



Classroom quality and children's social skills and problem behaviors: Dosage and disability status as moderators[☆]



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ABSTRACT

Multiple studies have reported associations between early childhood education (ECE) quality and dosage and children's social and behavior development, with some suggesting that this association may be stronger for specific groups of children. In this study, we examined the association between classroom quality and children's social skills and problem behaviors, as reported by ECE teachers, as well as the moderating effects of ECE dosage and children's disability status. Participants were 222 children ($M_{\text{age}} = 63.75$, $SD = 7.77$), including 180 typically developing (90 boys) and 42 children with disabilities (29 boys), from 44 inclusive classrooms in the Metropolitan Area of Lisbon, Portugal. Our results indicated that children's social skills and behavior problems were not directly associated with observed classroom quality domains. However, lower classroom organization predicted lower social skills and higher externalizing behavior at higher number of months with the lead teacher; and instructional support predicted increased social skills for children with disabilities. Days absent from school predicted lower social skills. Overall, our results suggest that diverse types of dosage influence teacher's reports of social and behavioral outcomes in different ways.

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1. Introduction

Early childhood education (ECE) settings are one of the most relevant microsystems for young children, especially since the number of children spending a considerable part of their days in these settings is steadily rising (European Commission/EACEA/Eurydice/Eurostat, 2014). A considerable number of studies report modest but enduring benefits of attending high-quality ECE settings (e.g., Mashburn et al., 2008). ECE quality can be evaluated in terms of structure (i.e., regulatable) characteristics and/or classroom processes (Vandell & Wolfe, 2000). Classroom processes can be defined as children's direct experiences in the classroom, which include teacher-child interac-

tions, classroom activities, and routines (Cryer, Tietze, Burchinal, Leal, & Palacios, 1999).

The Teaching Through Interactions' framework (Hamre et al., 2013; Hamre, 2014) defines three domains of classroom process quality: emotional support, classroom organization, and instructional support. In highly emotionally supportive classroom environments, teachers are responsive to children's emotions and needs, are respectful of their perspectives, and nurture feelings of competence and autonomy, making children feel safe, self-confident, and capable of exploring the world (Pianta, Hamre, & Allen, 2012). Emotional support has been linked to academic achievement, higher levels of activity engagement, and positive social development (Pianta et al., 2012). Furthermore, high-quality classrooms are well managed when the teacher establishes clear expectations and rules to guide children's behavior, clearly defines routines, carefully monitors children's behavior and work, and favors activities that are interesting (Emmer & Stough, 2001). Classroom organization has been linked to children's social, academic (Pianta & Hamre, 2009), and behavior outcomes (Rimm-Kaufman, Curby, Grimm, Nathanson, & Brock, 2009). Lastly, instructional support refers to teachers' ability to adequately and effectively implement learning activities in a way that supports children's cognitive, academic, and linguistic development (Pianta & Hamre, 2009). Howes et al. (2008) reported positive effects of high-quality

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instructional support in language and literacy development for children through preschool and kindergarten. Importantly, theory and evidence related to this framework supports both within- and cross-domain associations with children's outcomes (Downer, Sabol, & Hamre, 2010).

High-quality ECE has been reported to directly and positively influence children's social skills and behaviors (Mashburn et al., 2008). Social skills can be defined in terms of specific social behaviors (Cillessen & Bellmore, 2006), learned and developed through social interaction (Michelson, Sugai, Wood, & Kazdin, 1983), that are displayed in specific social situations (Rubin, Bukowski, & Parker, 2006), to respond to specific social tasks (Cillessen & Bellmore, 2006). Socially skilled preschool children exhibit cooperative and sharing behaviors, conflict management abilities (Webster-Stratton & Reid, 2004), self-reliance, and positive affect (Saft & Pianta, 2001). In turn, poor social skills can negatively impact both intrapersonal and interpersonal outcomes, including social withdrawal and rejection (e.g., Cillessen & Bellmore, 2006; Winsler & Wallace, 2002).

Most young children tend to exhibit challenging behaviors that, in most cases, diminish over time (Shaw, Lacourse, & Nagin, 2005), as children's self-regulation develops (NICHD Early Child Care Research Network, 2004). Behavior problems can be categorized as internalizing (e.g., angst, withdrawal, inhibition) (Liu, 2004) or externalizing (e.g., aggression, anger, disobedience) (Turney & McLanahan, 2015; Yamauchi & Leigh, 2011). Internalizing behavior problems relate to anxiety and depression (Eisenberg & Losoya, 2001) and are especially disruptive of children's psychological state (Liu, 2004). In turn, externalizing behavior problems emerge when children are unable to regulate their own behavior in a way that is congruous with environmental expectations (e.g., family, teachers) (Tucker-Drob & Harden, 2013) and tend to have a bigger impact on their surroundings (Liu, 2004). An extensive body of research suggests children with problem behaviors are more likely to face social adjustment difficulties (Boyd, Barnett, Bodrova, Leong, & Gomby, 2005; Mesman, Bongers, & Koot, 2001) and academic underachievement (Bub, McCartney, & Willett, 2007; Bulotsky-Shearer & Fantuzzo, 2011).

Although modest, the association between high-quality ECE and children's acquisition of socioemotional skills and decrease in problem behaviors seems to persist through elementary (Neidell & Waldfogel, 2010) and middle school (Sylva, Melhuish, Sammons, Siraj-Blatchford, & Taggart, 2011). In contrast, when children attend low-quality ECE settings, social and behavior gains tend to be scarce and far less enduring (e.g., Sylva et al., 2011), or even nonexistent (Burchinal, Vandergrift, Pianta, & Mashburn, 2010). However, this relation may not be linear (Burchinal, Vernon-Feagans, Vitiello, Greenberg, & The Family Life Project Key Investigators, 2014).

A multitude of contextual factors may moderate the effects of ECE quality (Votruba-Drzal, Coley, & Chase-Lansdale, 2004) on children's social and behavior outcomes, and help us understand why quality effects do not always seem consistent. Recently, researchers have shown interest in the study of the potential effects of ECE dosage (i.e., exposure), on children's outcomes. Dosage can be measured in multiple ways, including the total number of hours or days of attendance over several years and the number of hours the child spends per day, week, or current year in ECE (Zaslow et al., 2010). In this study, we considered the total number of months children have spent with their teachers and children's absences during the school year (i.e., a reverse indicator of daily attendance). Daily attendance is a special indicator of dosage, due to its potential associations with family SES, children's health, and other distress factors in children's lives (Logan, Piasta, Justice, Schatschneider, & Petrill, 2011). Importantly, this line of investigation is consistent with Bronfenbrenner's proposition that the extent of exposure to

proximal processes influences children's development of competence and dysfunction (Bronfenbrenner & Morris, 2006).

Some studies on the combined effects of ECE quality and dosage indicate that the positive effects of attending high-quality ECE, for example, in terms of increased emotional stability and decreased problem behaviors (Votruba-Drzal et al., 2004), are stronger for children who spend more time in these settings (NICHD Early Child Care Research Network, 2003; Zaslow et al., 2010). Yet, Xue et al. (2016) found no interaction effect between ECE quality and dosage for children's social skills, when considering absence from school, number of hours per week in ECE, and time expended in content-specific instruction as moderators.

