas, and the rest in suburban or rural areas. Only one classroom per center was recruited.

At Time 1, group sizes ranged from 1 to 12 infants ($M = 6.44$, $SD = 2.38$), and the child:adult ratio was on average 2.65 ($SD = 1.20$), ranging from 0.50 to 7.00. Regarding children's ages in these classrooms, on average, the youngest child was 4.99 months ($SD = 1.14$, ranging from 3 to 9) and the oldest was 10.79 months ($SD = 2.87$, ranging from 6 to 23). Six months later, at Time 2, the group size in each classroom varied between 2 and 18 infants ($M = 8.76$, $SD = 2.54$), and the child:adult ratio was on average 3.57 ($SD = 1.26$), ranging from 1.09 to 10. On average, the youngest child in the classrooms was 6.89 months ($SD = 1.97$, ranging from 3 to 11) and the oldest was 14.55 months ($SD = 2.74$, ranging from 10 to 24).

All classroom teachers were female. Although the word teacher (i.e., "educador") in Portuguese is normally used when referring to adults who have a degree in education, in this paper all caregivers who work in the infant classrooms are referred to as teachers, no matter their level of education or training. Portuguese legislation (Portaria n° 262/2011 and August 31st, 2016) does not require childcare centers to have caregivers with specific training in ECEC working in classrooms for infants, which contributes to greater variation in staff qualifications across settings. At Time 1, 31% ($n = 28$) of the participating classrooms had a trained lead teacher with a university-level degree in Early Childhood Education (ECE), although only 15 of these trained teachers worked full time in the infant classrooms. These teachers were typically assigned to more than one classroom, and thus were not full time in any classroom. In the remaining 69% of the classrooms, the lead teachers worked full time in an infant classroom, with 10% of these teachers having only completed the elementary school level (4 years of schooling), 51% a basic level of education (9 years of schooling), and 39% a high-school degree (12 years of schooling). On average, teachers were 42.53 years old ($SD = 9.97$); the youngest teacher was 20 years old and the oldest was 64. Teachers' experience in child care varied between 1 month and 37 years ($M = 8.36$ years, $SD = 6.51$). The majority of non-trained teachers ($n = 55$) had monthly salaries between 482€ and 580€ (about \$620 – \$750 in U.S. dollars at the time), and none earned more than 680 euros. Trained teachers' salaries ranged from "less than 482€" to "between 1781€ and 1880€", even though only three teachers reported earning more than 1080€ (about \$1400 U.S.). In 89% of the participating classrooms, the lead teacher was the same person at both time points (see Table 1).

4.2. Measures and procedures

The Portuguese Data Protection Authority approved all measures and data collection procedures and informed consent was obtained from the child care center directors and from the lead teacher of the infant classroom participating in the study. In each classroom, data were collected at two time points with a 6-month interval in between. Time 1 observations occurred from August – December 2014. The observations at both Time 1 and Time 2 consisted of two full mornings in which trained and reliable observers used the Infant/Toddler Environment Rating Scale – Revised (ITERS-R; Harms, Cryer, & Clifford, 2012), the Classroom Assessing Scoring System – Infant version (CLASS-Infant; Hamre et al., 2014), and the Caregiver Interaction Scale (CIS; Arnett, 1989). Both in Time 1 and Time 2, one set of observers rated all ITERS-R indicators on one morning, and a different set of observers coded the CLASS-Infant and the CIS on a different morning within 2 days before or after the ITERS-R observation. A few classrooms (one in Time 1 and three in Time 2) included a few children older than 18 months. For consistency, we followed the same observation protocol in every classroom.

At Time 1 the lead teachers were asked to complete the *Infant Classrooms' Structural Characteristics Questionnaire* (QSC-E; Barros et al., 2013), a short questionnaire about their training, experience, and classroom enrollment, as well as about the number of children and adults in the classroom; this information was updated at Time 2. Group size and number of adults were also observed during data collection in Time 1 and Time 2. The average group size and child:adult ratio were computed from the data collected both on the observations and questionnaires at both data collection periods. The computed group size variable considered the maximum number of children recorded in the group.

All measures are described below, including training and reliability procedures.

4.2.1. Infant/Toddler Environment Rating Scale – Revised

(ITERS-R; Harms et al., 2012). In this study the Portuguese translation of the ITERS-R was used. This measure consists of 39 items organized under seven subscales: Space and Furnishings, Personal Care Routines, Listening and Talking, Activities, Interaction, Program Structure, and Parents and Staff. Scores are given using a 7-point scale. Each item has descriptors for 1 (*inadequate*), 3 (*minimal*), 5 (*good*), and 7 (*excellent*). According to the scale instructions, a score of "Not Applicable" (NA) is allowed for several items when assessing classrooms with children under 12 months of age, namely the items 17 (Art), 19 (Blocks) and 21 (Sand and water play). Items 23 (Use of TV, video, and/or computer), 31 (Group play activities), 32 (Provisions for children with disabilities) and 36 (Staff interaction and cooperation) are also scored NA if the situation they describe does not apply to that classroom. Following the procedure reported in previous studies (e.g., Barros & Aguiar, 2010; Hestenes, Cassidy, Hegde, & Lower, 2007; Tietze, Cryer, Bairrão, Palacios, & Wetzel, 1996), all items that were allowed to be scored with NA were excluded from the analyses. Cronbach's alpha coefficient was 0.78 for the overall scale at Time 1 and 0.74 at Time 2. For the overall scale excluding the Parents and Staff items, the alpha was 0.81 at Time 1 and 0.76 at Time 2. In this study, and according to previous factor analyses (Barros et al., 2016), only one ITERS-R factor, named ITERS-R Interactions and Supervision, is included. This factor includes 8 items: Helping children use language, Staff-child interaction, Safety practices, Discipline, Helping children understanding language, Supervision of play and learning, Room arrangement, Greeting/departure. The factor's internal consistency was 0.80 for Time 1 and 0.75 for Time 2.

Before data collection, all observers received and successfully completed training on the measure, achieving at least 80% of agreement with a master coder as per the authors' recommendations. In addition, inter-rater reliability was assessed regularly during data collection in both time periods with a gold standard observer present in 25.6% of the ITERS-R observations. For Time 1 the exact agreement averaged 89.5%; within-one point agreement averaged 92.2%; and weighted kappa averaged 0.73. For Time 2 the exact agreement averaged 89.4%; within-one point agreement averaged 95.8%; and weighted kappa averaged 0.76.

4.2.2. Caregiver Interaction Scale

(CIS; Arnett, 1989). The CIS intends to capture several aspects of the interactions between caregivers and children, including caregivers' emotional tone, discipline style, and responsiveness in the classroom (Arnett, 1989). This is a widely used measure

Table 1
Descriptives and Tests of Mean Differences over Time for Process Quality Variables and Structural Indicators (N = 90).

