

Article

Quality of the Opportunities for Preschoolers' Physical Activity in Portuguese Kindergartens

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Abstract: Kindergarten's physical and social environment influences preschoolers' physical activity (PA) and impacts their development. This study aimed first to describe the quality of the opportunities provided by the physical attributes and social guidelines to promote PA and, second, to investigate the relationship between design attributes and daily practices to support PA in sixteen Portuguese kindergartens (15 public). The Children's Physical Environment Rating Scale was used to rate the quality of the design attributes. Sixteen directors and teachers filled out surveys to quantify the equipment available and assess the quality of the written policies and daily practices to promote PA. Correlations between design attributes and daily practices to support PA were analyzed. The results emphasize the need for improvements in indoor settings that facilitate a wide range of gross motor activities for children. Similarly, outdoor environments should be designed to enable play opportunities regardless of weather conditions, encouraging children to engage in diverse and challenging physical activities. Providing more times per year for teachers' PA training is also necessary. The design attributes and daily practices to support children's PA were related. In kindergartens with a room only for PA, children spent less time sitting and more time in teacher-led PA. In kindergartens with large and challenging outdoor areas, children engaged in more intense PA. However, having a roofed protection area outdoors was not sufficient to decrease indoor sitting time. These findings highlight the need for ongoing review and assessment of the physical and social environment in kindergartens to ensure preschoolers have the best opportunities for PA.

Keywords: kindergarten; quality assessment; affordances; physical environment; social guidelines; physical activity; preschooler's development



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1. Introduction

Children need to be physically active to develop healthily [1,2]. Physical activity (PA) is defined as any bodily movement produced by skeletal muscles that requires energy expenditure (WHO, 2022) [3]. Running, swimming, tumbling, throwing, catching, walking, and participating in interactive play with games and equipment are common types of PA among preschoolers [4]. Kindergartens can positively impact preschoolers' physical activity (PA) by providing a child-friendly physical environment [5] and by adopting social guidelines that encourage children to practice PA regularly [2] and safely [6]. With a low percentage of preschoolers meeting international guidelines for PA [7], it is vital to understand if the physical environment and social guidelines of kindergartens are focused on facilitating preschoolers' PA [8].

Children's PA is highly influenced by the physical and social characteristics of the child and their surroundings. According to Gibson's affordances theory [9], the perception of the opportunities for action in the environment, or affordances, is dependent on characteristics of the individual (e.g., age, profiles, interests) and the context, namely its physical attributes (e.g., design, places, equipment, surfaces) and social characteristics (e.g., institutional rules, teachers daily practices), which modulate the actions of children [9]. Thus, the exploration of the environment is guided by the fit between child characteristics and the physical and social aspects of their surroundings, which can facilitate or inhibit the children's use of movement to look for developmentally meaningful actions [10].

Although kindergartens have a strong potential to positively influence preschoolers' PA, the mere existence of these settings does not guarantee it will happen [11,12]. Indeed, such engagement is highly influenced by the kindergarten physical environment (e.g., design, surfaces, equipment) and social guidelines (e.g., written policies and daily practices) that encourage children to be physically active [13–16]. Moreover, the physical environment must be planned and designed to adequately support pedagogical guidelines so that teachers feel more supported when leading children to regular moments of physically active play [17,18].

In this work, the physical environment includes both the physical design attributes [19] and the equipment provisions [20]. A child-friendly kindergarten PA environment offers indoor and outdoor design, surfaces, and equipment that invite children to safely engage in a variety of movements and different types of physical activities [5,21,22]. To optimize active play, the design of the kindergarten's indoor physical environment should include a large indoor multipurpose active playroom or gym [5], with an adequate floor and defined areas for different movements [16] (e.g., tumbling and climbing zones). This area should also provide easy access to equipment and structures that promote a variety of motor skill behaviors [15]. Indoor areas with inadequate acoustic or spatial separation from quiet play activity areas or that include non-portable toys often limit intense body movement activities [5,15].