Findings on the effects of dosage alone on children's social and behavior development are also inconsistent. The NICHD Early Child Care Research Network (2006) found that children who spent more time in ECE had more positive interactions with their peers at 54 months, while Xue et al. (2016) found a negative effect of absence from school on children's academic outcomes, but no effect on children's social skills. Furthermore, there are reports of a linear relation between dosage and behavior, with children's problematic behaviors increasing with dosage (e.g., Loeb, Bridges, Bassok, Fuller, & Rumberger, 2007; Torres et al., 2015), but there are also reports of behavior benefits, such as decreases in both internalizing and externalizing behavior problems, resulting from increased ECE dosage (Votruba-Drzal et al., 2004). Despite the contradictory results, available evidence suggests ECE quality may work as a buffer for dosage undesirable effects (McCartney et al., 2010), while dosage can strengthen the positive effects of high-quality ECE (Votruba-Drzal et al., 2004).

Quality and dosage may have distinctive effects on diverse groups of children. For example, some research suggests that children from low-income backgrounds (Votruba-Drzal et al., 2004; see Zaslow et al., 2010) tend to benefit more from high-quality ECE in higher dosages, displaying encouraging and lasting social and behavior outcomes, even though evidence is not entirely consistent (see Burchinal et al., 2014). Children with disabilities are a specific group of children at risk for negative social and behavior outcomes: they tend to have more difficulties in regulating their emotional states, in processing complex social information, and in solving social problems (Guralnick, 1999). Consequently, they often (but not always; Odom, McConnell, & Brown, 2008) display poorer social skills (Guralnick, 1997) and more problem behaviors (McIntyre, Blacher, & Baker, 2006), when compared with their typically developing peers. These characteristics constrain their ability to develop positive relationships with others (Guralnick, 1997), and may lead to social acceptance problems (Ferreira, Aguiar, Correia, Fialho, & Pimentel, 2018; McIntyre et al., 2006). Based on the evidence on the compensatory effects of high-quality ECE for children living in poverty (Votruba-Drzal et al., 2004), it is likely that children with disabilities may also benefit more from attending high-quality ECE classrooms.

In conclusion, although not consensual, research suggests ECE quality is positively related to children's social skills and negatively related to children's behavior problems (Broekhuizen, Mokrova, Burchinal, Garrett-Peters, & The Family Life Project Key Investigators, 2016). Furthermore, studies exploring the effects of ECE quality at different dosage levels are growing, but results are inconsistent, especially for social outcomes (Zaslow et al., 2010). Lastly, evidence indicates that high-risk children may benefit more from ECE quality (Votruba-Drzal et al., 2004).

1.1. Current study

This study is part of a larger research project, Enhancing peer relationships: Preschool teachers' ideas and practices, developed in Portugal, thus differing from most of prior studies, conducted

mainly with North American samples (Yamauchi & Leigh, 2011). Over the last 30 years, Portugal has witnessed extensive investments in ECE, with the purpose of increasing coverage rates (Abreu-Lima, Leal, Cadima, & Gamelas, 2013; Pinto, Pessanha, & Aguiar, 2013). From 1985 to 2012/13, coverage rates for preschool-aged children increased from 30% (Gabinete de Estatística e Planeamento da Educação [GEPE], 2007) to approximately 89% (Direção-Geral de Estatísticas da Educação e Ciência, 2014). In 2015, Decree-Law No. 65/2015 established the universality of preschool education for children aged four or above. Similar investments were made to increase the enrollment rates of children with disabilities in regular ECE classrooms, with the purpose of creating an inclusive ECE system. Data from 2016 indicate that 99% of all Portuguese children with disabilities have access to mainstream education (87% in the public-school system), with the majority (87%) participating full-time in regular classrooms (Direção-Geral de Estatísticas da Educação e Ciência, 2016). In 2015, a survey with a representative sample, indicated that about 20% of regular classrooms, in the public ECE system, served at least one child with disabilities (Inspeção-Geral de Educação e Ciência, 2015).

The Portuguese ECE system is supervised by the Ministry of Education, and includes public, private for profit, and private non-profit centers. In the public and private non-profit ECE networks, the educational component is free. Most Portuguese ECE classrooms serve mixed-age groups of children (Abreu-Lima et al., 2013). Further, ECE schedules for children are relatively consistent, with children typically attending centers five days a week, for a minimum of 5 h per day. Despite increases in coverage rates (in 2015, approximately 77%, 91%, and 96% of 3, 4 and 5-year-olds, attended ECE [Direção-Geral de Estatísticas da Educação e Ciência, 2015]), Portuguese ECE classrooms may not have the necessary assets to significantly impact children's development (Abreu-Lima et al., 2013), with some studies describing mediocre levels of quality (Pinto et al., 2013). Thus, further studies on ECE quality may be needed to generate more knowledge to support educational policies and practices (Abreu-Lima et al., 2013).

Based on the inconsistent findings on the direct and combined effects of ECE quality and dosage on children's social and behavior development (Zaslow et al., 2010), this study investigates the association between ECE quality and children's social skills and problem behaviors, as well as the potential role of dosage as a moderator. Furthermore, we investigate the potential stronger effects of ECE quality on the social skills and problem behaviors of children with disabilities, when compared to typically developing children. In all analysis, children's age, gender, verbal competence, and entry levels of social skills and behavior problems, as well as mothers' education are controlled for. Building on the theorization regarding within- and cross-domain effects (Downer et al., 2010), we hypothesize that (1) higher-quality emotional support, classroom organization, and instructional support are associated with increased social skills for all children; (2) high-quality emotional support, classroom organization, and instructional support are associated with decreased internalizing and externalizing behaviors for all children; (3) children attending classrooms with higher-quality emotional support, classroom organization, and/or instructional support show increased social skills at higher levels of dosage; (4) increases in social skills at higher-quality emotional support, classroom organization, and/or emotional support are stronger for children with disabilities than for typically developing children; (5) children attending classrooms with higher-quality emotional support, classroom organization, and instructional support show decreased internalizing and externalizing behavior problems at higher levels of dosage; and (6) decreases in internalizing and externalizing behavior problems at higher-quality emotional support, classroom organization, and/or

instructional support are stronger for children with disabilities than for typically developing children.

2. Method

2.1. Participants

Participants were 222 children, aged between 43 and 85 months ($M = 63.75$, $SD = 7.77$), including 180 typically developing children (90 boys) and 42 children with disabilities (29 boys), from 44 inclusive preschool classrooms in the Metropolitan Area of Lisbon. In each classroom, four typically developing children (two boys and two girls), and one child with disabilities were randomly selected. Inclusion criteria for children with disabilities included receiving support from early childhood intervention (ECI) (under Decree No. 281/2009) or early childhood special education (ECSE) services (under Decree-Law No. 3/2008), and the absence of severe multiple disabilities. Twelve children had global developmental delay, nine had autism spectrum disorder, four were undiagnosed (ongoing or inconclusive assessment), three had rare disorders, three other children had speech or language difficulties, two had Down syndrome, and seven had other disabilities (information missing for two children). Regarding education background, 42% of responding mothers had an education level inferior to secondary school, while the remaining 53% completed secondary education or had a higher education degree (information missing for 17 mothers).

The lead teachers in each classroom, aged between 29 and 63 years old ($M = 48$, $SD = 7.6$), also participated in the study. The 44 teachers (1 male) had between 7 and 35 years of experience ($M = 22.74$, $SD = 6.43$), 93% had at least one year of experience in inclusive classrooms, and close to 35% had at least one year of experience working in ECI or ECSE. Consistent with the Portuguese ECE system trends, lead teachers did not change during the school year. Approximately 89% ($n = 39$) of the classrooms were in public preschools, 4% ($n = 2$) were in private non-profit centers, and 7% ($n = 3$) were in private for-profit centers. In total, 14 public preschools, two private non-profit centers, and two private for-profit centers participated. Thirteen classrooms (29.5%) were in public preschools that participate in the Educational Territories for Priority Intervention program, targeting disadvantaged communities.