	Time 1			Time 2					
	M	*SD*	*Range*	*M*	*SD*	*Range*	*Possible range*	*t*	*p*
Process Quality									
CLASS-Infant	3.51	0.69	1.94–5.38	3.25	0.82	1.63–5.75	1–7	3.123	.002
ITERS-R Interactions	3.50	1.02	1.50–6.63	2.89	0.96	1.00–4.88	1–7	5.899	<.001
CIS Total mean score	3.29	0.36	2.25–3.86	3.08	0.48	1.89–3.96	1–4	5.179	<.001
Structural Quality									
Group Size	6.44	2.38	1–12	8.76	2.54	2–18		−9.099	<.001
Ratio	2.65	1.20	0.50–7.00	3.57	1.26	1.09–10.00		−6.239	<.001
Lead teacher training T1	0.44		0–1						
Lead teacher continuity				0.89		0–1			

Note. Lead teacher training T1 (1 = university level degree); Lead teacher continuity (0 = other teacher; 1 = same teacher).

and its validity and reliability are extensively studied, including in Portugal (Cadima, Peixoto, & Leal, 2012; Colwell, Gordon, Fujimoto, Kaestner, & Korenman, 2013; Cryer, Tietze, Burchinal, Leal, & Palacios, 1999). Four dimensions of caregiver-child interactions are included in the original version of the scale, namely Sensitivity (including the warmth, level of enthusiasm and developmental appropriateness of the teacher's interactions with children), Harshness (referent to teacher's hostile behavior, threatening, and harshly critical tone of interactions), Detachment (relative to teacher's lack of involvement and interest towards children), and Permissiveness (related to caregivers relaxed and permissive approach towards children's misbehaviors) (Arnett, 1989). However, other factor solutions, including two- or three-factor solutions, are also supported in a study by Colwell et al. (2013). In Portugal, studies report the three-factor solution for older children (Cadima et al., 2012; Cryer et al., 1999) and internal consistencies for the three dimensions (Positive Interactions/Sensitivity, Punitiveness/Harshness and Detachment) have been shown to be adequate in these studies. In this study, we include 21 out of the total 26 items from the CIS (see Barros et al., 2016). Following several authors (e.g., de Kruif, McWilliam, Ridley, & Wakely, 2000; Hindman, Skibbe, Miller, & Zimmerman, 2010; Loeb, Fuller, Kagan, & Carrol, 2004; Zill et al., 2003), we used a single total score representing the caregiver interaction style. The internal reliability coefficient for the total mean score (based on the included 21 items) was 0.91 for Time 1 and 0.92 for Time 2.

All observers received and successfully completed training on the measure, achieving at least 97% of within-one point agreement with a master coder. A gold standard observer made 25.6% of the CIS observations with another observer for inter-rater reliability purposes during data collection. For Time 1 the exact agreement averaged 68.2%; within-one point agreement was 99.0%; and weighted kappa was 0.42. For Time 2 the exact agreement averaged 68.7%; within-one point agreement was 99.8%; and weighted kappa was 0.52.

4.2.3. *Classroom Assessment Scoring System – Infant*

(CLASS-Infant; Hamre et al., 2014). The CLASS-Infant consists of four dimensions: Relational Climate, Teacher Sensitivity, Facilitated Exploration, and Early Language Support. The Relational Climate dimension refers to the extent to which teachers and infants share close and positive relationships, the degree of general happiness and playfulness, the respect shown by the teacher to infants, and the absence of negativity. Teacher's awareness and responsiveness to all children in the classroom is assessed through the Teacher Sensitivity dimension of the measure. Facilitated Exploration dimension captures the level of teachers' active involvement with infants, providing opportunities for infants' exploration, as well and teachers' encouragement and capacity to adjust the environment to childrenís interests. The Early Language Support dimension is related to the extent to which teachers provide frequent high-quality language, and expand and extend infants' communication attempts. Each dimension is scored on a 7-point Likert scale with low (1, 2), middle (3, 4, 5) and high (6,7) range scores possibilities. The average score of the four dimensions of the CLASS-Infant achieved an adequate level of internal consistency at Time 1 and Time 2 ($\alpha = 0.89$. and $\alpha = 0.94$, respectively).

All observers received and successfully completed training on the measure. The training procedure was conducted in close collaboration with one of the authors of the scale. Observers achieved at least 80% reliability on an online test provided by the authors. During data collection, inter-rater reliability was assessed regularly, with a gold standard observer in 25.6% of the CLASS-Infant observations. For Time 1 the mean exact agreement was 65.2%; within-one point agreement was 99.2%; and weighted kappa was 0.70. For Time 2 the mean exact agreement was 68.8%; within-one point agreement was 98.9%; and weighted kappa was 0.72.

4.2.4. *Infant classrooms' structural characteristics questionnaire*

(QSC-E; Barros, Pessanha, Pinto, & Cadima, 2013). This questionnaire was designed to collect childcare structural indicators, such as center location, type of center, group size, number of teachers in the classroom; and lead teacher training (0 = no training in ECE; 1 = university-level degree in ECE), experience in childcare, salary, and continuity (0 = another teacher at Time 2; 1 = same teacher in Time 1 and Time 2).

4.3. *Data analyses*

To examine change of teacher-infant interactions quality in childcare classrooms over time, we used different approaches. First, we examined changes in the classroom that were systematic, through a simple change approach. Specifically, mean differences were computed to examine systematic change from Time 1 to Time 2 for the three measures of quality, namely, CLASS-Infant, CIS total mean score, and ITERS-R Interactions and Supervision. However, the level of change may vary across classrooms (Son & Morrison, 2010). Therefore, we used a second approach to examine change, in which the correlations between the two moments were calculated for each quality measure. This approach gives information on the degree of consistency versus individual variation of change. If there is a decrease in the group on the whole, the overall trend will be captured by the intercorrelation between the measures across the two time points (Son & Morrison, 2010).

Finally, a third approach to analyze change was used, the residualized change model. This approach goes a step further and captures the variation beyond the average change in the group, through hierarchical regression models. Specifically, Time 1 classroom quality score was entered into the model and its effect was partialled out. The variance in Time 2 classroom quality that could not be predicted

linearly by classroom quality Time 1 became a measure of change. The residualized change model represents a good specification of change that captures the relative change, over and beyond the systematic change in the group (Son & Morrison, 2010). In addition, this approach is also adequate to determine the extent to which structural features of the classroom contributed to relative change on the process quality over time. For each quality measure, blocks of predictors were entered into the model in the following order: (a) measure of quality at Time 1, (b) structural features at Time 1, and (c) change in structural features from Time 1 to Time 2. The measure of quality at Time 1 was entered first so that we could examine the unique contribution of the change in structural features on relative change, over and beyond the systematic change. Effect sizes were estimated as Cohen's *d* (Cohen, 1992) to interpret significant associations. Complete data were available for all classrooms.

