



# The quality of the physical environment of Early Childhood Care and Education Centers in the Northeast region of Portugal: a comparison between researchers' and educators' assessments

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## Abstract

The Early Childhood Care and Education Center (ECEC) physical environment plays a significant role in shaping children's behavior and learning outcomes and influencing educators' management of children's exploration and action, which is pivotal for their overall development and well-being. This study compared the researchers' and educators' physical environment quantitative assessments of 12 Portuguese ECECs. Wilcoxon tests were used to investigate possible differences between the researchers' and educators' assessments. The ratings differ significantly regarding the institution's image and scale, safety, indoor organization, building location, and site characteristics, with educators reporting consistently higher levels of quality than the researchers. This study's outcomes highlight the importance of adopting an interdependent perspective between the researchers' and the educators' assessments regarding the ECEC physical environment quality. Such complementarity facilitates the accurate identification of key physical features of ECEC that need to be readdressed to promote children's high-quality education and positive development, learning, and overall well-being.

**Keywords** Early learning centers · Physical environment · Quality · Children development

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## Introduction

Many young children spend a significant portion of their daily lives in the Early Childhood Care and Education Center (ECEC) (European Commission/EACEA/Eurydice, 2019), making these institutions critical microsystems to provide rich opportunities for early development and learning (Bronfenbrenner & Morris, 2007). The quality of the ECEC environment is therefore essential, as it directly and positively impacts children's opportunities for playing, learning, development, and well-being (G.T. Leal et al., 2009; Moore, 2012).

Quality in ECEC is a multidimensional construct, and one of its central dimensions is the physical environment (Leal et al., 2009). Previous research has provided evidence of how specific high-quality ECEC physical attributes positively impact children's behavior and learning outcomes (Berti et al., 2019; Liempd et al., 2020), acting, respectively, as good quality indicators of the ECEC physical environment.

Research suggested high-quality indoor ECEC environments support children's engagement, emotional regulation, and well-being by offering quiet, comfortable, well-lit indoor areas, with adequate temperatures, including cozy home-based spaces for functional caregiving activities, and large flexible rooms that foster physical activity (Ata et al., 2012; Moore, 2012; Vashisth et al., 2021). Adequate indoor materials for children's scales promote self-directed and independent exploration, creativity, motivation to play with peers (Knauf, 2019), well-being, and readiness to learn (Moore, 2012). Well-defined circulation paths and connection between different activity room play areas (Moore, 1986) lead children to engage deeply in playtime and cooperate with peers (Moore, 1986). Strong indoor–outdoor connection further enriches children's play experiences, since through concrete and sensorial experiences offered by the outdoor environment, children can easily build their knowledge indoors (Bento, 2020). Regarding outdoor spaces, previous empirical studies also proved that combine manufactured (e.g., fixed swings or slides) and natural elements (e.g., trees, wood, stones, water, grass) stimulate different kinds of play. Whereas manufactured materials are associated with functional play (Zamani, 2016), contact with natural elements is related to constructive and longer duration of dramatic and symbolic play (Dyment & O'Connell, 2013). Besides that, the presence of natural elements enhances children's spatial-cognitive awareness (Herrington & Studtmann, 1998), physical activity (Määttä et al., 2019), social proximity (Moreira et al., 2022), imagination, creativity, self-esteem, self-confidence (Bento, 2020; Brussoni et al., 2015), and well-being (Bento & Dias, 2017; Brussoni et al., 2017). In this sense, to ensure that these skills are not compromised, outdoor environments must offer good conditions to be used all year, independent of the atmospheric conditions (e.g., shaded areas, drainage systems, shelters from the rain, snow, or strong wind) (Bento, 2020; Moore et al., 1996). Moreover, safe indoor and outdoor ECEC physical settings, which offer various surfaces and materials to promote active and risky play opportunities (Berti et al., 2019; Obee et al., 2020), together with well-defined play areas that are easy to circulate, with designated and comfortable spaces where children can have privacy and quiet time if they need it, are important for children to regulate their emotions and feel secure in the environment (Bento, 2020; Moore et al., 1996). Also, previous studies highlighted the importance of the ECEC centers being close to community services like public transport and natural parks to encourage children to develop a more consistent representation of the surrounding space and move more independently (Moore, 2012). Additionally, it enables them to learn about their physical and

social functionality and act as space specialists according to their needs, interests, motivations, and environmental and non-material cues (Lopes, 2021; Lopes et al., 2018).