2.2. Procedure

Prior to initiating this short-term longitudinal study, authorization forms were submitted to and approved by the Portuguese National Authority for Data Protection and by the General Directorate of Education. Teachers and parents of participating children signed informed consent forms. Data were collected in three moments, during the school year of 2013/2014: Time 1 (T1) assessments occurred between October 2013 and February 2014; Time 2 (T2) assessments occurred between February and April 2014; and Time 3 (T3) assessments occurred during May and June 2014. An interval of at least five months between T1 and T3 applications was ensured for all children.

Children's social skills and problem behaviors were assessed, based on teachers' reports, at T1 and T3. ECE quality was assessed based on classroom observations, focused on the lead teacher, conducted at T2. Observations were organized into four cycles of 30 min each (20 min of observation, plus 10 min of coding) during one typical day (usually, in the morning), as per the standard guidelines. The scores for each dimension were computed as the mean of the four cycles available for each classroom and the scores for each domain were computed as the mean of the corresponding dimensions. Classroom observations were carried

out by four certified observers who passed the reliability test by coding over 80% within one of the master codes after completing a two-days training. Around 27% of observations were scored independently by two observers, and inter-rater reliability was computed using intraclass correlation coefficients (one-way random effects model). Reliability scores for ECE quality domains (emotional support = .66; classroom organization = .60; instructional support = .56) were moderate (Koo & Li, 2016) and a par with those generally reported for the measure (e.g., Pianta et al., 2014).

Children's verbal competence was assessed at T1. Individual assessments were conducted by research team members with a masters' degree in Psychology, at the ECE center, in a separate and quiet room.

2.3. Measures

2.3.1. Social skills and problem behaviors

A Portuguese version (Fialho & Aguiar, 2017) of the preschool form of the Social Skills Rating System (SSRS; Gresham & Elliott, 1990/2007) for teachers was used to assess children's social skills and problem behaviors. The SSRS is composed of two scales for the preschool years: social skills and problem behaviors. The social skills scale used in this study ($\alpha = .94$ for T1, $\alpha = .95$ for T3), includes 30 items on children's cooperation, assertion, and self-control, measured in a 3-point scale (0 = *never*, 1 = *sometimes*, 2 = *very often*). The problem behaviors scale ($\alpha = .80$, for both T1 and T3) comprises one subscale for internalizing problems ($\alpha = .60$ for T1, $\alpha = .63$ for T3; including four items on children's anxiety, sadness, isolation, and low self-esteem) and another scale for externalizing problems ($\alpha = .88$ for T1, $\alpha = .85$ for T3; including six items on children's aggressiveness towards others, low self-control, and quarreling), in a total of 10 items, rated using the same 3-point scale (Gresham & Elliott, 2007).

In this study, raw scores for social skills and problem behaviors scales were obtained through the mean of the respective items. Higher scores on the social skills scale represent higher competence, whereas higher scores on the problem behaviors scale represented more behavior problems (Gresham & Elliott, 2007).

2.3.2. ECE classroom quality

The pre-K Classroom Assessment Scoring System (CLASS; Pianta, LaParo, & Hamre, 2008) was used to assess classroom quality. The CLASS is a standardized classroom observation system that measures classroom process quality in three broad domains: emotional support, classroom organization, and instructional support (Pianta & Hamre, 2009). Each CLASS domain was rated by independent observers on a 7-point Likert-type scale, divided in three quality levels: low quality (scores of 1–2), medium quality (scores of 3–5), and high quality (scores of 6–7) (Rimm-Kaufman et al., 2009). Emotional support ($\alpha = .90$) covers the conditions influencing children's social and emotional functioning (Hamre, Hatfield, Pianta, & Jamil, 2014; Pianta & Hamre, 2009), including four dimensions: positive classroom climate, negative classroom climate, teacher sensitivity, and regard for student perspectives. The three dimensions that make up the classroom organization domain ($\alpha = .80$) are behavior management, productivity, and instructional learning formats. The three dimensions that compose the instructional support domain ($\alpha = .85$) are concept development, quality of feedback, and language modeling (Pianta & Hamre, 2009).

2.3.3. ECE dosage

Two indicators, based on teacher's report, were used to measure dosage: the total number of months children spent with the lead teacher and the proportion of days children were absent from school in the school year of data collection.

2.3.4. Verbal competence

The Portuguese adaptation (Seabra-Santos et al., 2006) of the Wechsler Preschool and Primary Scale of Intelligence - Revised (WPPSI-R; Wechsler, 2010) was used to assess children's verbal competence. The WPPSI-R is a standardized intelligence measure, composed of a verbal scale and a performance scale. In this study, only the verbal scale ($\alpha = .90$) was considered, based on four subtests: information, comprehension, arithmetic, and vocabulary.

2.4. Data analyses

First, descriptive and correlational analyses were performed. Secondly, inferential statistics (paired samples *t*-test) and Cohen's *d* were computed for analyzing change in social skills, internalizing, and externalizing behaviors. The magnitude of the effects was interpreted in accordance with Cohen's guidelines (Cohen, 1992). Next, multilevel analyses were conducted using Mplus Version 6 (Muthén & Muthén, 1998–2010), addressing the nesting of children within classrooms (Hox, 2002). Intraclass correlation coefficients (ICC) representing the proportion of variance between classrooms (Bartko, 1976; Gulliford, Ukoumunne, & Chinn, 1999), were calculated. ICC values were .06 for social skills, .03 for externalizing behavior problems, and .31 for internalizing behavior problems.

A series of two-level models were computed for each of the three outcomes: social skills at T3, internalizing behavior problems at T3, and externalizing behavior problems at T3. Level 1 (child level) variables included children's sex, age, disability status, mother's education, social skills at T1, externalizing and/or internalizing behavior problems at T1, verbal competence at T1, number of months with the lead teacher, and proportion of days absent. Level 2 (classroom level) variables included the three ECE quality domains: emotional support, classroom organization, and instructional support. Given the strong correlation between emotional support and classroom organization, the three quality domains were tested in separate models. For each outcome, the three initial models tested main effects and subsequent models included interaction terms to test the moderating effect of ECE dosage. To examine whether the parameter estimates differed for children with and without disabilities, a multiple group comparison approach was used. A series of nested models were estimated in which parameters were constrained to be equal across disability status and compared sequentially by testing the decrease in model fit using the Satorra-Bentler scaled Chi-square difference test. In the multigroup models, to address the hierarchical nature of data, the complex procedure of Mplus was used, which corrects standard errors for nesting within classrooms.

Missing data for any one variable ranged between 0% and 10%. Complete data on age, gender, disability status, social skills at T1, and behavior problems at T1 were available for all children. Verbal ability, CLASS scores, and number of months with the lead teacher had less than 5% of missing data, and mother's education and proportion of days missed had up to 10% missing data. Full information maximum likelihood (FIML) estimation with robust standard errors was used to account for missing data and prevent reduction of sample size and statistical power loss (Enders, 2001). FIML parameter estimates have been shown to be effective and less biased than traditional missing data techniques (Enders, 2001).