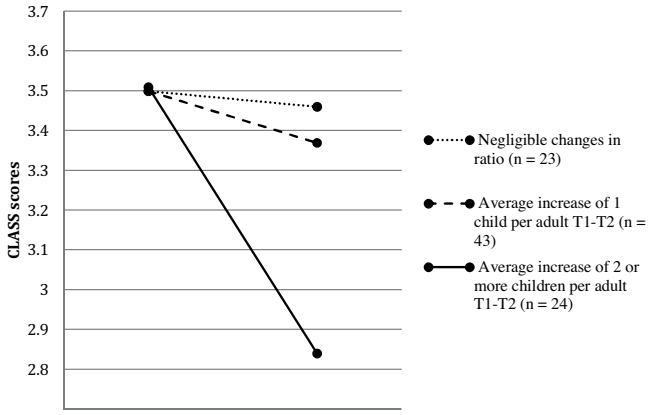

Fig. 1. Changes in CLASS scores from T1 to T2 by size of ratio increase.

5. Results

Descriptive statistics are presented in Table 1 for all study variables. Mean scores from Time 1 and Time 2 of CLASS-Infant were in the middle range of quality, covering almost the entire possible range, particularly at Time 2. Such results suggest that in most classrooms, although teachers were generally positive and sensitive, the opportunities to expand infants' experience and to support their communication were less common, both at Time 1 and Time 2. With respect to ITERS-R Interactions and Supervision, mean scores indicated minimal quality and a more limited range in Time 2. Finally, CIS Total mean scores were, on average, at a high level of quality in Time 1 and Time 2 indicating that most classrooms exhibited relatively high levels of positive, close relationships, and low levels of punitive relations. Results of paired-samples *t* tests revealed statistically significant decreases in teacher-child interaction quality from Time 1 to Time 2.

We also examined changes in group size and ratio. As shown in Table 1, classrooms exhibited statistically significant increases in group size and ratio. At Time 2, classrooms had, on average, larger group sizes and infant:teacher ratios, when compared to Time 1. To examine whether increases in ratio were spread over the sample, we examined the extent of change in ratio across classrooms. Of note was that classrooms varied in the extent of change in ratio, from negligible increases to increases equal or above two infants per adult. Results are summarized in Table 2, which displays ratios and group sizes at T1 and T2 for three ratio-change groups: classrooms with negligible changes in ratio ($n = 23$), classrooms with an average increase of one child per adult ($n = 43$), and classrooms with an average increase of at least two children per adult ($n = 24$). As shown, classrooms that exhibited greater increases in ratio from T1 to T2 had lower ratios in T1, compared to the other groups of classrooms, $F(2, 87) = 24.72$, $p < 0.001$, post hoc Gabriel, $p < 0.001$, but higher ratios in T2, $F(2, 87) = 13.40$, $p < 0.001$, compared to classrooms with negligible changes in ratio, post hoc Gabriel, $p < 0.001$. Considering that examining ratios at Time 1 and Time 2 separately would not fully capture the changes among classrooms, we have used ratio change in the subsequent models.

To address specifically the individual variation of change across classrooms, correlations were calculated between all variable pairs. Results of Pearson product moment correlation coefficients are summarized in Table 3. For all pairs of variables we found statistically significant positive associations between Time 1 and Time 2, varying from moderate to strong. Specifically, strong associations were obtained for CIS Total mean scores ($r = 0.582$), as well as for ITERS-R Interactions and Supervision mean scores ($r = 0.520$), while for CLASS-Infant mean scores, moderate associations were obtained ($r = 0.488$). Such results suggest relative stability in teacher-infant interaction quality, indicating that the rank-ordering of the teacher-infant interaction quality across the classrooms did not substantially change over time.

A second purpose of the study was to examine the role that classroom structural indicators have in predicting the change in quality of teacher-child interactions in infant childcare classrooms over time. We first examined correlations among predictors and outcome variables (see Table 3). Small nonsignificant associations were found between quality at Time 2 as measured by the three quality measures and most of the structural features at Time 1 or change in structural features from Time 1 to Time 2. Although the associations between ratio change and the quality measures at T2 did not reach statistical significance, the associations were modest and in the expected direction.

Hierarchical regression models were then performed separately for each measure of quality, entering as predictors (a) measure of quality at Time 1, (b) structural features at Time 1 (caregiver training, group size, ratio), and (c) change in structural features from Time 1 to Time 2. Due to multicollinearity, group size change was excluded from the models.

As shown in Table 4, after block 1 was entered, with the Time 1quality score in the equation, R^2 was significantly different from zero for all Time 2 quality variables. Thus, quality at Time 2 was statistically significantly related to quality at Time 1. None of the structural indicators entered in block 2 or 3 significantly contributed to teacher-infant interaction quality as measured by the three quality measures used in the present study.

Block 4 made a statistically significant contribution to CLASS-Infant and CIS Total mean score. The change in child:teacher ratios between Time 1 and Time 2 was a statistically significant predictor of teacher-child interaction quality at Time 2 as measured by CLASS-Infant and CIS Total mean score, after controlling for prior quality at Time 1 and structural features at Time 1. This result indicates that increases in child:teacher ratio in classrooms were associated with decreases in quality of teacher-child interactions from Time 1 to Time 2. Regarding the ITERS-R Interactions dimension, no effect was found for the ratio change. Only the quality measure score at Time 1 had a significant predictive effect for this variable. Figs. 1 and 2 depict changes in quality scores for CLASS and CIS, respectively, according to changes in ratio from T1 to T2 for classrooms with negligible changes in ratio, classrooms with an average increase of one child per adult, and classrooms with an average increase of at least two children per adult. As shown, in classrooms with an increased ratio of two or more children per adult from T1 to T2, the decrease in quality scores of both CLASS and CIS was steeper.

Finally, a series of sensitivity analyses were conducted to increase our understanding of the role of ratio on changes in quality, examining the specific role of approved ratios in Portugal. A higher

Table 2
Group Size and Ratio at T1 and T2 for Three Ratio-Change Groups.

		Group size		Ratio	
	n	T1	T2	T1	T2
Changes in ratio from T1 to T2	23	7.26	8.26	3.85	3.16
Negligible changes					
Average increase of 1 child per adult	43	6.23	8.52	2.37	3.24
Average increase ≥2 children per adult	24	6.04	9.67	2.00	4.57

Table 3
Bivariate Correlations Between Time 1 and Time 2 Process and Structural Indicators.

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
1. CLASS-Infant T1											
2. ITERS-R Interactions T1	.459**										
3. CIS Total mean score T1	.801**	.546**									
4. CLASS-Infant T2	.488**	.492**	.509**								
5. ITERS-R Interactions T2	.395**	.520**	.548**	.565**							
6. CIS Total mean score T2	.508**	.439**	.582**	.845**	.601**						
7. Group size T1	−.121	−.173	−.167	−.156	−.138	−.150					
8. Group size change	−.079	−.070	−.086	−.161	−.163	−.195	−.437**				
9. Ratio T1	−.138	−.073	−.073	−.065	.075	.004	.584**	−.398**			
10. Ratio change	−.002	−.202	−.006	−.200	−.206	−.189	−.138	.368**	−.544**		
11. Lead teacher training T1	.273**	.127	.153	.167	.069	.105	−.048	.148	−.121	.138	
12. Lead teacher continuity	.230*	.069	.157	.133	.086	.095	−.008	.017	−.019	−.133	.111

Note. *$p < 0.05$. **$p < 0.01$.