Understanding how children interact with the physical environment requires a theoretical lens that considers the interplay between individual, environmental, and sociocultural factors. This study draws on Gibson's Affordances Theory (Gibson, 1979) which defines affordances as properties of the environment (e.g., objects, surfaces, design) that offer action possibilities, whose functionality is perceived by children depending on their characteristics (e.g., age, sex, motor, and social abilities) and their needs (Gibson, 1979). According to Gibson, the sociocultural system is embedded in affordances, thus influenced by social interactions (Gibson, 1979). By extending this perspective, Marketta Kyttä's model emphasizes that affordances in childhood are shaped not only by environmental physical properties but also by sociocultural norms, institutional policies, organizational culture, and adults' guidance (Kyttä, 2004). Kyttä's model sustains that children learn from adults which affordances are safe and appropriate. For that reason, Kyttä (2004) categorizes affordances into three subsets: the field of promoted action (FPA), shaped by adults encouraging specific actions within accepted cultural norms; the field of constrained action (FCA), where sociocultural and material restrictions lead adults to constrain children's exploration of affordances; and field of free action (FFA), representing children's independent exploration and deliberate actualization of the affordances. These fields interact dynamically, that is, when children are playing, they explore and actualize affordances by moving from one field of action to another and, often, seek to enlarge their field of free action, testing what may be socially promoted, but also socially constrained. In this sense, Kyttä's model of affordances actualization, applied to ECEC, is particularly useful for understanding how educators' perceptions, institutional policies, and sociocultural practices encourage or inhibit children's opportunities to engage with the physical environment (Moreira et al., 2023).

In recent years, scholars have begun to explore how educators perceive the quality of the physical environment, acknowledging that their perceptions, motivations, and beliefs mediate children's actions and behavior (Ata Doğan & Boz, 2019; Bento & Portugal, 2016; Ernst, 2014; LeMasters & Vandermaas-peeler, 2021; Rao, 2010; Sahin et al., 2011; Sandseter et al., 2020; Vashisth et al., 2021).

Educators tend to value physical environments that are safe, flexible, and offer varied opportunities for exploration, but their perceptions are often shaped by contextual constraints such as group size, institutional policies, and weather conditions (Sahin et al., 2011; Sandseter et al., 2020; Vashisth et al., 2021). For example, educators report greater satisfaction and more positive interactions with children when working in larger areas with fewer children (Sahin et al., 2011), but feel limited, demotivated, and tired by working in noisy spaces (Rao, 2010), and with lack of space, which lead them to restrict children's physical activity (Vashisth et al., 2021). Educators also reveal concerns about safety and accident prevention during children play time in ECEC outdoors (Bento & Portugal, 2016; LeMasters & Vandermaas-peeler, 2021), mentioning weather conditions as one of the biggest barriers to letting children move and play in the ECEC playground (Ata Doğan & Boz, 2019; Sandseter et al., 2020; Vashisth et al., 2021).

These studies used qualitative approaches (e.g., interviews or questionnaires) to assess educators' perceptions. Although deemed necessary, this approach fails to present a more objective perception of the educators' assessment of the quality of the ECEC physical environment based on well-defined and studied quality indicators (e.g., a quantitative approach), which is essential to accurately identify the physical attributes that may condition educators' actions and, consequently, children's behavior (Moore, 2012).

Moreover, to the best of our knowledge, no study has yet compared directly the perceptions of researchers—who often assesses ECEC physical environment based on normative, evidence-based criteria—to those of educators’, who engage with these environments daily and assess their quality through a more context-sensitive approach and practical lens, based on their personal beliefs (Ernst, 2014; Renick, 2009), pedagogical intentions (Reed, 2014), cultural background (Little et al., 2012), and accumulated work experience (Chong & Lu, 2019). This gap highlights the need for studies that bring both perspectives into dialog. Comparing researchers’ and educators’ perceptions can highlight potential gaps between theoretical standards and practical realities, allowing a more comprehensive understanding of how to develop more balanced and practical strategies both scientifically grounded and contextually relevant, to improve the quality of the ECEC centers, with direct benefits for children’s development and learning (Renick, 2009).

Therefore, this study seeks to address this gap by comparing researchers’ and educators’ assessments on the quality of the physical environment in ECEC settings, using a quantitative approach. Specifically, it aims to explore potential differences in their perceptions and, considering the theoretical lenses here adopted, to infer possible implications for children’s development and learning. To guide this inquiry, the working hypothesis is that researchers and educators will differ in their evaluations, with educators reporting higher-quality levels due to their context-sensitive perspectives.

## Materials and methods

### Study design, context, and procedures

The present study adopted a cross-sectional quantitative research design. In December 2020, 12 of the 15 ECECs in the Northeast region of Portugal were invited to participate in this study. The sample was selected for convenience since all the ECEC were part of a program designed to promote young children’s mobility, physical activity, health, and well-being, called *Pé Ativo*. This program was promoted by the Research Centre in Basic Education (CIEB), Instituto Politécnico de Bragança, in Portugal. The researchers scheduled an online meeting with each ECEC director to explain the purpose of the study and its procedures. All 12 directors (eight private and four public) agreed to the ECECs’ participation. Some were small buildings with cozy environments, while others were integrated into larger buildings with an institutional appearance. In January 2021, the researchers (first and last authors) visited all the kindergartens and carried out an *in loco* observation to assess the quality of the physical environment’s design facilities. In February 2021, after the researchers visited and assessed the quality of the 12 ECECs, educators from each institution were invited to participate in this study. They were informed about the study’s goals and procedures, the voluntary nature of their participation, and how data would be analyzed and saved to guarantee their privacy (Ethical Code for Early Childhood Researchers, 2015). Nineteen educators (18 females and one male) returned their written consent to participate in the study and received training on using the EAEFC rating scale. This training occurred through two 120-min online sessions and had a theoretical and practical component. In the practical component, educators were challenged to score different ECEC physical environments through images. This practical component allowed educators to experience the scale rating and ask the necessary questions to feel more confident applying it. Then, the educators gave their ratings using the EAEFC scale regarding their ECEC