3. Results

3.1. Descriptive statistics

Table 1 includes means and standard deviations for individual and classroom variables. Children's social skills at T1 and T3, as reported by classroom teachers, were in the medium-high range,

Table 1
Descriptive statistics.

| | N | M | SD | Min. | Max. |
|---|-----|-------|-------|------|-------|
| Child's age (months) | 222 | 63.75 | 7.77 | 42.5 | 85.1 |
| Typically developing children | 180 | 63.33 | 7.05 | 42.5 | 76.2 |
| Children with disabilities | 42 | 65.56 | 10.23 | 42.7 | 85.1 |
| Social skills Time 1 | 222 | 1.39 | 0.40 | 0.07 | 2.00 |
| Typically developing children | 180 | 1.50 | 0.31 | 0.43 | 2.00 |
| Children with disabilities | 42 | 0.95 | 0.43 | 0.07 | 1.85 |
| Problem behaviors Time 1 | 222 | 0.49 | 0.39 | 0.00 | 1.90 |
| Typically developing children | 180 | 0.41 | 0.34 | 0.00 | 1.70 |
| Children with disabilities | 42 | 0.82 | 0.43 | 0.00 | 1.90 |
| Internalizing behavior Time 1 | 222 | 0.31 | 0.37 | 0.00 | 1.75 |
| Typically developing children | 180 | 0.27 | 0.34 | 0.00 | 1.50 |
| Children with disabilities | 42 | 0.46 | 0.46 | 0.00 | 1.75 |
| Externalizing behavior Time 1 | 222 | 0.61 | 0.55 | 0.00 | 2.00 |
| Typically developing children | 180 | 0.51 | 0.50 | 0.00 | 1.50 |
| Children with disabilities | 42 | 1.05 | 0.54 | 0.00 | 2.00 |
| Verbal competence Time 1 | 220 | 9.78 | 3.09 | 1.00 | 16.50 |
| Number of months with lead teacher Time 2 | 217 | 10.11 | 8.90 | 1.9 | 40.2 |
| Proportion of days missed Time 2 | 199 | 0.07 | 0.06 | 0.00 | 0.29 |
| Emotional support Time 2 | 217 | 5.01 | 0.80 | 2.88 | 6.69 |
| Classroom organization Time 2 | 217 | 5.11 | 0.64 | 3.50 | 6.42 |
| Instructional support Time 2 | 217 | 1.76 | 0.45 | 1.00 | 3.25 |
| Social skills Time 3 | 213 | 1.47 | 0.39 | 0.40 | 2.00 |
| Typically developing children | 173 | 1.57 | 0.31 | 0.47 | 2.00 |
| Children with disabilities | 40 | 1.04 | 0.42 | 0.40 | 1.93 |
| Internalizing behavior Time 3 | 213 | 0.26 | 0.35 | 0.00 | 1.50 |
| Typically developing children | 173 | 0.23 | 0.34 | 0.00 | 1.50 |
| Children with disabilities | 40 | 0.39 | 0.35 | 0.00 | 1.00 |
| Externalizing behavior Time 3 | 213 | 0.54 | 0.49 | 0.00 | 2.00 |
| Typically developing children | 173 | 0.45 | 0.44 | 0.00 | 2.00 |
| Children with disabilities | 40 | 0.93 | 0.51 | 0.00 | 2.00 |

while internalizing and externalizing behavior problems for T1 and T3 were low. Children's social skills scores were lower at T1 than at T3 ($t_{(212)} = -5.352, p < .001, d = -0.21$), while internalizing ($t_{(212)} = 2.046, p = .042, d = 0.13$) and externalizing ($t_{(212)} = 2.518, p = .013, d = 0.13$) behavior problem scores were higher at T1 than at T3, for all children. Moreover, social skills increased significantly (small effect), between T1 and T3, for typically developing children ($t_{(172)} = -4.851, p < .001, d = -0.27$), and for children with disabilities ($t_{(39)} = -2.236, p = .031, d = -0.20$), while differences in internalizing and externalizing behavior scores indicated a non-significant decrease, for both typically developing children ($t_{(172)} = 1.960, p = .052, d = 0.13$; $t_{(212)} = 1.962, p = .051, d = 0.12$, respectively), and children with disabilities ($t_{(39)} = 0.628, p = .534, d = 0.15$; $t_{(39)} = 1.699, p = .097, d = 0.24$, respectively), from T1 to T3.

ECE classroom quality was in the medium-quality range for emotional support and classroom organization, and in the low-quality range for instructional support. On average, children were with the lead classroom teacher for about a year and the proportion of days children were absent from school was low.

Correlations between variables are presented in Table 2. We note that instructional support was weakly and negatively correlated with internalizing behavior problems at T1 and that the proportion of days absent was negatively correlated with mothers' education and positively correlated with internalizing behavior problems at T1 and T3 (small effects).

3.2. Multilevel modeling results

3.2.1. Multilevel models predicting social skills

Table 3 displays standardized estimates for six two-level models computed for social skills. Contrary to our first hypothesis, we did not find main effects of emotional support, classroom organization, or instructional support on children's social skills. While we did not find direct effects of the number of months with the lead teacher on social skills, the proportion of days absent was a predictor of children's social skills across all models.

Missing more school days had a detrimental effect on children's social skills development. Importantly, we did not find significant interaction effects between proportion of days absent and any domain of classroom process quality nor did we find significant interaction effects between the number of months with the lead teacher and emotional or instructional support. However, a positive and significant interaction effect was found between classroom organization and the number of months with the lead teacher, $\beta = .101, SE = .043, p = .020$ (see Model 5). As shown in Fig. 1, children who experienced lower-quality classroom organization, and spent more months with the lead teacher, demonstrated lower social skills, as reported by the lead teacher, than other children. Thus, the direction of the effect is consistent with our third hypothesis, even though it suggests detrimental effects of higher exposure to low-quality classroom organization and not positive effects of increased exposure to higher-quality classroom organization.

To test whether the effects of ECE quality were similar for children with and without disabilities, a set of multiple group analyses was conducted. For emotional support and organizational support predicting social skills, the results revealed that the full constraint model was adequate, $\chi^2(9) = 2.502, p = .9808, RMSEA = .000, CFI = 1.000$ and $\chi^2(9) = 2.418, p = .983, RMSEA = .000, CFI = 1.00$, with non-significant chi-square differences when releasing the parameters, suggesting that the pattern of associations among variables was similar for children with and without disabilities. However, constraining the main effect of instructional quality to be equal across disability status resulted in a significant decrease in model fit, $\Delta S-B \chi^2 = 9.19, p = .002$, suggesting that the effect of instructional quality on social skills differed for children with and without disabilities. For children with disabilities, there was a significant positive effect of instructional quality, $B = .201, SE = .083, p = .016$. In contrast, no effects were evident for children without disabilities, $B = .033, SE = .069, p = .628$. The fit of the model was good, $\chi^2(8) = 2.00, p = .981, RMSEA = .000, CFI = 1.00$. Our fourth hypothesis was, thus, partially confirmed.

Table 2
Pearson correlation coefficients among variables.