Table 4
Summary of Hierarchical Regression Analyses for Variables Predicting Teacher-Infant Interactions Quality in Time 2.

	CLASS-Infant T2			ITERS-R Interactions and Supervision T2			CIS Total mean score T2		
	B	*SE B*	β	*B*	*SE B*	β	*B*	*SE B*	β
Step 1			$R^2 = .238^{***}$			$R^2 = .270^{***}$			$R^2 = .338^{***}$
Measure of quality at T1	.580	.111	.488***	.487	.085	.520***	.770	.115	.582***
Step 2			$\Delta R^2 = .016$			$\Delta R^2 = .033$			$\Delta R^2 = .013$
Measure of quality at T1	.559	.117	.471***	.471	.087	.502***	.749	.119	.565***
Lead teacher training T1	.082	.188	.043	.051	.207	.023	.031	.101	.027
Group size T1	−.052	.040	−1.52	−.071	.046	−.177	−.026	.022	−.125
Ratio T1	.064	.079	.094	.174	.090	.218	.049	.044	.122
Step 3			$\Delta R^2 = .000$			$\Delta R^2 = .003$			$\Delta R^2 = .000$
Measure of quality at T1	.554	.120	.466***	.468	.087	.499***	.748	.121	.565***
Lead teacher training T1	.079	.189	.041	.039	.209	.017	.030	.102	.027
Group size T1	−.052	.040	−1.52	−.071	.046	−.177	−.026	.022	−.126
Ratio T1	.064	.079	.094	.174	.090	.218	.049	.044	.123
Lead teacher continuity	.055	.250	.021	.158	.278	.052	.008	.137	.005
Step 4			$\Delta R^2 = .047^{*}$			$\Delta R^2 = .000$			$\Delta R^2 = .031^{*}$
Measure of quality at T1	.534	.117	.449***	.466	.091	.497***	.748	.119	.565***
Lead teacher training T1	.132	.185	.069	.041	.212	.018	.052	.101	.045
Group size T1	−.027	.040	−.079	−.070	.047	−.175	−.013	.023	−.066
Ratio T1	−.067	.095	−.099	.168	.112	.211	−.013	.053	−.032
Lead teacher continuity	−.046	.247	−.018	.153	.284	.051	−.044	.137	−.029
Ratio change	−.160	.067	−.276*	−.007	.082	−.011	−.076	.038	−.222*
	Total $R^2 = .302$			Total $R^2 = .306$			Total $R^2 = .382$		
	Adjusted $R^2 = .252$			Adjusted $R^2 = .256$			Adjusted $R^2 = .337$		

Note. *$p < 0.05$. **$p < 0.01$. ***$p < 0.001$.

increase in ratio could be associated with passing the threshold of approved ratios in Portugal of 5 children per adult in Time 2, which could indicate that exceeding the approved ratio was related to decreases in quality. Regression analyses were conducted using a dummy variable for ratio in Time 2 with a cut-point of 5:1, using the same covariates, with the exception of ratio change. No evidence emerged supporting this hypothesis. It seemed that, as Figs. 3 and 4 illustrate, classrooms with higher increases in ratio (increases of two or more children per adult) showed steeper decreases in quality scores in both CLASS and CIS, regardless of whether the increase passed the approved ratio of 5:1.

6. Discussion

Considering the importance of high-quality interactions across the first years of life, emphasized by theory and previous research (e.g., Jamison et al., 2014; Shonkoff & Phillips, 2000), as well as the large number of infants spending time in center-based ECEC, it is increasingly relevant to understand the nature of infants' education and care experiences in child care settings. Addressing the need in this area due to the limited data on teacher-child interaction quality during the infancy period and its consistency over time, the first aim of this study was to analyze change in teacher-child interaction quality for infants in their first 6 months of childcare

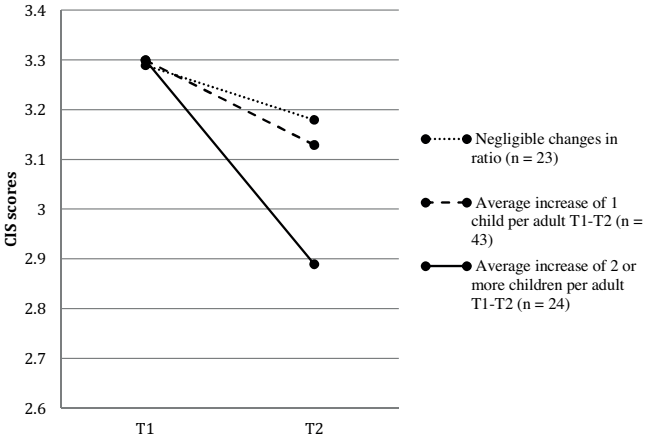

Fig. 2. Changes in CIS scores from T1 to T2 by size of ratio increase.

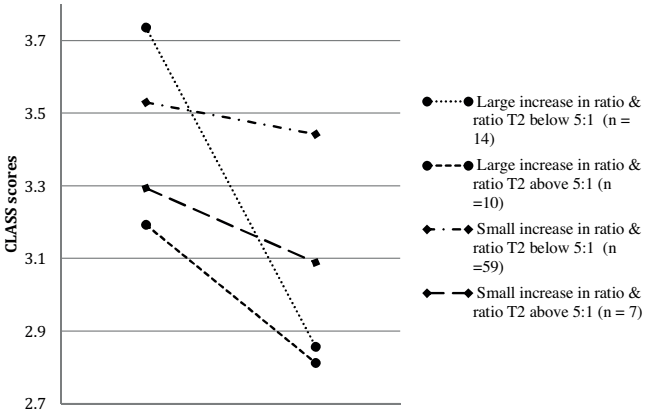

Fig. 3. Changes in CLASS scores from T1 to T2 by size of ratio increase (small vs high) and approved ratios in Portugal (above and below).
Note. Large increase was defined as an increase of at least two children per adult.

attendance as measured by dimensions derived from three well known observational measures: CLASS-Infant, ITERS-R, and CIS.

Overall, findings from the current study showed that the quality of teacher-child interactions in the participating infant classrooms was relatively modest, both at the time infants entered child care as well as 6 months later. The overall emotional tone of teacher-infant interactions was generally positive, but results also suggested poor intentionality in teachers' practices and restricted opportunities to expand children's experiences and support their communication. Additionally, the results indicated that only basic developmental needs were being addressed, not only during play and learning activities, but also regarding safety practices, the kind of room arrangements provided, and during greeting/departing.

In general, results from this study are similar to other recent studies conducted in infant/toddler classrooms, using the same observational measures of quality (e.g., Jamison et al., 2014; La Paro et al., 2014; Thomason & La Paro, 2009). Pessanha, Aguiar and Bairrão (2007) argued that possible explanations for the lack of developmentally appropriate practices in classrooms for very young children are a predominance of custodial conceptualization of infant and toddler care as opposed to an educational focus in preschool, and an almost exclusive focus of Portugal's teacher preservice education programs on the education and care of preschoolers (age 3–6 years).