workplace. Between January and February, the researchers did not share any information about their physical environment assessments with directors or educators at each institution. No changes to the ECECs' physical environment were made between the researchers' and the educators' assessments.

Seventeen of the participating institutions elected one responsible educator to carry on the in-locus observation. In two institutions more than one educator accepted to participate. To ensure that the educators who applied the scale alone had the opportunity to debate and reflect on their scores with other colleagues, an online meeting was provided with all educators. This meeting was mediated by the researchers (first and last author), who did not interfere with educators' score decisions and reflections. All the procedures followed the 1964 Helsinki Declaration and its later amendments. The Ethics Committee of the Instituto Politécnico de Bragança approved all the study procedures (CEIF Approval Number: n.º 61/2021).

## Instruments and variables

### Quality of the ECECs physical environment

The quality of the physical environment was scored by researchers and educators by using the *Escala de Avaliação dos Envolvimentos Físicos para Crianças* (EAEFC) (Moreira et al., 2020). This scale is the Portuguese version of the Children's Physical Environments Rating Scale (CPERS5) (Moore, 2012). It aims to analyze whether the physical attributes of the indoor and outdoor ECEC spaces meet the quality indicators that promote favorable child development in early childhood age (infants, toddlers, and preschoolers). The EAEFC was designed to be applied by educators and researchers (Moore, 2012).

The EAEFC is divided into 124 items, distributed through 14 subscales (sub.), which in turn are divided into four parts: Part A (Planning) assesses the ratio between the size of the center and the amount of the available space for activities inside, relative to the number of children, and also the modules organization for infants, toddlers and preschoolers (sub. 1); Part B (Building as a Whole) assesses the building qualities in terms of image and scale (sub. 2), circulation routes (sub. 3), the common core of shared facilities within the building (e.g., administrative office, reception; staff lounge room, staff workroom, meeting/conference room; gym) (sub.4), temperature, light, ventilation, noise protection (sub. 5), and lastly, safety and security to children (sub. 6); Part C (Children's indoor spaces) looks to the flexibility and openness of the indoor children activity spaces (sub. 7), and assesses also the characteristics of indoor areas for feeding and sleeping (sub. 8); for quiet activities like the reading, manipulative (fine motor), and computer play areas (sub. 9), for physical activities such as the physical (gross motor), music, and dramatic/fantasy play areas (sub. 10); and for messy activities, like arts and crafts studio, water play area and science and nature area (sub. 11). Finally, Part D (outdoor areas) checks the functional (sub. 12) and development needs of the outdoor play yards (sub. 13), as well as characteristics of the site and building location relative to the community (sub. 14) (Moore, 2012)<sup>1</sup>.

The subscale's items were scored between 0 (do not meet) and 4 (comply with excellence). The average values of all the items obtained a final subscale score. In turn, obtaining a final score on the ECEC's physical environment quality was possible by calculating

<sup>1</sup> For more information on the scale items, see Moore (2012).

the average values of all the subscales. Both subscales and the final ECEC score ranged between 0.00–1.00=bad quality, 1.01–2.00=fair quality, 2.01–3.00=good quality, and 3.01–4.00=excellent quality (Moore, 2012).

Both researchers and educators gave their ratings using the EAEFC scale onsite, via direct observation, during an approximately 50 min.

## Data analysis

The research team used the IBM SPSS Statistics 25 to analyze the data analysis.

To analyze the researchers' and educators' assessments of the ECEC physical environment quality, a descriptive analysis (means, standard deviations, minimum and maximum values) was performed for the EAEFC final score, subscales, and item scores attributed by the researchers and the educators.

In cases where more than one educator from the same institution participated in the study, an average of all educators' assessments was made and treated as a single assessment.

Due to the non-normality of the data, a Wilcoxon signed-ranks test was used to investigate the possible differences between the researchers' and the educators' assessments for the same institutions on the EAEFC final scoring, subscales, and item scores.

## Results

Researchers and educators' assessments of the quality of the ECEC physical environment differed significantly (Table 1). While researchers rated the institution's physical environment as providing fair quality to support children's development needs and learning, educators rated it as good quality (Table 1).