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
|-------------------------------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|------|------------|------------|------------|------|--------------|------------|
| 1. Sex ^a | | | | | | | | | | | | | | | | |
| 2. Age | -.01 | | | | | | | | | | | | | | | |
| 3. Disability ^b | .15 | .11 | | | | | | | | | | | | | | |
| 4. Mothers' education ^c | .01 | -.09 | -.13 | | | | | | | | | | | | | |
| 5. Social skills T1 | -. 31 | .17 | -. 53 | .04 | | | | | | | | | | | | |
| 6. Problem behaviors T1 | .31 | .00 | .40 | -.09 | -. 56 | | | | | | | | | | | |
| 7. Internalizing behavior T1 | .04 | .04 | .20 | -.10 | -. 45 | .56 | | | | | | | | | | |
| 8. Externalizing behavior T1 | .35 | -.02 | .39 | -.06 | -. 47 | .93 | .22 | | | | | | | | | |
| 9. Verbal competence T1 | -.11 | -. 15 | -. 61 | .23 | .44 | -. 36 | -. 22 | -. 33 | | | | | | | | |
| 10. No. months with lead teacher T2 | -.07 | .18 | .10 | -.07 | .12 | -. 41 | -.10 | -.01 | -.02 | | | | | | | |
| 11. Proportion of days missed T2 | -.07 | .08 | .04 | -. 15 | -.01 | -.03 | .23 | -.13 | -.00 | -.07 | | | | | | |
| 12. Emotional support | .02 | -.04 | -.01 | .16 | .08 | -.01 | -.05 | .00 | -.07 | -.02 | -.06 | | | | | |
| 13. Classroom organization | -.01 | .08 | -.00 | .07 | .01 | -.01 | .00 | -.01 | -.10 | -.13 | .04 | .77 | | | | |
| 14. Instructional support | -.02 | .10 | .01 | .05 | .05 | -.09 | -. 21 | -.01 | -.04 | .13 | .03 | .57 | .57 | | | |
| 15. Social skills T3 | -. 30 | .16 | -. 52 | .06 | .85 | -. 52 | -. 47 | -. 40 | .45 | .04 | -.10 | .07 | -.02 | .08 | | |
| 16. Internalizing behavior T3 | -.00 | -.12 | .19 | -.10 | -. 44 | .33 | .64 | .10 | -. 18 | -.05 | .16 | .03 | .09 | -.11 | -. 54 | |
| 17. Externalizing behavior T3 | .35 | -.11 | .38 | -.06 | -. 51 | .76 | .23 | .79 | -. 33 | .02 | -.11 | .04 | .04 | -.03 | -. 58 | .22 |

Note. Variables were mean centered. ^a1 = boy, ^b1 = children with disabilities, ^c0 = inferior to secondary education; 1 = complete secondary education or higher education. T1 = Time 1, T2 = Time 2, T3 = Time 3. Coefficients in bold are statistically significant: $p < .001$ for all coefficients $\geq .30$, $p < .01$ for all coefficients $\geq .17$, $p < .05$ for all coefficients $\geq .15$.

Table 3
Summary of multilevel analysis predicting children's social skills (Time 3).

| | Model 1 β (SE) | Model 2 β (SE) | Model 3 β (SE) | Model 4 β (SE) | Model 5 β (SE) | Model 6 β (SE) |
|--|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|
| Level 1 | | | | | | |
| Sex ^a | -.06 (.04) | -.06 (.04) | -.06 (.04) | -.06 (.04) | -.06 (.04) | -.06 (.04) |
| Age | .07 (.04) | .07 (.04) | .06 (.04) | .06 (.04) | .07 (.04) | .06 (.04) |
| Disability status ^b | -.08 (.05) | -.09 (.05) | -.08 (.05) | -.08 (.05) | -.06 (.05) | -.07 (.05) |
| Mothers' education ^c | .01 (.04) | .01 (.04) | .01 (.04) | .01 (.04) | .02 (.04) | .01 (.04) |
| Social skills T1 | .71*** (.05) | .71*** (.05) | .71*** (.05) | .71*** (.05) | .72*** (.05) | .72*** (.05) |
| Behavior problems T1 | -.05 (.05) | -.05 (.05) | -.05 (.05) | -.06 (.05) | -.06 (.05) | -.06 (.05) |
| Verbal competence T1 | .09 (.05) | .08 (.05) | .09 (.05) | .09 (.05) | .09 (.05) | .10 (.05) |
| No. months with lead teacher | -.05 (.05) | -.05 (.05) | -.05 (.05) | -.05 (.05) | -.05 (.05) | -.06 (.05) |
| Proportion of days missed | -.13*** (.04) | -.13*** (.04) | -.13*** (.04) | -.13*** (.04) | -.13*** (.04) | -.13*** (.04) |
| Level 2 | | | | | | |
| Emotional support | .07 (.23) | | | .03 (.23) | | |
| Classroom organization | | -.21 (.23) | | | -.33 (.23) | |
| Instructional support | | | .26 (.22) | | | .22 (.23) |
| Interactions | | | | | | |
| Emotional support × No. months with lead teacher | | | | .05 (.04) | | |
| Emotional support × Proportion of days missed | | | | .02 (.04) | | |
| Classroom org. × No. months with lead teacher | | | | | .10* (.04) | |
| Classroom org. × Proportion of days missed | | | | | .02 (.04) | |
| Instructional support × No. months with lead teacher | | | | | | .05 (.04) |
| Instructional support × Proportion of days missed | | | | | | .01 (.04) |

Note. Standardized estimates are reported. Variables were mean centered. ^a0 = girl, ^b0 = typically developing children; 1 = children with disabilities, ^c0 = inferior to secondary education; 1 = complete secondary education or higher education. T1 = Time 1.

* $p \leq .05$.
** $p \leq .01$.
*** $p \leq .001$.

3.2.2. Multilevel models predicting internalizing behavior problems

Standardized estimates from the six two-level models computed for internalizing behavior problems are displayed in Table 4. A direct and negative effect of social skills at T1 on internalizing behavior problems at T3 was found across all models, suggesting children with more social skills at T1 tended to exhibit less internalizing behavior problems at T3. Importantly, contrary to our second hypothesis, ECE quality domains did not predict internalizing behavior problems. Similarly, we did not find main effects of proportion of days missed or number of months with the lead teacher on children's internalizing behavior problems, nor did the number of months with the lead teacher moderate the relationship between ECE quality domains and children's internalizing behavior problems. However, we found a statistically significant interaction effect between the proportion of days missed and instructional sup-

port ($\beta = -.125$, $SE = .064$, $p = .050$). As depicted in Fig. 2, the pattern of results did not confirm our fifth hypothesis as children attending classrooms with higher-quality instructional support seemed to exhibit lower internalizing behavior problems at lower levels of attendance. Results from the multiple group analyses suggested that disability status did not moderate the association between ECE quality domains and children's internalizing behavior problems, contrary to our sixth hypothesis. The fit of the models was good, $\chi^2(6) = 3.04-4.69$, $p = .584-.804$, $RMSEA = .000$, $CFI = 1.00$.