Concerning the kindergarten outdoor play yard's physical environment, the design must guarantee an adequate area per child [23], provide a larger outdoor playground [24], have open areas [8], play settings adjacency [13], and define tracks/paths [23] to invite children to physical play. In addition, directors, staff, and designers must provide for safe play spaces, following local, national, and international requirements (e.g., European standards) [6]. That way, children will be able to encounter acceptable risk as part of a stimulating, challenging, and controlled play environment, which is important for them to expand their level of physical competence [25]. Having roofed and shaded areas, drainage systems, and shelters should be planned so children can actively play outdoors all year, even with adverse weather (e.g., rain, snow, wind, full sun) [26,27]. The presence of a variety of play equipment is necessary to stimulate different kinds of physical activities [28]. Both manufactured equipment (e.g., fixed swings or slides) and natural elements (e.g., trees, wood, cliffs, water, grass, and sand) afford active play; however, the natural elements invite more risky play [29]. Portable trampolines [15], large fixed play equipment, areas constructed with climbing, sliding, swinging, and balancing structures [8,24,30], ropes, sand, and hilly terrain [15] have been positively associated with PA in children. The opposite happens in a playground with a hard ground cover (i.e., a concrete play area) and equipment that promotes sitting or little movement (i.e., seesaws [15] and sand tables [30]).

As for kindergarten social guidelines, or the written policies determined by the administration and the daily practices applied by teachers [20], previous studies suggest that preschoolers PA is favored by defined written policies such as providing children with 120 min of active play every day (indoors and outdoors) [31], offering a physical education class each week [32] limiting screen-viewing [33], and training teachers about PA twice a year or more [31,34,35].

Measuring the quality of the kindergarten's physical environment and social guidelines enables staff, researchers, parents, and policy makers to understand whether the

physical attributes, administration-written policies, and teachers' daily practices are appropriate and harmonized to encourage preschoolers PA [14]. In the last few years, research interest in the influence of the physical environment and social variables influencing children's PA has grown, with many studies supporting that relationship [8,13,15,16,33,36]. However, the literature continues to highlight the need to conduct research that accurately describes the quality of the kindergarten's physical environment and social factors to guide educational and political agents to meet the highest quality guidelines to promote children's PA [20,22,37–39]. Such assessment should use scales specifically designed to measure the quality of the kindergarten physical environment and the social variables for PA instead of general measures of more global constructs (e.g., teacher educational background) [40,41]. Considering the importance of the kindergarten environment on children's healthy development, ongoing monitoring of the physical environment and social guidelines to practice PA, comparing the results with best practice quality indicators, and inquiring about the relation between the physical environment and social guidelines to promote children's PA is fundamental to guide action and support change. This has become even more important after the negative effect of the COVID-19 lockdown on children's physical activity and health [42,43].

To the best of our knowledge, no study has yet explored how the physical environment's design and social guidelines relate to facilitating or constraining children's PA during the time they spend in kindergarten. Therefore, this study aimed firstly to describe the quality of the physical environment and social guidelines to promote preschoolers' PA in Portuguese kindergartens, and secondly to investigate the relation between the physical environment and the teacher's daily practices to promote PA. Regarding the second goal, we hypothesized that in kindergartens with a PA-friendly physical design environment, the daily practices applied by teachers would highly correspond to PA best practices quality scores.

2. Materials and Methods

2.1. Procedures

In September 2020, the preschool year that started after the COVID-19 lockdown, half of the 72 kindergartens in Gondomar ($n = 36$), Portugal city, were invited to participate in this study. The sample was selected for convenience but covered kindergartens located in areas with different urbanization characteristics within Gondomar (urban and rural). The researcher scheduled a face-to-face meeting with each kindergarten director to explain the purpose of the study and its procedures. Sixteen directors (15 public and one private) agreed to participate. Most refusals were related to ongoing COVID restrictions. Of the fifteen public kindergartens, thirteen had buildings dedicated for preschoolers and were physically independent of other classroom and administration buildings. The remaining two were integrated into school centers with elementary and preschool services. The private center had nursery, preschool, and elementary school services in one building. In November 2020, the researcher (first author) visited all the kindergartens and carried out an in loco observation to assess the quality of the physical environment's design attributes. The director and one preschool teacher from each institution were also asked to complete surveys to quantify the presence of physical elements at the kindergartens (equipment, natural elements, and surfaces) and measure the quality of the social guidelines (administration written policies and teachers' daily practices) to promote children's PA. All the procedures were conducted according to the Code of Ethics for Early Childhood Researchers (EECERA) [44]. The Ethics Committee of the Faculty of Human Kinetics, University of Lisbon, approved all the study procedures (CEIF Approval Number: 26/2019).