Statistically significant differences were found across several EAEFC subscales, with large effect sizes (Cohen's  $d \geq 0.80$ ) in many cases (Table 1). Overall, researchers consistently attributed lower scores (ranging from fair to poor quality) compared to educators (ranging from good to excellent quality) regarding: institution's center image and scale ( $Z = -2.59$ ,  $p = .009$ ,  $d = 0.86$ ), the circulation routes ( $Z = -3.06$ ,  $p = .002$ ,  $d = 1.00$ ), the conditions of the common core of shared facilities ( $Z = -2.79$ ,  $p = .005$ ,  $d = 0.91$ ), safety and security ( $Z = -2.76$ ,  $p = .006$ ,  $d = 0.94$ ), the flexibility and openness of children's activity spaces ( $Z = -2.82$ ,  $p = .005$ ,  $d = 0.92$ ), the home bases ( $Z = -2.12$ ,  $p = .034$ ,  $d = 0.69$ ), the quiet activity play areas ( $Z = -2.93$ ,  $p = .003$ ,  $d = 1.00$ ), and the building location and site ( $Z = -2.82$ ,  $p = .005$ ,  $d = 0.92$ ). The interpretation of effect sizes indicates that the differences between researchers and educators were statistically significant, particularly concerning circulation routes, safety and security, flexibility of activity spaces, quiet activity areas, and the location and site of the building.

Researchers highlighted positive aspects related to the ECEC building size and modules organization, indoor environment quality, and location, emphasizing appropriate sizing, excellent ventilation and temperature, well-designed outdoor natural features and conditions to buffer the outdoor play areas from excessive noise, and proximity to public transportation and natural parks. However, researchers identified major shortcomings regarding the flexibility and openness of children's activity spaces and the lack of acoustic and visual protection between the indoor messy/noisy play areas (e.g., arts and crafts and dramatic play areas) and clean/quiet play areas (e.g., reading and computer areas). The researchers

**Table 1** Descriptive statistics (Mean, SD) and Wilcoxon signed-ranks test results of the EAEFC subscales and final score by researchers and educators

| EAEFC final score and subscales                | Sub-scale score           |                            | <i>Z</i> ( <i>p</i> ) | Cohen's <i>d</i> <sup>a</sup> |
|--|---------------------------|----------------------------|-----------------------|-------------------------------|
|  | Researchers               | Educators                  |                       |                               |
|  | ( <i>n</i> = 2)<br>M ± SD | ( <i>n</i> = 19)<br>M ± SD |                       |                               |
| EAEFC final score                              | 1.57 ± 0.32               | 2.37 ± 0.61                | − 2.99 (.003) *       | <b>0.97</b>                   |
| 1. Center size and modules                     | 2.63 ± 1.33               | 2.97 ± 1.17                | − 0.94 (.345)         | 0.43                          |
| 2. Image and scale                             | 1.68 ± 0.64               | 2.31 ± 0.90                | − 2.59 (.009) *       | <b>0.86</b>                   |
| 3. Circulation routes                          | 1.54 ± 0.52               | 3.02 ± 1.05                | − 3.06 (.002) *       | <b>1.00</b>                   |
| 4. Common core of share facilities             | 1.53 ± 0.51               | 2.47 ± 0.83                | − 2.79 (.005) *       | <b>0.91</b>                   |
| 5. Indoor environmental quality                | 2.23 ± 0.44               | 2.50 ± 0.76                | − 1.33 (.182)         | 0.43                          |
| 6. Safety and security                         | 1.24 ± 0.73               | 2.29 ± 0.94                | − 2.76 (.006) *       | <b>0.94</b>                   |
| 7. Flexibility and openness of activity spaces | 0.57 ± 0.37               | 2.22 ± 1.19                | − 2.82 (.005) *       | <b>0.92</b>                   |
| 8. Home bases                                  | 1.99 ± 0.67               | 2.70 ± 0.66                | − 2.12 (.034) *       | 0.69                          |
| 9. Quiet activity play areas                   | 1.00 ± 0.36               | 2.43 ± 1.03                | − 2.93 (.003) *       | <b>1.00</b>                   |
| 10. Physical activity play areas               | 1.41 ± 0.92               | 1.88 ± 1.12                | − 1.60 (.110)         | 0.55                          |
| 11. Messy activity play areas                  | 0.74 ± 0.44               | 1.26 ± 1.23                | − 1.25 (.213)         | 0.42                          |
| 12. Play yards—functional needs                | 1.68 ± 0.73               | 1.95 ± 1.00                | − 1.02 (.306)         | 0.33                          |
| 13. Play yards—developmental needs             | 1.40 ± 1.16               | 1.74 ± 1.18                | − 0.76 (.450)         | 0.26                          |
| 14. Location and site                          | 2.41 ± 0.59               | 3.27 ± 0.72                | − 2.82 (.005) *       | <b>0.92</b>                   |

\*Significant differences for  $p < 0.05$ , <sup>a</sup>0.00–1.00 = poor; 1.01–2.00 = fair; 2.01–3.00 = good; and 3.01–4.00 = excellent; effect size interpretation was based on benchmarks suggested by Cohen (1988) as small ( $d \leq 0.20$ ), medium ( $0.20 < d < 0.80$ ), and large ( $d \geq 0.80$ ); large effect size is shown in bold

considered that the children's activity areas needed to be adequately defined and enclosed to protect them from visual and noise distractions. Moreover, the researchers pointed out that the conditions of the furnishings and storage in the arts and crafts, water play, and science and nature areas did not match the standard quality requirements (e.g., the water play area did not have easily cleaned floor, tables, nor storage; the science and nature areas did not have racks, cabinets, or shelves, nor provisions for keeping pets and plants, small indoor garden). Moreover, the researchers considered that indoor and outdoor settings should be better visually and spatially connected.