3.2.3. Multilevel modeling predicting externalizing behavior problems

Table 5 shows the standardized estimates for two-level models computed for externalizing behavior problems. Contrary to our second hypothesis, externalizing behavior problems were not predicted by ECE quality domains. Further, we did not find main effects

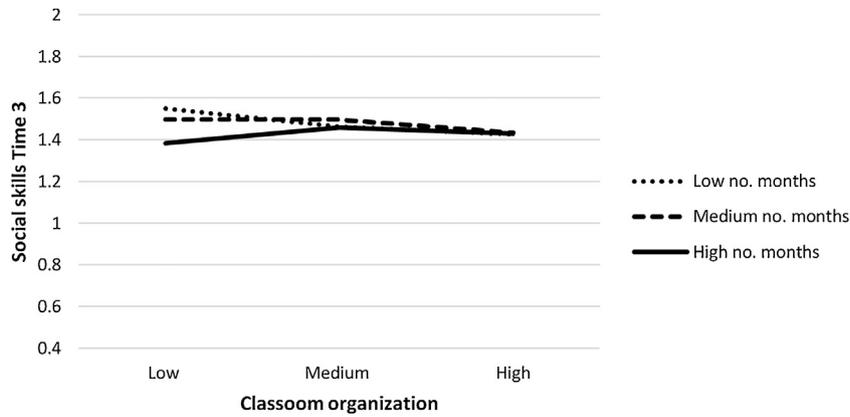


Fig. 1. Moderating effects of the number of months with the lead teacher in the relation between classroom organization and children's social skills at Time 3. Cut-off points for low, medium, or high levels of the predictor and the moderator were based on the 33th and the 66th percentiles. Covariates appearing in the model are evaluated at the following values: Social skills Time 1 = 1.39.

Table 4
Summary of Multilevel Analysis Predicting Children's Internalizing Behavior (Time 3).

| | Model 1 β (SE) | Model 2 β (SE) | Model 3 β (SE) | Model 4 β (SE) | Model 5 β (SE) | Model 6 β (SE) |
|---|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|
| Level 1 | | | | | | |
| Sex ^a | -.07 (.06) | -.07 (.06) | -.07 (.06) | -.07 (.06) | -.07 (.06) | -.08 (.06) |
| Age | -.07 (.07) | -.07 (.07) | -.07 (.07) | -.07 (.07) | -.08 (.07) | -.09 (.07) |
| Disability status ^b | -.04 (.08) | -.04 (.08) | -.04 (.08) | -.04 (.08) | -.03 (.08) | -.01 (.08) |
| Mothers' education ^c | .05 (.06) | .05 (.06) | .05 (.06) | .05 (.06) | .05 (.06) | .06 (.06) |
| Social skills T1 | -.24* (.09) | -.23** (.09) | -.23* (.09) | -.23* (.09) | -.23* (.09) | -.19 (.09) |
| Internalizing behavior T1 | .54*** (.07) | .54*** (.07) | .53*** (.07) | .54*** (.07) | .54*** (.07) | .54*** (.07) |
| Verbal competence T1 | -.03 (.07) | -.02 (.08) | -.03 (.08) | -.03 (.08) | -.02 (.08) | -.02 (.08) |
| No. months with lead teacher | .04 (.07) | .05 (.07) | .05 (.07) | .04 (.07) | .05 (.07) | .02 (.07) |
| Proportion of days missed | .06 (.06) | .05 (.06) | .06 (.06) | .05 (.06) | .06 (.06) | .06 (.06) |
| Level 2 | | | | | | |
| Emotional support | .07 (.22) | | | .08 (.22) | | |
| Classroom organization | | .11 (.22) | | | .11 (.23) | |
| Instructional support | | | -.11 (.22) | | | -.17 (.24) |
| Interactions | | | | | | |
| Emotional support × No. months with lead teacher | | | | -.01 (.07) | | |
| Emotional support × Proportion of days missed | | | | -.03 (.06) | | |
| Classroom organization × No. months with lead teacher | | | | | -.02 (.07) | |
| Classroom organization × Proportion of days missed | | | | | -.03 (.06) | |
| Instructional support × No. months with lead teacher | | | | | | .01 (.07) |
| Instructional support × Proportion of days missed | | | | | | -.13* (.06) |

Note. Standardized estimates are reported. Variables were mean centered. ^a0 = girl. ^b0 = typically developing children; 1 = children with disabilities. ^c0 = inferior to secondary education; 1 = complete secondary education or higher education. T1 = Time 1.

* $p \leq .05$.
** $p \leq .01$.
*** $p \leq .001$.

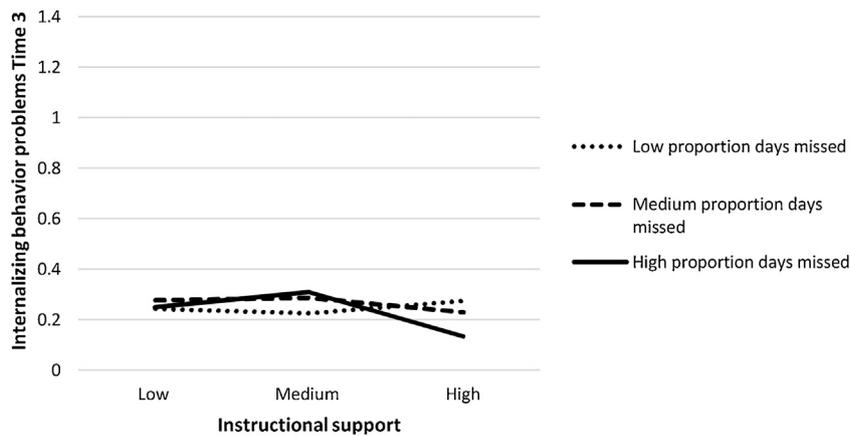


Fig. 2. Moderating effects of the proportion of days missed in the association between instructional support and children's internalizing behavior problems at Time 3. Cut-off points for low, medium, or high levels of the predictor and the moderator were based on the 33th and the 66th percentiles. Covariates appearing in the model are evaluated at the following values: Internalizing behavior problems Time 1 = 0.29.

Table 5
Summary of multilevel analysis predicting children's externalizing behavior (Time 3).

| | Model 1 β (SE) | Model 2 β (SE) | Model 3 β (SE) | Model 4 β (SE) | Model 5 β (SE) | Model 6 β (SE) |
|---|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|
| Level 1 | | | | | | |
| Sex ^a | .05 (.04) | .05 (.04) | .05 (.04) | .04 (.04) | .04 (.04) | .04 (.04) |
| Age (months) | -.08 (.05) | -.08 (.05) | -.08 (.05) | -.08 (.05) | -.08 (.05) | -.08 (.05) |
| Disability status ^b | -.02 (.06) | -.02 (.04) | -.02 (.06) | -.02 (.06) | -.04 (.06) | -.01 (.06) |
| Mothers' education ^c | -.02 (.04) | -.02 (.04) | -.02 (.04) | -.02 (.04) | -.03 (.04) | -.02 (.04) |
| Social skills T1 | -.10 (.06) | -.10 (.06) | -.10 (.06) | -.11 (.06) | -.12 (.06) | -.09 (.06) |
| Externalizing behavior T1 | .75*** (.05) | .75*** (.05) | .75*** (.05) | .75*** (.05) | .75*** (.05) | .75*** (.05) |
| Verbal competence T1 | -.05 (.06) | -.05 (.06) | -.05 (.06) | -.05 (.06) | -.06 (.06) | -.05 (.06) |
| No. months with lead teacher | .02 (.05) | .02 (.05) | .02 (.05) | .02 (.05) | .02 (.05) | .02 (.05) |
| Proportion of days missed | -.03 (.04) | -.03 (.04) | -.02 (.04) | -.03 (.04) | -.02 (.04) | -.02 (.04) |
| Level 2 | | | | | | |
| Emotional support | .04 (.25) | | | .09 (.26) | | |
| Classroom organization | | .06 (.25) | | | .18 (.28) | |
| Instructional support | | | -.27 (.23) | | | -.29 (.24) |
| Interactions | | | | | | |
| Emotional support \times No. months with lead teacher | | | | -.07 (.05) | | |
| Emotional support \times Proportion of days missed | | | | -.01 (.04) | | |
| Classroom org. \times No. months with lead teacher | | | | | -.10* (.05) | |
| Classroom org. \times Proportion of days missed | | | | | -.02 (.04) | |
| Instructional support \times No. months with lead teacher | | | | | | -.01 (.05) |
| Instructional support \times Proportion of days missed | | | | | | -.04 (.05) |

Note. Standardized estimates are reported. Variables were mean centered. ^a0 = girl. ^b0 = typically developing children; 1 = children with disabilities. ^c0 = inferior to secondary education; 1 = complete secondary education or higher education. T1 = Time 1.