2.2. Instruments

2.2.1. Quality of the Kindergarten's Physical Environment Design Attributes to Promote PA

The quality of the kindergarten's physical environment design attributes was scored using the Escala de Avaliação dos Envolvimentos Físicos para Crianças (EAEFC) [45]. This is the Portuguese version of the original Children's Physical Environments Rating Scale (CPERS5) [46]. The EAEFC is used to assess kindergarten's indoor and outdoor physical environment design attributes and analyze how they meet the best environmental quality indicators, previously associated with favorable children's development [47]. The EAEFC includes 124 items divided into 14 subscales and is grouped into 4 parts (For more details, see Moreira et al., 2020 [45]). Depending on the study's goals, the subscale's items may be used independently, providing information about specific kindergartens physical design features. For this study, only the 11 items that assess the quality of the indoor/outdoor physical environment design features related to preschoolers PA were used. These include items related to the characteristics of the indoor gym, the appropriateness of the physical motor play area for all gross-motor physical activities, the size of the outdoor play yard, diversity and challenging contours, weather protection, and the characteristics of the building site (see Table 1). Each item was scored on a 0 to 4 scale according to established criteria for compliance with physical environment quality indicators: 0 (Do not comply); 1 (Comply poorly); 2 (Comply fairly); 3 (Comply good); and 4 (Comply with excellence) [46].

2.2.2. Quality of the Kindergarten Physical Elements and Social Guidelines to Promote PA

The Environment and Policy Assessment and Observation-Self-Report (EPAO-sr) [20] was used to assess and quantify the physical elements and social guidelines in the kindergarten setting that promote PA (see Moreira et al. [48] for the Portuguese version). Following the instrument's procedures, three surveys were distributed: the Director General Survey (to assess the institution's written policies regarding time and space for PA, training for staff, and parental education), the Teacher General Survey (to assess the elements of the physical environment that promote PA and active play), and the Teacher daily survey (to assess teacher daily practices and time to promote PA).

Items from the three surveys are combined and used to score 13 sub-components (see Table 2). Each subcomponent is scored on a 0 to 3 scale. A score of three indicates the PA's best practice in this area was met or exceeded [48]. The EPAO-sr PA total score is computed as a simple sum of the 13 sub-component scores and could range from 0 (lower compliance) to 39 (higher compliance) [20]. Items from the EPAO-sr can also be used to summarize time in active play, adult-led PA, and the type of physical activities children are involved in (mostly sitting to mostly vigorous) in the indoor and outdoor areas of the kindergarten [20].

Table 1. Quality of the physical environment features design to promote children’s PA measured by Escala de Avaliação dos Envolvimentos Físicos para Crianças (EAEFC).

Part	Subscale (Number of Items)	Item Assessed ^{1,2}	Item Score (0 to 4)	Average Quality	Percent of Kindergartens (<i>n</i> = 16) in Each Quality Category				
			M (SD)		Fail	Poor	Fair	Good	Excel
B. Building as a Whole	Common and Shared Facilities (12) Facilities for adults and children (e.g., staff and multipurpose room)	4.8. Center has an indoor multipurpose playroom or gym, with enough space to accommodate slides, tunnels, ball play or to ride small push toys.	1.00 (0.82)	Poor	25	56.3	12.5	6.3	0
	Physical Activity Areas (14)	10.3. Center has an indoor physical gross motor play area for preschoolers.	0.13 (0.50)	Fail	93.8	0	6.3	0	0
	Spatial definition, surfaces, equipment, and storage of the physical gross motor play area	10.4 The physical gross motor play area is spatially separated from other (non-shared) activity areas.	2.19 (1.83)	Fair	31.3	12.5	6.3	6.3	43.8
C. Indoor Spaces for Children		10.5. The physical gross motor play area is appropriate for a range of gross-motor physical activities (e.g., hard surfaces for ball play, storage, display racks, climbing equipment).	0.56 (0.63)	Poor	50	43.8	6.3	0	0
	Play Yards: Functional Needs (7)	12.1 Calculate the total area (m ²) of useable outdoor play yards per child.	3.13 (1.45)	Good	12.5	0	18.8	0	68.8
	Feature of outdoor play area meets functional needs.	12.4. Some of the play yard is open and largely flat.	2.75 (0.68)	Good	6.3	0	18.8	68.8	6.3
D. Outdoor areas for Children		12.7 There are roofed outdoor areas that protect children’s activities in most local weather conditions.	0.87 (0.81)	Poor	37.5	37.5	25	0	0
	Play Yards: Developmental Needs (8)	13.1 The play yard(s) provides enough diversity, such as a variety of surfaces for different types of play, to be interesting for children.	1.19 (0.98)	Poor	25	43.8	18.8	12.5	0
	Features of outdoor play area meet developmental needs	13.2. The play yards have both large and small areas for children to play.	1.25 (1.13)	Poor	31.3	25	37.5	0	6.3
		13.5. Some of the play yards contain contours that are safe yet challenging enough for children to play on.	1.00 (0.63)	Poor	18.8	62.5	18.8	0	0
	Location and Site (11) Characteristics of the building site and its location in the community	14.9. The site has natural features such as trees, shrubs, and gentle slopes.	1.88 (1.02)	Fair	12.5	18.8	37.5	31.3	0