Educators, on the other hand, rated circulation routes, building location and site particularly highly (excellent), highlighting that the circulation routes do not disturb the children's activities, and valuing the center's closeness to public transportation and natural parks by walking. However, educators noted lower quality (fair) in indoor messy play areas, the physical activity play areas, and outdoor play yards. Educators emphasized the limited opportunities for science and nature exploration, messy play (e.g., water play), and indoor physical activity, as well as a lack of weather-protected outdoor play areas, insufficient outdoor storage, and a lack of outdoor play areas dedicated to social and water play.

## Discussion

This study aimed to compare the researchers' and educators' assessments regarding the quality of the ECEC physical environment in the Northeast Region of Portugal.

In line with our hypothesis, the researchers' and the educators' assessments regarding how each group perceived the general quality of the ECEC's physical environment significantly differed between the two. Despite using the same quantitative physical environment rating scale and having had the same training to apply that scale in the same way as researchers did, educators scored significantly higher on the general quality of how ECEC's supported children's developmental needs and potential learning. While researchers considered that the quality of the physical environment supported children's development and learning with only fair quality, the educators praised the physical environment of ECECs, perceiving it to provide good quality.

These findings are consistent with previous research emphasizing the importance of incorporating multiple perspectives when evaluating ECEC environments, as highlighted by Ernst (2014) and Renick (2009). They clearly demonstrate, as Renick (2009) also suggested, the existence of discrepancies between internal (educators') and external (researchers') assessments of the quality of the physical environment in ECEC settings. Furthermore, our results extend prior research by showing that such divergence applies not only to overall quality ratings but also to specific environmental attributes—particularly those related to circulation routes, safety and security, flexibility of activity spaces, quiet activity areas, and the location and site of the building. Additionally, this study provided objective and concrete insights into which aspects of the physical environment require improvement to better support the developmental and learning needs of children in the participating institutions.

Indeed, educators expressed the tendency to attribute significantly higher levels of quality in specific physical environment attributes when compared to the researchers. Such perspective was expressed in terms of the adequateness of the building size to the number of children attended, how the buildings guarantee children's autonomy to circulate indoor and outdoor surroundings, and how the building has well defined the administration services and spaces for adults and staff. Other aspects referring to a higher quality of settings when compared with the researchers' perspectives, were evident, namely in how the design assures children's safety, security, and support; how it corresponds to their functional caregiving activities; how it provides flexibility for children manage the space according to their interests and play behaviors; and how it enables them to be comfortable without noise or visual distractions in quiet activity play areas.

An explanation for these results can be supported by Chong and Lu (2019) previous empirical study findings, which suggest that educators, by spending their day-to-day time at the ECEC and every day trying to adjust it to children's needs and functioning, perceive it as more functional and adequate than it may be. That is, by being continuously exposed to the daily life of institutions, educators may become less sensitive to the quality of the physical environment. Indeed, continued pedagogical practice may lead educators to overestimate the quality of the physical environment, which is associated with overestimating the quality of their practice. Therefore, the researchers entering the institution for the first time may have a more objective and more critical view. Hence, the outcomes of this study may also help to identify areas in which educators benefit from the contribution of researchers to alert and remind them of objective quality criteria.

Furthermore, the fact that the participating educators identified strengths or weaknesses of the ECEC physical environment, by attributed higher or lower levels of quality to specific physical attributes, enhances the premise of Kyttä's theoretical model (2004), since these findings highlight which physical attributes, in the educators' perception, are more or less socially and culturally significant for their pedagogical practice. Simultaneously, such an account may contribute to anticipating the physical environment conditions that lead them to promote or constrain some of the children's actions (Kyttä, 2004; Reed, 2014), since educators tend to perceive the quality of the ECEC physical environment according to their preferences, beliefs, pedagogical intentions (Ernst, 2014; Renick, 2009), or even socio-cultural differences (Kyttä, 2004; Little et al., 2012).

In this sense, regarding what was pointed out by the researchers with lower quality, it seems necessary to reflect on some criteria regarding the need for more definition and organization of the indoor activity areas and more connection between indoor and outdoor environments. Indeed, these findings obtained through researchers' assessments clearly identified some ECEC physical environment fragilities, which according to other scholars constrained children's attention and engagement in free play (Berti et al., 2019; Moore, 1986), and, as such, their emotional well-being and social interaction (Berti et al., 2019; Liempd et al., 2020). Additionally, the present study's results emphasize, as previous scholars such Bento (2020) and Bilton (2010), that the ECEC indoors and outdoors should be rethought as one combined and integrated environment and must be available to children simultaneously since the connection between indoor and outdoor spaces eases children's access to concrete sensory experiences.