* $p \leq .05$.

*** $p \leq .001$.

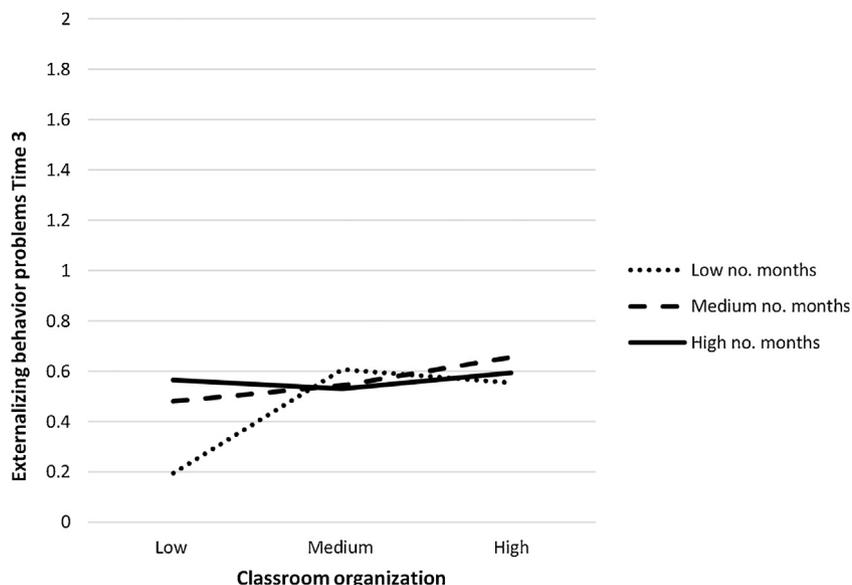


Fig. 3. Moderating effects of number of months with the lead teacher in the association between organizational support and children's externalizing behavior problems. Cut-off points for low, medium, or high levels of the predictor and the moderator were based on the 33th and the 66th percentiles. Covariates appearing in the model are evaluated at the following values: Externalizing behavior problems Time 1 = 0.60.

of proportion of days missed or number of months with the lead teacher. However, we found a negative interaction effect between classroom organization and the number of months spent with the lead teacher in Model 5, $\beta = -.098$, $SE = .047$, $p = .037$. As shown in Fig. 3, for children attending classrooms with lower-quality organizational support, an increase in the number of months with the lead teacher was associated with teacher's reports of increased levels of children's externalizing behavior problems. The direction of this effect is consistent with our fifth hypothesis even though it suggests detrimental effects of higher exposure to lower-quality organizational support and not enhancing effects of increased exposure to higher quality. Based on the results of the multiple group analyses, disability status did not moderate the relation between ECE quality

domains and externalizing behavior problems, therefore, not confirming our sixth hypothesis. The fit of the models was good, $\chi^2(8) = 5.61-6.44$, $p = .598-.692$, $RMSEA = .000$, $CFI = 1.00$.

4. Discussion

This study tested the association between observed ECE quality and children's social skills and problem behaviors, while investigating the moderating effects of dosage and disability status. According to our findings, ECE quality domains did not predict increases in children's social skills and problem behaviors. These results do not support our predictions, grounded in prior studies, that ECE quality and children's social and behavior outcomes would be directly

associated (e.g., Mashburn et al., 2008). Burchinal et al. (2010) proposed the existence of quality thresholds and suggested that only high-quality ECE may be robust enough to produce positive effects on children's development. As quality levels observed in this study were moderate for emotional support and classroom organization and low for instructional support, it is possible that ECE quality levels were not sufficient to influence children's social and behavior development directly. Importantly, as previous studies with Portuguese samples found similar levels of quality (e.g., Abreu-Lima et al., 2013), our findings add to the evidence base suggesting the need for continued investment in ECE, with a special focus on increasing process quality.

Findings on the direct effects of dosage on children's social and behavior outcomes were mixed. No direct effects of the number of months with the lead teacher on social skills or problem behaviors were found. However, contrary to findings by Xue et al. (2016), we found a direct negative effect of the proportion of days children were absent from school on social skills development, across all models. This result is consistent with Bronfenbrenner's proposal that human development is nurtured by proximal processes, and that frequency and interruption of exposure to these processes may influence children's competence development (Bronfenbrenner & Morris, 2006). In this case, children who missed more school days were rated by their teachers as less socially skilled than children who missed fewer days, suggesting that a lower level of exposure to ECE processes may be detrimental to children's social competence development or, more precisely, to teachers' perceptions of children's social skills. It may also be that children who miss more school days have other characteristics that are associated with difficulties in learning and developing social skills (Guralnick, 1997, 1999, 2010), such as socioeconomic disadvantage and health problems (see Magnuson, Ruhm, & Waldfogel, 2007; Susman-Stillman, Englund, Storm, & Bailey, 2018). Indeed, attendance may be considered a special case of dosage as it may function as a proxy for distress in children's lives (Logan et al., 2011). Our results are compatible with this possibility, since we found a small, but statistically significant, correlation between the proportion of days children were absent from school and mothers' education. Further studies addressing the effect of this type of dosage would benefit from investigating the motives associated with children's absences. Conversely, no direct effects of attendance, positive or negative, were found for internalizing and externalizing behavior problems, which warrants further examination.

It is possible that ECE quality effects only become apparent when interacting with other predictors, such as dosage. We found moderating effects of the number of months with the lead teacher, on the relation between classroom organization and children's social skills and externalizing behavior problems. Children who had spent more time with teachers observed to provide lower-quality classroom organization were rated by their teachers as having fewer social skills and displaying more externalizing behavior problems. These findings suggest that high exposure reinforces the negative effects of experiencing lower-quality ECE (Votruba-Drzal et al., 2004), which is consistent with the proposition that exposure to proximal processes may not only determine competence, but also dysfunction (Bronfenbrenner & Morris, 2006). However, these findings may also suggest that teachers struggling with classroom organization rate children's social skills and externalizing behavior problems more positively in an initial stage of their work with the child than teachers observed to provide higher-quality classroom organization. This finding warrants further investigation, combining teachers' reports and independent observations of children's behavior, as teacher's perceptions and efficacy in assessing children's social skills and behaviors may be associated with their ability to ensure high-quality classroom management.

Consistent with findings reported by Xue et al. (2016), the proportion of days children were absent from school did not moderate the relation between emotional support and classroom organization and children's social and behavior outcomes. However, children attending classrooms with higher instructional support seemed to show decreased levels of internalizing behaviors at lower attendance levels. This finding is not consistent with our hypothesis and overall rationale but might reflect the nature of these behavior problems, which are not disruptive of classroom activities. Teachers who provide higher quality instructional support might need additional time with children to observe and report internalizing behavior problems. Subsequent studies based on more reliable internalizing behavior scores should examine this interpretation further.