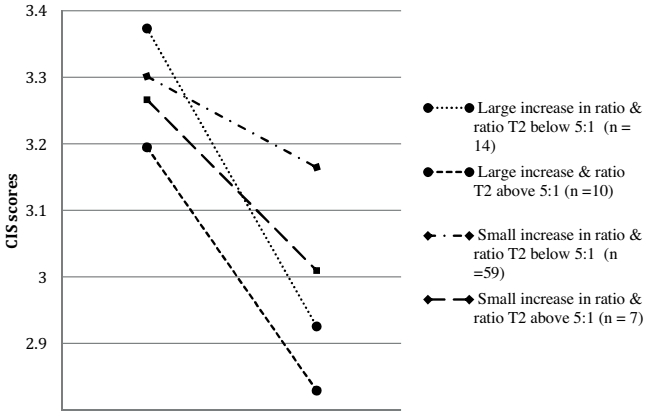

Fig. 4. Changes in CIS scores from T1 to T2 by size of ratio increase (small vs high) and approved ratios in Portugal (above and below).
Note. Large increase was defined as an increase of at least two children per adult.

Considering the relevance of responsive interactions with children throughout the infancy period (e.g., National Association for the Education of Young Children [NAEYC], 2009; Recchia & Shin, 2012; Shonkoff & Phillips, 2000; Wittmer & Petersen, 2006; ZERO TO THREE, 2009) and the evidence that only high-quality programs appear to have a positive effect on child development (Burchinal et al., 2010), our results raise significant concerns about the quality of infant education and care in Portugal, specifically regarding teacher-infant interactions.

For Portuguese parents and policymakers it should be disturbing that the quality of teacher-infant interactions in a wide sample of infant classrooms was so often in the low to moderate range, and equally disturbing that the quality decreased over the school year. For infants in the observed classrooms, the quality of interactions with teachers tended to decrease over the year as their developmental needs changed. As Recchia and Shin (2012) noted, around the end of the first year of life, infants "become more proficient in their motor skills, develop more verbal, linguistic communication, initiate intentional social interactions, and become increasingly independent social agents" (p. 1546). Therefore, caregivers' interactions need to change through a continuous process of responsive learning environment in order to better respond to children's developmental modifications over time. Our results suggest that teachers are struggling in accommodating infants' developmental changes and individual differences in their interactions with the infants. In most classrooms in this study, new children entered the infant classrooms throughout the school year, as their mothers' maternity leave ended. Their teachers not only had to respond to the developing competencies, interests, and needs of infants of different ages, but frequently to a new child with a new set of needs. Despite the decline of teacher-infant interactions quality from Time 1 to Time 2, the individual rank order of classrooms on teachers-infant interactions quality remained stable over time (relative stability), that is, the observed classrooms in the present study maintained their position over time relative to other classrooms.

The second aim of this study was to examine the role that classroom structural indicators play in predicting the change in teacher-child interaction quality over time. As in previous research (e.g., Goelman et al., 2006), our results suggest that the child:adult ratio is of particular interest in understanding process quality in infant ECEC. Specifically, as child:teacher ratios increased over time, teacher-infant interaction quality decreased on two of the three measures used here. These results document the detrimental effects of increased ratios on classroom interaction quality indicating that teachers are less able to offer sensitive and responsive caregiving when the number of infants per adult is higher, and

specifically when, as mentioned earlier, infant classrooms can have children with very different developmental characteristics and needs.

These data support the need to keep ratios as good as feasible. Two well-known recommendations for child:adult ratio in infant childcare classrooms indicate between 3:1 and 4:1. The American Academy of Pediatric and American Public Health Association (2002) recommendation is 3:1 with no more than 6 infants per group; NAEYC (2009) recommends no more than 4:1 with no more than 8 infants per group. The Portuguese policy on infant:teacher ratio with non-mobile children defines 5:1 with no more than 10 infants in a group (Portaria n° 262/2011 and August 31st, 2016), which is higher than internationally recommended. Of concern is the fact that some classrooms had higher ratios than those defined by the Portuguese policy (i.e., were out of compliance). The fact that the specific cutoff of 5:1 was not related to decreases in quality suggests that other cutoffs should be considered, in particular, if ratios are to increase over the year. It appeared that it was a common practice to include in the classroom a growing number of children across the year, but to keep the same staff.

It was unexpected that the child:adult ratio change from Time 1 to Time 2 did not significantly contribute to teacher-child interactions at Time 2 as measured by ITERS-R Interactions and Supervision domain. Only the quality measure score at Time 1 played a significant predictive role for this variable. One possible reason is that the ITERS-R Interactions and Supervision domain also include less dynamic features of child care environment.

7. Limitations and conclusions

Some limitations to this study must be acknowledged. First, although a random sampling procedure was used to select the participating classrooms, due to some strict requirements of the broader project concerning participant characteristics, the eligible centers were reduced to those that had infants entering child care during the first months of the school year (August-December). In addition, the study included only centers from the north of Portugal with a higher participation rate of private nonprofit centers than for-profit centers. Therefore, our results must be interpreted with caution given that they cannot be generalized to all Portuguese childcare centers. Both conditions should be considered when translating results to other childcare settings, namely those in other regions of the country or from for-profit childcare centers. Second, the three quality measures used in the present study to document teacher-child interactions were not originally developed in Portugal, although ITERS-R and CIS have been extensively used here, with results documenting their adequacy to the Portuguese child care settings (Barros & Aguiar, 2010; Barros & Leal, 2015; Cadima et al., 2012; Cryer et al., 1999). With respect to the CLASS-Infant measure, even though other age versions have been found to be reliable for the Portuguese context (Cadima, Leal, & Burchinal, 2010), this study is the first to use the Infant version in Portugal, through a close collaboration with one of the scale's authors.

Despite these limitations, the present study expands on earlier national and international research focused on childcare quality in early stages of development by examining the consistency of teacher-child interaction quality in infant childcare classrooms over time, as well as by analyzing its association with classroom structural characteristics. Particularly, our study supports the significant body of research that documents the importance of child:teacher ratio, a structural dimension of quality, on the quality of interactions between caregivers and infants (e.g., Barros & Aguiar, 2010; Cost, Quality & Child Outcomes Study Team, 1995; Jamison et al., 2014). The study also adds uniquely to the existing research in the area by using a multi-measure approach to teacher-infant interactions quality. The use of three different observational measures was intended to provide more rigorous evidence of teacher-infant interaction quality in infant childcare classrooms over time, with potential to inform policy decisions, teachers' professional development, as well as future research.

Given the low-to-moderate levels of teacher-infant interaction quality, our findings highlight the need to invest in childcare centers' supervision and monitoring support to improve the quality of center-based care for infants in Portugal. Teachers need specific training in caring for infants and toddlers and in interacting with very young children. These findings also highlight the need to rethink current Portuguese policy regarding allowed child:adult ratios in infant classrooms and to improve this regulation in order to ensure higher quality interactions for infants in childcare settings. Finally, further studies could deepen our understanding on how teacher-child interactions occur during infancy and analyze its association with children's short- and long-term developmental outcomes. In the present study we provide an overall summary of quality of children's direct experiences in the classroom over time by examining the classroom-level quality processes. Supported by other authors (e.g., Cadima, Verschueren, Leal, & Guedes, 2015; Recchia & Shin, 2012), we add the need to further examine how teachers adapt their interactions over time to the uniqueness and the developmental needs of particular infants, examining the quality at an individual level.