Besides the signaled differences between researchers and educators on some of the ECEC physical environment attributes, this study results also found that both assessors agreed regarding the good quality of the building size and scale, in a way that building areas dimensions were adequate to the number of children attended, the ventilation, and light. The temperature was suitable, and the buildings' location and site were well community-positioned. Such positive environmental features signaled by researchers and educators, in the present investigation, signalize the presence of good physical environment indicators, which according to Moore (2012) integrate the domain of child-friendly physical environment attributes that strongly support children's development and learning, especially children's cognitive (Ata et al., 2012; Herrington & Studtmann, 1998), motor, and social-emotional development (Bento, 2020; Brussoni et al., 2017).

Furthermore, researchers and educators agreed to attribute a fair quality to the indoor design for children to engage in physical activities and to the correspondence of the outdoor design to the children's functional and developmental needs. These results highlight, as also previously defended by Carson and colleagues (2017) the need to rethink these spaces more carefully to enhance their potential and help children achieve better opportunities to explore their bodies indoors and outdoors surroundings, something vital at such an early age, and reinforce a need, as previously evidenced in the study of Vashisth et al. (2021), that the absence of indoor spaces for physical activity may limit the opportunities for children's active play (adult led or not), since requires educators to adapt and reorganize the activity room to carry out physical activity classes, which they perceive as a tiring and challenging task, and a contributing factor in decreasing their motivation and cheerful disposition to guide children in these types of activities.

This study's outcomes also reinforce the importance of thinking with educators about how the outdoor play yards can be redesigned to correspond to the educators' needs and intentions and become the educators' strong allies in their practice, something previous defended by Bento and Portugal (2016) and Bilton (2010), by showing that outdoor play

yards with scarce weather protection and storage provisions, which according to previous researchers may limit children to use these spaces (Ihmeideh & Al-Qaryouti, 2015; Sandseter et al., 2020) and act as barriers to their physical activity, positive development, learning, and well-being (Sando & Sandseter, 2020; Smith et al., 2014). Moreover, the Natural Learning Initiative (2023), in their top ten activity settings that enhance the value of early childhood outdoor play and learning environments, reinforces the importance of children's access to diverse play and activity settings. Hence, the scarcity of variety and diversity of opportunities afforded to children at the outdoor play yards, as scored by participating educators, may indicate that they perceive ECEC outdoor areas to have few features to support their pedagogical intentions to promote young children's development and learning.

This study also found that researchers' and educators' assessments revealed the need to improve the indoor physical environment to let children engage in messy activities. In both assessments, this was the physical attribute that supported children's development and potential learning with lower quality. By failing to meet the physical conditions for children to play with messy materials indoors, such as water or paints, the institutions may not be facilitating an optimal hands-on experience for children, which, in early years, is the vehicle for children to build knowledge and learn about their surroundings (Cline & Smith, 2013). Such experiential knowledge is paramount to the embodiment of experiences that facilitate children's development and learning (Macedonia, 2019) and positively impact the acquisition and development of language (Marian et al., 2019) and thinking skills (Macedonia 2019). Besides, previous research proved that when the educator perceives messy materials indoors as "too confusing and time-consuming," children are negatively affected by being inhibited from exploring these necessary sensorial materials (Goodwin, 2008).

These findings not only reveal perceptual differences but also highlight the potential for collaboration between educators and researchers to bridge gaps in understanding and improve early childhood environments. In other words, our results show that the difference in perspective between researchers and educators is affected not only by how they perceive the quality of resources and physical environments but also by their vision of the sociocultural environment, norms, organizational culture, perceptions, beliefs, etc.

Due to their role and in their work, researchers will not be as affected by the dominant sociocultural norm, while educators will be. On the one hand, researchers look at the better or worse quality of physical environments, which is more informed by the perspective of affordance theory and the impact of environmental characteristics on children's behavior and the resulting benefits. In this way, researchers become less susceptible to the pressure of conformity and the prevailing social and organizational norms. On the other hand, educators have daily experience with children, and their relationship with involvement cannot be minimized. The educators' perspective, even if it is more optimistic than the researchers', must be integrated into a more comprehensive vision, as does the researchers' position. To promote changes that contribute to improve the physical environment quality, it will also be necessary to intervene at the level of educators' perceptions, as these are an integral part of how sociocultural and organizational norms are promoted and generated. This is, in fact, the interdependence of the Kytta's model (2004) applied to the present study. Practical recommendations stemming from these results are discussed below.