Researchers have reported diverse effects of ECE quality in the socio-behavioral outcomes of different subgroups of children (e.g., Votruba-Drzal et al., 2004). Zero-order correlation coefficients indicated that, in our sample, children with disabilities had fewer social skills and exhibited more internalizing and externalizing behavior problems than their typically developing peers. Indeed, relations between disability status, deficits in social skills (e.g., Gresham, Sugai, & Horner, 2001), and more behavior problems (e.g., McIntyre et al., 2006) are consistently reported. However, in our study, disability status did not predict children's social skills or problem behavior development directly, after accounting for covariates. Importantly, disability status moderated the relation between instructional support and children's social skills, in the expected (i.e., compensatory) direction, with children with disabilities benefiting significantly from higher-quality instructional support, unlike typically developing children. Further, this effect emerged within a sample characterized by low-quality instructional support, suggesting even small increments in this ECE process quality domain, focusing on language and concept development, may be important for the social outcomes of young children with disabilities. This finding is especially noteworthy in the context of recent research reporting lower-quality instructional support in inclusive ECE classrooms (Cadima, Aguiar, & Barata, 2018; Pelatti, Dynia, Logan, Justice, & Kaderavek, 2016). It also strengthens the evidence base on cross-domain associations between ECE quality domains and children's outcomes (Downer et al., 2010).

Disability status did not moderate the relation between emotional support or classroom organization and social skills, nor did it moderate any relation between ECE quality and children's problem behaviors. Consequently, we did not find most of the compensatory effects hypothesized in our fourth and sixth hypotheses. Thus, our findings do not provide strong evidence of compensatory effects of ECE for children with disabilities and, thus, are mostly consistent with reports by Howes et al. (2008), while mostly contradicting expectations based on reports by Votruba-Drzal et al. (2004), among other studies.

Children with higher social skills tended to exhibit decreased internalizing behavior problems. Poor social skills have been linked to difficulties in establishing positive relationships with others (e.g., Winsler & Wallace, 2002), and to social withdrawal and rejection in preschool-aged children (Cillessen & Bellmore, 2006). Conversely, socially skilled children can establish positive and enduring interactions with others (e.g., Winsler & Wallace, 2002), which, in turn, build up their social skills, and so on (Michelson et al., 1983). Therefore, it seems logical that social skills may protect against the development of internalizing behavior problems (Cillessen & Bellmore, 2006). Conversely, we would expect to find a similar pattern for externalizing behavior problems; however, that was not the case. A plausible explanation, based on a socioethological perspective of peer relationships in the preschool context (Torres et al., 2015), is that socially competent children can and often use differ-

ent behavior strategies to achieve their goals (e.g., Waters & Sroufe, 1983). This means that a socially competent child may exhibit more dominant aggressive strategies or opt for a prosocial strategy (e.g., Hawley, 2002), depending on the circumstances.

4.1. Limitations

A few limitations constrain the interpretation of our findings and could explain some of the non-significant results. First, due to the correlational nature of this short-term longitudinal study, we cannot establish causal effects, nor can we establish, with certainty, the direction of the effects. Secondly, our sample is restricted geographically and relatively small. Thus, it may not be representative of the children served in ECE settings from the metropolitan area of Lisbon. Previous research depending on bigger samples found mainly small (e.g., Mashburn et al., 2008) or modest effects (Burchinal et al., 2014). Our sample size may be too small to detect existing effects, particularly in the group of children with disabilities. In addition, our small group of children with disabilities did not allow us to address type of disability in our analysis, despite the heterogeneity within the group.

To avoid potential multicollinearity, multiple models were tested for each outcome. Therefore, the interaction effects reported here should be confirmed in subsequent studies to ensure these are not spurious findings. Importantly, the scarcity of significant effects in our study may be due to the relatively small interval between assessments. The five months between assessments might have been insufficient to fully capture the effects of ECE quality and dosage on children's outcomes, and more time may be needed for changes to become visible. Moreover, we only collected two data points, which did not allow us to estimate children's development trajectories.

Another important limitation of our study is the fact that we used measures of children's social skills and problem behaviors that are based on teacher reports, which may have resulted in biased estimates of children's outcomes. External validity and rating accuracy issues have been associated with this approach (Michelson et al., 1983). For example, we acknowledge it is possible that teachers develop negative perceptions of children who attend school less often. Therefore, future research would benefit from using parent reports and/or observation measures of children's social and behavior outcomes.

Internal consistency for internalizing behavior problem scores was relatively low, likely because of the reduced number of items, raising concern about the validity and accuracy of the data (Tavakol & Dennick, 2011). Importantly, the interrater reliability of ECE quality scores is moderate and does not reach the good or excellent levels (Koo & Li, 2016) needed to avoid concerns about accuracy and, consequently, validity. Our interrater reliability estimates were similar to those reported in other studies using the CLASS (Pianta et al., 2014); however, we acknowledge the need to ensure higher levels of accuracy.

Finally, classroom observation cycles took place on a single day. While this procedure is a par with the extant literature in the field, we acknowledge that classroom quality scores may not be fully representative of children's classroom experiences. Future research would benefit from the use of classroom quality scores based on observations across multiple days.

4.2. Implications for practice and policy

Our findings on observed process quality levels are consistent with previous reports on Portuguese samples (e.g., Abreu-Lima et al., 2013; Pinto et al., 2013), and suggest the need to improve classroom processes (Pianta, Hamre, & Stuhlman, 2003), potentially based on the provision of high-quality pre-service training and

effective professional development for teachers (Rudasill & Rimm-Kaufman, 2009). High-quality in-service professional development seems to be particularly effective in improving ECE classroom processes (Mashburn et al., 2008). Professional development practices such as “mentoring, consultee-centered consultation, and program monitoring and feedback” (Mashburn et al., 2008, p. 747), should be implemented in detriment of common classroom detached practices (Haymore-Sandholtz, 2002), such as workshops (Birman, Desimone, Porter, & Garet, 2000). Based on our observations of ECE process quality levels and our estimates of compensatory effects for children with disabilities, professional development opportunities focusing on dimensions of instructional support might be especially important for ECE teachers in inclusive classrooms.

The direct effect of absence from school and the moderating effect of the cumulative experience with the teacher also merit consideration. Despite their small magnitude, these effects were observed within a short 5-month interval, which makes them meaningful from a practice and policy point of view. The direct negative effects of absence from school on children's social skills suggest that policymakers and stakeholders should not only strive to increase ECE coverage rates and classroom processes but also promote higher attendance rates (Barnett & Yarosz, 2007), through careful assessment of the barriers affecting children's attendance (Susman-Stillman et al., 2018). The moderating (i.e., detrimental) effect of cumulative exposure to teachers who provide lower-quality classroom organization further suggests that quality monitoring and improvement initiatives might need to prioritize assessments of how ECE teachers manage children's behavior, time, and engagement to ensure effective supports in positive behavior and classroom management, minimizing children's continued exposure to low-quality classroom organization processes.

4.3. Conclusion

This study, conducted in Europe, provides an international perspective on the effects of ECE quality and dosage, contributing to a more nuanced understanding of the effects of children's exposure to ECE. It adds to extant literature by reporting that time spent with the lead teacher and attendance influenced teacher's reports of children's social and behavior outcomes in distinct ways. Specifically, time spent with the lead teacher aggravated the negative effects of low classroom organization, while attendance mostly influenced children's social skills directly, possibly reflecting other disadvantages in children's lives.

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