Acknowledgements

This paper is financed by FEDER funds through the Operational Competitiveness Program – COMPETE and by national funds through FCT – Portuguese Foundation for Science and Technology under the project FCOMP-01-0124-FEDER-029509; FCT – PTDC/MHC-CED/4007/2012.

References

American Academy of Pediatrics and American Public Health Association. (2002). *Caring for our children: National health and safety performance standards: Guidelines for out-of-home child care* (2nd ed.). Elk Grove Village, IL: American Academy of Pediatrics.

Arnett, J. (1989). Caregivers in day-care centers: Does training matter? *Journal of Applied Developmental Psychology*, *10*, 541–552.

Balaban, N. (2011). Transition to group care for infants, toddlers and families. In D. M. Laverick, & M. R. Jalongo (Eds.), *Transitions to early care and education, educating the young child* (Vol. 4) (pp. 7–20). New York: Springer Science-Business Media.

Barros, S., & Aguiar, C. (2010). Assessing the quality of Portuguese child care programs for toddlers. *Early Childhood Research Quarterly*, *25*, 527–535. http://dx.doi.org/10.1016/j.ecresq.2009.12.003

Barros, S., & Leal, T. (2011). Dimensões da qualidade das salas de creche do distrito do Porto [Quality dimensions of day care classrooms in the district of Porto]. *Revista Galego-Portuguesa de Psicoloxía e Educación*, *9*(2), 117–132.

Barros, S., & Leal, T. B. (2015). Parents' and teachers' perceptions of quality in Portuguese childcare classrooms. *European Journal of Psychology of Education*, *30*(2), 209–226. http://dx.doi.org/10.1007/s10212-014-0235-4

Barros, S., Pessanha, M., Pinto, A., & Cadima, J. (2013). *Questionário de características estruturais: Berçário [Infant classrooms' structural characteristics questionnaire]. Unpublished questionnaire*. Portugal: Faculty of Psychology and Educational Sciences, Porto University.

Barros, S., Cadima, J., Bryant, D., Coelho, V., Pinto, A. I., Pessanha, M., & Peixoto, C. (2016). Infant child care quality in Portugal: Associations with structural characteristics. *Early Childhood Research Quarterly*, *37*, 118–130. http://dx.doi.org/10.1016/j.ecresq.2016.05.003

Bronfenbrenner, U., & Evans, G. W. (2000). Developmental science in the 21st century: Emerging questions, theoretical models, research designs and empirical findings. *Social Development*, *9*, 115–125.

Bronfenbrenner, U., & Morris, P. A. (1998). The ecology of developmental processes. In W. Damon, & R. M. Lerner (Eds.), *Handbook of child psychology* (Vol. 1) (5th ed., Vol. 1, pp. 993–1028). New York.

Bryant, D. M., Burchinal, M., & Zaslow, M. (2011). Empirical approaches to strengthening the measurement of quality: Issues in the development and use of quality measures in research and applied settings. In M. Zaslow, I. Martinez-Beck, K. Tout, & T. Halle (Eds.), *Quality measurement in early childhood settings* (pp. 33–47). Baltimore, MD: Brookes.