## Practice and policy recommendations

Bridging researchers' and educators' perceptions of the quality of ECEC physical environments is crucial for creating environments that better support children's developmental

needs and educators' pedagogical goals. Based on this study's results, we suggest the following key takeaways for researchers and practitioners, enriched with practical recommendations:

### **Invest in joint ECEC assessments by mixed teams of researchers and educators**

The differences in researchers' and educators' perceptions offer an opportunity to design collaborative research projects. For example, in the ECEC physical environment, where researchers identified weaker aspects that educators perceived as stronger, such as the adequacy of space for caregiving or promoting children's autonomy, researchers and educators must work together to establish what it means to promote children's autonomy strongly. Thus, periodically, mixed teams, composed by educators and researchers, may conduct structured assessments on the physical environment quality of ECEC settings, followed by a post-assessment reflexive discussion on the findings of both parties. These assessments should use quantitative rating scales, specifically designed to measure physical environmental quality, such as EAEFC and end with a practical action plan that prioritizes small, achievable improvements (e.g., reorganizing quiet zones, adjusting indoor–outdoor pathways). Small pilot changes should then be tested and refined based on feedback. These actions could help maintain a balanced perspective and promote mutual learning to develop the best solutions for the ECEC physical environment's evolving needs, assuring that the ECEC is conducive to children's development needs with the best physical environment quality. These periodic assessments and reflexive meetings between educators and researchers are beneficial for the creation of shared practice-based perspectives, informed by scientific background and by everyday educational experiences, around the quality of opportunities that the physical environment affords children to relate with in ECEC settings.

### **Promote training in objective assessment of ECEC physical environment**

Regular training sessions focused on objective quality criteria, mediated by the researchers, are needed to help educators better align their assessments with research-based standards. Additionally, reflection workshops where educators evaluate their environments with researchers can help balance subjective impressions and objective evaluations. It is recommended that after each training, educators conduct a self-assessment of the education setting where they work and discuss it in small peer groups to critically reflect on biases and improvements.

### **Organize reflection meetings with researchers, educators, and children**

Organize quarterly participatory meetings between researchers, educators, and children, to reflect where children's suggestions for improvements in the physical environment are considered and incorporated through child-friendly tools such as drawings, photographs, or storytelling and, with the support of researchers, adjust such propositions to the indicator standards and the needs of educators. It is advisable that these meetings conclude with a shared document outlining agreed priorities for ECEC physical environmental adjustments.

## **Cultivating a feedback culture**

Educational leaders should cultivate a culture where feedback is actively sought and implemented, ensuring that physical environments continue to evolve to meet the needs of both children and educators. Therefore, it is suggested that educational leaders carry out monthly feedback routines where educators are encouraged to suggest improvements to the physical environment and reflect on changes already implemented. Educational leaders must formalize responses and actions taken based on the educators' feedback to ensure transparency and motivation.

## **Organize visits exchanges and interviews between educators**

Providing opportunities for educators to visit other institutions and participate in evaluating or monitoring these settings can further enhance their ability to assess the physical environment critically. Therefore, educators may spend one day, every semester, visiting another ECEC institution, participating in observation tours, and co-assessing the physical environment quality using objective and quantitative measures. This exchange also may help to create informal networks of support and knowledge-sharing among institutions, contributing to the continuous improvement of the ECEC physical environment.

## **Define policy guidelines and prioritize fundings**

Policymakers must develop clear guidelines to support key designs that enhance the developmental potential of ECEC environments. Indeed, funding programs must prioritize renovations in areas that lack flexibility, safety, and child-centered features, as highlighted in this study. Therefore, it is suggested that the educational bodies of governments ought to develop, in partnership with researchers, educators, and children who use the ECEC environments, guidelines manuals for the ECEC quality physical environment that may include detailed design standards. These manuals may include the minimum measures of the ratio between space and children in the indoor and outdoor environments; guidelines to adapt and reorganize indoor spaces to accommodate physical activities; content on adequate playground design and surfaces for children to play there independently from weather conditions, and different ground floor surfaces, as with earth, grass, cement, sand, hilly terrain with slope in outdoor designs; information on relevant actions to enrich the play value of ECEC areas, by incorporating natural loose parts, such as the use of water, sand, soil, tree leaves, tree sticks, or manufactured loose parts, such as ropes, tires, and cardboard boxes, into children's play environments; and ECEC case studies of national and international good practices on the provision of high-quality physical environments, as a means to persuade and guide educational leaders and educators to assure more variety and challenge in ECEC outdoors play yards. Moreover, developing an ECEC quality physical environment guidelines manual may encourage local and national governments to fund infrastructure improvement based on hyperlocal research data. More specifically, it will be possible to compare the results of the objective assessments with the high-quality indicators referred to in the manual and demonstrate more easily how renovations could meet these new standards and encourage strategic and targeted upgrades.