¹ Reprinted with permission from Moore, 2012 [46]. For more information on the scale items, contact the author of the original scale, The Children’s Physical Environments Rating Scale (CPERS5) [46]. ² Each item is scored on a 0 to 4-point scale, according to the increase of compliance with the quality indicators for physical environment design features. 0 = Do not comply (fail); 1 = Comply poorly; 2 = Comply fairly; 3 = Comply good; 4 = Comply with excellence [46].

Table 2. Kindergartens ($n = 16$) compliance with EPAO-sr best practices to promote PA.

EPAO sr. Sub-Components		Average Score ^a	Percent of Kindergartens Meeting Best Practice
		M (SD)	
1.	PA time provided	1.65 (0.58)	12.5
2.	Indoor play equipment	1.54 (0.46)	0.0
3.	Daily PA practices	2.31 (0.46)	43.8
4.	PA teacher training	1.06 (0.45)	0.0
5.	PA written policy	1.63 (0.81)	6.3
6.	Screen time	1.34 (0.29)	0.0
7.	Daily screen time practices	1.69 (0.36)	6.3
8.	Screen Time teacher training	0.50 (0.53)	0.0
9.	Screen Time policy	1.62 (0.53)	12.5
10.	Outdoor playtime	2.22 (0.33)	31.3
11.	Outdoor play environment	1.48 (0.56)	6.3
12.	Outdoor play and learning teacher training	0.65 (0.63)	0.0
13.	Outdoor play and learning written policies	1.81 (0.83)	12.5
Total score ^b		19.50 (4.61)	

^a Higher scores indicate better compliance with best practice standards. 0 = do not meeting best practice, 3 = meeting best practice. ^b Total score range from 0 to 39.

2.3. Data Analysis

The data analysis was carried out by the research team using IBM SPSS Statistics 25. A descriptive analysis (means, standard deviations, minimum and maximum values, and frequencies) was performed for all variables. Due to the small sample size, the Spearman coefficient was used to investigate possible correlations between the physical environment's design attributes and the social guidelines that promote children's PA.

3. Results

3.1. Quality of the Kindergarten's Physical Environment Design Attributes to Promote PA

The summary of the 11 EAEFC items is presented in Table 1. Across the 16 kindergartens observed, two areas were found to have good quality. Consistently high ratings for total outdoor area available for each child to play ($M = 3.13$, $SD = 1.45$), and having open and largely flat play areas ($M = 2.75$, $SD = 0.68$) were noted. Lower quality scores were found for outdoor weather protection ($M = 0.87$, $SD = 0.81$), the variety of surfaces available for children to play on ($M = 1.19$, $SD = 0.98$), and the balance between safety and challenging contours ($M = 1.00$, $SD = 0.63$). Furthermore, the results showed that the kindergartens failed to have an indoor physical gross motor play area ($M = 0.13$, $SD = 0.50$) and had poor quality designs for the physical gross motor play area ($M = 0.56$, $SD = 0.63$).

3.2. Quality of the Kindergarten Physical Elements and Social Guidelines to Promote PA

The average total EPAO-sr. PA score was 19.50 ± 4.61 (min. = 12.48, max. = 27.37) out of a maximum possible score of 39. EPAO-sr. summary scores are shown in Table 2. According to the results, the assessed kindergartens showed higher compliance with the best practice indicators for Daily PA practices (44% of sites met best practice) and outdoor playtime and lower compliance regarding teacher training on PA, screen time, and outdoor play and learning (0% met best practice).