Burchinal, M. R., Roberts, J. E., Nabors, L. A., & Bryant, D. M. (1996). Quality of center child care and infant cognitive and language development. *Child Development, 67*, 606–620.
Burchinal, M. R., Cryer, D., Clifford, R. M., & Howes, C. (2002). Caregiver training and classroom quality in child care centers. *Applied Developmental Sciences, 6*(1), 2–11.
Burchinal, M., Vandergrift, N., Pianta, R., & Mashburn, A. (2010). Threshold analysis of association between child care quality and child outcomes for low-income children in pre-kindergarten programs. *Early Childhood Research Quarterly*, *25*, 166–176. http://dx.doi.org/10.1016/j.ecresq.2009.10.004
Burchinal, M., Kainz, K., & Cai, Y. (2011). How well do our measures of quality predict child outcomes? A meta-analysis and coordinated analysis of data from large-scale studies of early childhood settings. In M. Zaslow, I. Martinez-Beck, K. Tout, & T. Halle (Eds.), *Quality measurement in early childhood settings* (pp. 11–31). Baltimore, MD: Brookes.
Cadima, J., Leal, T., & Burchinal, M. (2010). The quality of teacher-student interactions: Associations with first graders' academic and behavioral outcomes. *Journal of School Psychology*, *48*, 457–482. http://dx.doi.org/10.1016/j.jsp.2010.09.001
Cadima, J., Peixoto, C., & Leal, T. (2012). Observação das interacções educador-criança: Escala de interacção do prestador de cuidados [Observation of teacher-child interactions: Scale interaction carer]. *Análise Psicológica, 30*, 373–386.
Cadima, J., Verschueren, K., Leal, T., & Guedes, C. (2015). Classroom interactions, dyadic teacher-child relationships, and self-regulation in socially disadvantaged young children. *Journal of Abnormal Child Psychology*, http://dx.doi.org/10.1007/s10802-015-0060-5
Campbell, F. A., Ramey, C. T., Pungello, E. P., Sparling, J., & Miller-Johnson, S. (2002). Early childhood education: Young adult outcomes from the Abecedarian Project. *Applied Developmental Science, 6*, 42–57.
Cost, Quality, & Child Outcomes Study Team. (1995). *Cost, quality, and child outcomes in child care centers: Public report* (2nd edition). Denver: Economics Department, University of Colorado at Denver.
Cohen, J. (1992). Quantitative methods in psychology: A power primer. *Psychological Bulletin, 112*, 155–159.
Colwell, N., Gordon, R. A., Fujimoto, K., Kaestner, R., & Korenman, S. (2013). New evidence on the validity of the arnett caregiver interaction scale: Results from the early childhood longitudinal study-Birth cohort. *Early Childhood Research Quarterly*, *28*, 218–233. http://dx.doi.org/10.1016/j.ecresq.2012.12.004
Cryer, D., Tietze, W., Burchinal, M., Leal, T., & Palacios, J. (1999). Predicting process quality from structural quality in preschool programs: A cross-country comparison. *Early Childhood Research Quarterly, 14*, 339–361.
Cryer, D., Wagner-Moore, L., Burchinal, M., Yazejian, N., Hurwitz, S., & Wolery, M. (2005). Effects of transitions to new child care classes on infant/toddler distress and behavior. *Early Childhood Research Quarterly*, *20*, 37–56. http://dx.doi.org/10.1016/j.ecresq.2005.01.005
Curby, T. W., Grimm, K. J., & Pianta, R. C. (2010). Stability and change in early childhood classroom interactions during the first two hours of a day. *Early Childhood Research Quarterly*, *25*, 373–384. http://dx.doi.org/10.1016/j.ecresq.2010.02.004
Curby, T. W., Rimm-Kaufman, S. E., & Abry, T. (2013). Do emotional support and classroom organization earlier in the year set the stage for higher quality instruction? *Journal of School Psychology*, *51*, 557–569.
Daniel, J., & Shapiro, J. (1996). Infant transitions: Home to center-based child care. *Child & Youth Care Forum, 25*, 111–123.
Datler, W., Ereky-Stevens, K., Hover-Reisner, N., & Malmberg, L. E. (2012). Toddler's transition to out-of-home day care: Settling into a new care environment. *Infant Behavior and Development, 35*, 439–451.
De Schipper, J. C., Van Ijzendoorn, M. H., & Tavecchio, L. W. C. (2004). Stability in center day care: Relations with children's well-being and problem behaviour in day care. *Social Development*, *13*, 531–550.
Deynoot-Schaub, M. G., & Riksen-Walraven, J. M. (2005). Child care under pressure: The quality of Dutch centers in 1995 and in 2001. *The Journal of Genetic Psychology: Research and Theory on Human Development*, *166*(3), 280–296. http://dx.doi.org/10.3200/GNTP.166.3.280-296
Edwards, C. P., & Raikes, H. (2002). Extending the dance: Relationship-based approaches to infant/toddler care and education. *Young Children*, *57*, 10–17.
Fernandez, M. E. P. (2004). *A survey study of entry transition practices used by teachers of infants and toddlers (Unpublished master's thesis)*. Denton Texas: University of North Texas. Retrieved from http://digital.library.unt.edu/ark:/67531/metadc4710/
Gabinete de Estratégia e Planeamento/Ministério da Solidariedade, Emprego e Segurança Social. (n.d.a). Carta social: Rede de serviços e equipamentos (Relatório 2013) [Social charter: Network of services and equipments (2013 Report)]. Retrieved from http://www.cartasocial.pt/pdf/csocial2012.pdf.
Goelman, H., Forer, B., Kershaw, P., Doherty, G., Lero, D., & LaGrange, A. (2006). Towards a predictive model of quality in Canadian child care centers. *Early Childhood Research Quarterly*, *21*, 280–295. http://dx.doi.org/10.1016/j.ecresq.2006.07.005
Hamre, B. K., & Pianta, R. C. (2007). Learning opportunities in preschool and early elementary classrooms. In R. C. Pianta, M. J. Cox, & K. L. Snow (Eds.), *School readiness and the transition to kindergarten in the era of accountability* (pp. 49–84). Baltimore: Brookes.
Hamre, B. K., La Paro, K. M., Pianta, R. C., & LoCasale-Crouch, J. (2014). *Classroom assessment scoring system (CLASS) manual: Infant*. Baltimore, MD: Brookes.
Harms, T., Cryer, D., & Clifford, R. M. (1990). *Infant/toddler environment rating scale*. New York: Teachers College Press.
Harms, T., Cryer, D., & Clifford, R. M. (2003). *Infant/toddler environment rating scale-revised*. New York: Teachers College Press.
Harms, T., Cryer, D., & Clifford, R. M. (2006). *Infant/toddler environment rating scale–Revised edition, updated*. New York: Teachers College Press.
Harms, T., Cryer, D., & Clifford, R. M., (2012). Infant/Toddler Environment Rating Scale–Revised edition (ITERS-R) (S. Barros, A. I. Pinto, C. Peixoto, & M. Pessanha, Trans.). Unpublished translation (Original work published 2006).
Head Start Family and Child Experiences Survey [FACES] (2001). Head Start FACES: Longitudinal findings on program performance. Third progress report (Executive Summary). Commissioner's Office of Research and Evaluation and the Head Start Bureau. Retrieved from http://www.acf.hhs.gov/sites/default/files/opre/perform_3rd_rpt.pdf.
Helmerhorst, K. O. W., Riksen-Walraven, M., Vermeer, H. J., Fukkink, R. G., & Tavecchio, L. W. C. (2014). Measuring the interactive skills of caregivers in childcare centers: Development and validation of the Caregiver Interaction Profile Scales. *Early Education and Development*, *25*, 770–790. http://dx.doi.org/10.1080/10409289.2014.840482
Hestenes, L. L., Cassidy, D. J., Hegde, A., & Lower, J. K. (2007). Quality in inclusive and non-inclusive infant and toddler classrooms. *Journal of Research in Childhood Education*, *22*, 69–84. http://dx.doi.org/10.1080/02568540709594613
Hindman, A. H., Skibbe, L. E., Miller, A., & Zimmerman, M. (2010). Ecological contexts and early learning: Contributions of child, family, and classroom factors during Head Start, to literacy and mathematics growth through first grade. *Early Childhood Research Quarterly*, *25*, 235–250.
Howes, C., Burchinal, M., Pianta, R., Bryant, D., Early, D., Clifford, R., & Barbarin, O. (2008). Ready to learn? Children's pre-academic achievement in pre-kindergarten programs. *Early Childhood Research Quarterly*, *23*, 27–50. http://dx.doi.org/10.1016/j.ecresq.2008.08.001
Jamison, K. R., Cabell, S. Q., LoCasale-Crouch, J., Hamre, B. K., & Pianta, R. C. (2014). CLASS-Infant: An observational measure for assessing teacher-infant interactions in center-based child care. *Early Education and Development*, *25*, 553–572. http://dx.doi.org/10.1080/10409289.2013.822239
La Paro, K. M., Williamson, A. C., & Hatfield, B. (2014). Assessing quality in toddler classrooms using the CLASS-Toddler and the ITERS-R. *Early Education and Development*, *25*, 875–893. http://dx.doi.org/10.1080/10409289.2014.883586
Leseman, P. P. M., & Slot, P. L. (2014). Breaking the cycle of poverty: Challenges for European early childhood education and care. *European Early Childhood Education Research Journal*, *22*(3), 314–326. http://dx.doi.org/10.1080/1350293X.2014.912894
Loeb, S., Fuller, B., Kagan, S. L., & Carrol, B. (2004). Child care in poor communities: Early learning effects of type, quality and stability. *Child Development*, *75*, 47–65.
Merrill, S. (2010). Child care: It's a transition for parents too!. *Young Children*, *65*(5), 60–61.
Ministério da Solidariedade, Emprego e Segurança Social. (2014). *Carta Social –Rede de Serviços e Equipamentos –Relatório 2014*. Lisboa: Gabinete de Estratégia e Planeamento.
Mortensen, J. A., & Barnett, M. A. (2015). Teacher-child interactions in infant/toddler child care and socioemotional development. *Early Education and Development*, *26*, 209–229. http://dx.doi.org/10.1080/10409289.2015.985878
National Institute on Child Health and Human Development Early Childhood Research Network. (1996). Characteristics of infant child care: Factors contributing to positive caregiving. *Early Childhood Research Quarterly*, *11*, 269–306.
National Institute of Child Health, & Human Development Early Child Care Research Network. (2006). Child-care effect sizes for the NICHD study of early care and youth development. *American Psychologist*, *61*, 99–116.
National Institute on Child Health and Human Development Early Childhood Research Network. (2000). Characteristics and quality of child care for toddlers and preschoolers. *Applied Developmental Science*, *4*, 116–135.
National Institute on Child Health and Human Development Early Childhood Research Network. (2005). Predicting individual differences in attention, memory, and planning in first graders from experiences at home, child care, and school. *Developmental Psychology*, *41*, 99–114.
National Association for the Education of Young Children [NAEYC]. (2009). *Developmentally appropriate practice in early childhood programs serving children from birth through age 8* (Position statement). Washington: NAEYC. Retrieved from http://www.naeyc.org/positionstatements.
Organization for Economic Co-Operation and Development [OECD]. (2011). Doing better for families: Portugal. Retrieved from http://www.oecd.org/portugal/47704295.pdf.
Peisner-Feinberg, E. S., & Yazejian, N. (2010). Research on program quality: The evidence base. In P. Wesley, & V. Buysse (Eds.), *The quest for quality: Promising innovations for early childhood programs* (pp. 21–45). Baltimore, MD: Brookes.
Peisner-Feinberg, E. S., Burchinal, M. R., Clifford, R. M., Culkin, M. L., Howes, C., Kagan, S. L., & Yazejian, N. (2001). The relation of preschool child-care quality to children's cognitive and social developmental trajectories through second grade. *Child Development*, *72*, 1534–1553.
Pessanha, M., Aguiar, C., & Bairrão, J. (2007). Influence of structural features on Portuguese toddler child care quality. *Early Childhood Research Quarterly*, *22*, 204–214. http://dx.doi.org/10.1016/j.ecresq.2007.02.003
Pessanha, M., Pinto, A. I., & Barros, S. (2009). Influência da qualidade dos contextos familiar e de creche no envolvimento e no desenvolvimento da criança [Effects