## Recognize community resources as an extension of ECEC physical environment

Leveraging community resources can be an effective solution for institutions that lack adequate outdoor spaces. Indeed, establishing partnerships with local parks, gardens, or public facilities provides children with alternative opportunities to explore and learn outdoors, encourages greater community involvement in early childhood education, and fosters a supportive network for ECEC institutions. The partnership between ECEC institutions and communities could be celebrated through formal agreements with city councils, where, for example, it may be foreseen that weekly outdoor learning days take place in public facilities. Additionally, local businesses and community organizations could sponsor minor playground enhancements (e.g., providing loose parts and building small shelters) for institutions lacking these physical elements.

In conclusion, fostering collaboration between researchers and educators is key to improving the quality of ECEC physical environments in a dynamic approach. By implementing these recommendations, ECEC institutions can bridge perceptual gaps, create more effective learning spaces, and ensure that physical environments align with the developmental needs of children and educators' pedagogical intentions.

## Strengths, limitations, and future directions

To the best of our knowledge, this study is the first to present an educators' assessment of the ECEC physical environment by using a quantitative and specific physical environment rating scale and comparing it with the researchers' previous assessment. In addition, the methodology that was adopted allowed not only access to a more holistic characterization of the participating ECEC's quality of the physical environment but also provided the educators with the ability to apply an instrument that facilitated their reflection on the pedagogical space, its organization, and impact on the child's behavior. Furthermore, this study reinforces the importance of training educators so that they can be autonomous in regularly assessing, monitoring, and reflecting on the quality of the ECEC physical environment. Something vital to progressively respond to the child's development needs with higher quality (Ernst, 2014).

Although limited in their generalizability, small studies and pilot projects are crucial steppingstones for advancing research in any field. These initiatives highlight findings that warrant further investigation, uncover new or previously overlooked practical and theoretical questions, and help refine methodologies and procedures for larger-scale studies and more resource-intensive interventions. Our study provides a unique model for investigating the differences between researchers' and educators' perceptions of the ECEC's physical environment quality. However, our work is limited by sample size, focused only on North-east Portugal, a small number of researchers, a limited number of educators, and the potential bias stemming from educators' familiarity with their work environments. These limitations should not be dismissed and must be better explored in future studies. Therefore, this study reinforces the need for future studies whose design ensures greater mitigation of the subjectivity in data collected by educators and greater validity in data collected by researchers. Thus, it is suggested a set of future studies in which (i) educators are to assess other institutions differently from their own to check whether the results would be more like those of the researchers, or whether the differences would be remaining; (ii) interviews are conducted with educators, looking to investigate how their years of experience in the ECEC setting, the adopted type of pedagogical approaches (adult led vs. child led), their

personal beliefs, work experience, and cultural background, may be related to their quantitative assessments on the scale of physical environment quality criteria; (iii) the educators' quantitative measure of the ECEC physical environment quality is complemented with a qualitative assessment of the type of activities and interactions they have with children inside and outside, and with a narrative perspective about educators' use of both spaces, their design, and physical attributes; (iv) more researchers are involved in evaluating each institution, distributing different peers of researchers to different institutions.

Furthermore, future studies must carry designs that help to translate this study's findings to other regional or cultural contexts to ensure a greater representation and generalization of obtained data according to different geographical, socio-economical, cultural background, or pedagogical variables. Expanding this study methodology to a more significant number of ECECs, especially to other geographical locations in Portugal (rural vs. city) or other minority or majority world countries, could be relevant. Moreover, it could also be valuable to correlate the relation between the scores of the quality of the physical environment with children's play, development, and learning outcomes. Using play observational scales and other standardized scales to measure children's cognitive, motor, social-emotional competence, or even children's well-being and engagement, could add value to the present research. In addition, a more comprehensive, mixed-method approach, including both researchers' and educators' perspectives on the physical and social qualities of the ECEC's environments, may contribute to better pedagogical and spatial practice for the daily work carried out by educators with children.

## Conclusion

This study compared the researchers' and educators' quantitative assessments regarding the quality of the physical environment of the ECECs in the Northeast region of Portugal. The main findings showed that considering the present conditions of the investigation, researchers and educators have different perceptions about the quality of the ECEC physical environment, the former rating "fair" and the latter rating "good." Such differences derive from rating discrepancies between researchers and educators, either in the same features or in different ones. This may indicate that researchers and educators share different perceptions of how children's developmental needs are supported or constrained by the quality indicators of ECECs' physical features.

The findings of this study, derived from both researchers' and educators' perspectives, provide a detailed quantitative characterization of the current status of the quality of physical environments of the participating ECEC. They offer valuable insights about the importance of considering both researchers' and educators' assessments of ECEC physical environment quality to ensure a more comprehensive understanding of how ECEC design attributes must be addressed and what spatial redesigns and practices are required to facilitate higher-quality children's development and learning.

Discussing the study results obtained with researchers and educators and listening to their ideas for physical environment improvements could be an asset in making ECEC physical environments more responsive to children's needs and interests. Such scaffolding would also be beneficial for educators to develop a more critical perspective of their pedagogical actions according to the spatial planning of the physical environment of ECEC.

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**Data availability** The data presented in this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

## Declarations

**Conflict of interest** No potential conflict of interest was reported by the authors.

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