Table 3 shows the percentage of kindergartens that offer specific written policies, physical attributes, and portable equipment to promote PA. More than 70% of kindergartens use an activity room or gym to practice PA indoors, but few have adequate space to practice all gross motor activities (GMAs) in the activity room (6.3%) or gym (31.3%). More than 80% of the kindergartens offer one PA class per week to the children. However, only a few (12.5%) ensured that at least 60 min of adult-led PA per day were carried out. Most teachers

report access to indoor equipment that could be used for a variety of GMAs but also report that indoor activity levels are just above “sitting” (see Table 4), indicating that access may not equate to consistent use of indoor play equipment. Computers (70.6%) and TVs (64.7%) were common in participating kindergartens, but less than half had written media use policies related to screen time. In the outdoors, few kindergartens had trees and rocks to climb (12.5%), and hills to climb and roll down (6.3%). The slide (81.3%) and the swing (62.5%) were the fixed pieces of equipment most used in the participating kindergartens. The balls, the equipment to jump (68.8%), the loose parts, and the marker items (e.g., cones) (62.5%) were the mobile equipment most used in the assessed kindergartens. Finally, a few kindergartens had a water play area available (6.3%).

A summary of the teacher’s reported daily activities and intensity is shown in Table 4. According to the teacher reports, children spent more time playing outdoors (72.19 min.) than playing actively indoors (28.44 min), with a higher percent of indoor active play classified as teacher-led (56%), compared to only 10% of time outside. Teachers reported about 31 min of seated activities (seated, computer, and TV), which only partially accounts for the average activity level inside, which was “mostly sitting” (2.2 on a 1 to 7 scale). While teachers reported children participating in “mostly moderate activities” (5.3 on a 1 to 7 scale) during outside time.

3.3. Correlation between Physical Environment Design Attributes and Teachers’ Daily Practices to Promote PA

Significant correlations were noted between several physical environment design attributes measured by EAEFC and daily routines reported by teachers in EPAO-sr. surveys. All correlations are presented in Table 5.

Results showed a strong positive correlation between indoor physical gross motor play area rating and minutes in teacher-led activity ($r_s = 0.64$; $p = 0.01$) and a strong negative correlation between indoor space for doing GMA and time children spend sitting ($r_s = -0.64$; $p = 0.01$).

The outcomes also revealed positive and moderate correlations between better-quality outdoor spaces, the number of times children went outside, and the types of physical activities children are involved in. Although the findings expressed a negative moderate correlation between having a roofed outdoor play area and the time children spend seeing TV or movies inside ($r_s = -0.59$; $p = 0.02$), a positive strong correlation occurred between having an outdoor play area with a roofed area and the time children spend sitting indoors ($r_s = 0.65$; $p = 0.01$).

Table 3. Percent of kindergartens reporting written policies and specific physical affordances to promote PA.