of day care and home quality on children's engagement and development]. *Psicologia*, *XXIII*, 55–71.
Pessanha, M., (2008). Vulnerabilidade e resiliência no desenvolvimento dos indivíduos: Influência da qualidade dos contextos de socialização no desenvolvimento das crianças [Vulnerability and Resilience on the development of individuals: Influence of the socialization contexts' quality on children's development]. Lisboa : Fundação Calouste Gulbenkian, Fundação para a Ciência e Tecnologia.
Phillips, D., Mekos, D., Scarr, S., McCartney, K., & Abbott-Shim, M. (2000). Within and beyond the classroom door: Assessing quality in child care centers. *Early Childhood Research Quarterly*, *15*, 475–496. http://dx.doi.org/10.1016/S0885-2006(01)00077-1
Phillipsen, L. C., Burchinal, M. R., Howes, C., & Cryer, D. (1997). The prediction of process quality from structural features of child care. *Early Childhood Research Quarterly*, *12*, 281–303. http://dx.doi.org/10.1016/S0885-2006(97)90004-1
Portaria n° 262/2011, August 31st., Diário da República n.° 167–I Série Ministério da Solidariedade e da Segurança Social. 2016. 4338-4343.
Ramey, C. T., Campbell, F. A., Burchinal, M. R., Skinner, M. L., Gardner, D. M., & Ramey, S. L. (2000). Persistent effects of early childhood education on high-risk children and their mothers. *Applied Developmental Science*, *4*, 2–14.
Rapoport, A., & Piccinini, C. A. (2001). O ingresso e adaptação de bebês e crianças pequenas à creche: Alguns aspectos críticos [Enrolment and adaptation of infants and young children to day care: Some critical aspects]. *Psicologia: Reflexão e Crítica*, *14*(1), 81–95.
Recchia, S. L., & Shin, M. (2012). In and out of synch: Infant childcare teachers' adaptations to infants' developmental changes. *Early Child Development and Care*, *182*, 1545–1562.
Reynolds, A. J., Miedel, W. T., & Mann, E. A. (2000). Adopting innovation in early childhood education: The Child-Parent Center Program. *Young Children*, *55*(2), 84–88.
Ritchie, S., & Howes, C. (2003). Program practices, caregiver stability, and child-caregiver relationships. *Applied Developmental Psychology*, *24*, 497–516.
Ruprecht, K., Elicker, J., & Choi, J. Y. (2016). Continuity of care, caregiver-child interactions and toddler social competence and problem behaviors. *Early Education and Development*, *27*, 221–239. http://dx.doi.org/10.1080/10409289.2016.1102034
Ruzek, E., Burchinal, M., Farkas, G., & Duncan, G. J. (2014). The quality of toddler child care and cognitive skills at 24 months: Propensity score analysis results from the ECLS-B. *Early Childhood Research Quarterly*, *29*, 12–21. http://dx.doi.org/10.1016/j.ecresq.2013.09.002
Shonkoff, J. P., & Phillips, D. A. (Eds.). (2000). From neurons to neighborhoods: The science of early childhood development. In. National Academy Press.
Son, S. H., & Morrison, F. J. (2010). The nature and impact of changes in home learning environment on development of language and academic skills in preschool children. *Developmental Psychology*, *46*(5), 1103–1118.
Thomason, A., & La Paro, K. M. (2009). Measuring the quality of teacher-child interactions in toddler child care. *Early Education and Development*, *20*, 285–304.
Tietze, W., Cryer, D., Bairrão, J., Palacios, J., & Wetzel, G. (1996). Comparisons of observed process quality in early child care and education programs in five countries. *Early Childhood Research Quarterly*, *11*, 447–475.
Vandell, D. L., Belsky, U., Burchinal, M., Steinberg, L., NICHD, & ECCRN. (2010). Do effects of early child care extend to age 15 years? Results from the NICHD Study of Early Child Care and Youth Development. *Child Development*, 737–756. http://dx.doi.org/10.1111/j. 1467-8624.2010.01431.x
Weiland, C., Ulvestad, K., Sachs, J., & Yoshikawa, H. (2013). Associations between classroom quality and children's vocabulary and executive function skills in an urban public prekindergarten program. *Early Childhood Research Quarterly*, *28*, 199–209. http://dx.doi.org/10.1016/j.ecresq.2012.12.002
Wittmer, D. L., & Petersen, S. H. (2006). *Infant and toddler development and responsive program planning: A relationship-based approach*. Upper Saddle River, NJ: Prentice Hall.
ZERO TO THREE. (2009). Developmentally appropriate practice in the infant and toddler years ages 0–3. Examples to consider. In C. Copple, & S. Bredekamp (Eds.), *Developmentally appropriate practice in early childhood programs serving children from birth through age 8*. Washington, D.C: NAEYC.
Zill, N., Resnick, G., Kim, K., O'Donnell, K., Sorongon, A., McKey, R., . . . & D'Elio, M. A. (2003). *Head start FACES 2000: a whole-child perspective on program performance (HHS- 105-96-1912)*. Washington, DC: Administration for Children and Families, Child Outcomes Research and Evaluation.
de Kruif, R. E. L., McWilliam, R. A., Ridley, S. M., & Wakely, M. B. (2000). Classification of teachers' interaction behaviors in early childhood classrooms. *Early Childhood Research Quarterly*, *15*, 247–268.