Written Policies		% of KGs ^a	Physical Attributes		% of KGs ^a	Portable Equipment		% of KGs ^a	
Physical Activity			Outdoor/natural Elements			Outdoor			
	Include PA in classroom routine and transitions	87.5		Small trees	68.8		Balls (large and small)	68.8	
	Adults and children with clothes participate in PA	81.3		Plants with flower	56.3		Equipment to jump (e.g., hula hoops, mini tramps)	68.8	
	Motor Skills planned lessons 1 ≥ time per week	81.3		Larger trees	50.0		Loose parts	62.5	
	Talking with children about PA importance	68.8		Grassy area	50.0		Marker items (e.g., poly spots, cones)	62.5	
	Give families information on PA 2 ≥ per year	37.5	Floor with variations (e.g., hills, mounds)	Trees to climb	12.5		Equipment to play on the floor (e.g., tumbling mats)	56.3	
	Limit sitting time to 15 minutes per day	25.0			Rock to climb	12.5		Riding toys (e.g., cars, tricycles)	56.3
	120 min. PA indoor and outdoor per day	25.0			Hill to climb or to down rolling	6.3		Balance toys (e.g., balance beams, river stones)	50.0
	60 min adult-led PA per day	12.5						Push/Pull toys (e.g., wagon, scooters, wheelbarrows)	43.8
	Give teachers training on PA 2 ≥ year	12.5	Fixed Equipment Outdoor				Portable Tunnel	43.8	
Screen Time (ST)				Slide	81.3		Slide	37.5	
	Only 30 min of screen time per week for children with 2 ≥ years	43.8		Swing	62.5		Twirling play equipment (e.g., ribbons, scarves, batons)	31.3	
	Give families information on ST 2 ≥ per year	37.5		Paved for bike or tricycle	43.8		Climbing structures (can be moved by staff or child)	31.3	
	Give teachers training on ST 2 ≥ year	12.5	Climb structures (e.g., jungle gyms, ladders)		43.8		Sand water toys	25.0	
Outdoor Play and Learning (OPL)					Play house	43.8		Sand water table	18.8
	Child and adults’ clothes to go outdoor in all seasons	73.3		Seesaw	37.5		Portable pool	18.8	
	3 ≥ times outdoor play per day	50.0	Balance platforms (e.g., balance beams, boards)		25.0	Indoor			
	90 min outdoor play per day	50.0			Sand box (e.g., large enough for child to sit in)		25.0	Equipment to play on the floor (e.g., tumbling mats)	100.0
	Give families information on OPL 2 ≥ per year	50.0		Benches	25.0		Equipment to jump (e.g., hula hoops, mini tramps)	81.3	
	Give teachers training on OPL 2 ≥year	25.0		Tunnel	6.3		Balls (large and small)	75.0	
Physical Attributes				Picnic tables	6.3		Marker items (e.g., poly spots, cones)	68.8	
Indoor spaces to practice PA				Water area	6.3		Portable Tunnel	56.3	
	Use the activity room to do PA with children	75.0	Media equipment				Balance toys (e.g., balance beams, river stones)	50.0	
	Use gym to do PA with children	68.8			Computer	70.6		Loose parts	37.5
	Gym has space for any GMA ^b	31.3		TV	64.7		Climbing structures (can be moved by staff or child)	31.3	
	Activity room have space for any GMA	6.3		DVD	52.9		Twirling equipment (e.g., ribbons, scarves, batons)	31.3	
Outdoor spaces to practice PA				Tablet	5.9		Push/Pull toys (e.g., wagon, scooters, wheelbarrows)	18.8	
	Outdoor have space for all class to run	93.8		Smartboard	0.0		Riding toys (e.g., cars, tricycles)	6.3	
			Videogames system (e.g., playstation)		0.0		Sand water table or toys	0.0	
								Slide	0.0
								Portable pool	0.0

^a Kindergarten; ^b GMA = Gross motor activities.

Table 4. Descriptive statistics (Mean, SD, min., percentile distribution and max.) of some daily PA routines.

Frequency, Time, and Type of Physical Activity Behavior ^a in a Day	M (SD)	Min.	p ₂₅	Median	p ₇₅	Max.
Number of times outside per day	1.97 (0.56)	1	1.00	1.00	1.00	3
Child play outdoors (min per day)	72.19(22.28)	40	56.25	68.75	90.00	128
Child indoor active play (min per day)	28.44 (36.73)	0	11.25	17.50	28.75	150
Adult PA led outdoor (min per day)	7.50 (7.75)	0	0.00	7.50	15.00	20
Adult PA led indoor (min per day)	15.94 (10.52)	0	6.25	17.50	23.75	30
Child is seating indoor (min per day)	22.56 (12.34)	0	15.00	24.50	30.00	44
Child is on the computer (min per day)	5.31 (6.95)	0	0.00	2.50	12.50	20
Child watching TV/movie (min per day)	3.12 (4.79)	0	0.00	0.00	10.00	10
Type of physical activities outdoors ^a	5.33 (1.36)	3	5.00	5.50	6.56	7
Type of physical activities indoors ^a	2.19 (1.52)	0	1.25	1.75	3.50	5

^a Type of physical activities rating scale used by teachers to quantify child behavior is a 1 to 7 scale of increasing intensity: 1 (mostly sitting), 2, 3 (mostly slow/easy activities like walking and marching), 4, 5 (mostly moderate activities), 6, 7 (mostly vigorous activities like running).

Table 5. Correlations between EAEFC items related to PA and daily practices reported by teachers in EPAO-sr. surveys.

EPAO-Sr. Daily Practices										
EAEFC ItemP	Outdoor					Indoor				
	Number of Times Outside per Day	Minutes to Play Outside per Day	Minutes Teacher Led PA per Day	Type of Physical Activities	Minutes Active Play per Day	Minutes Teacher Led PA per Day	Minutes TV or Movie	Minutes Computer	Minutes Sitting	Type of Physical Activities
(Scored 0 to 4)	r _s (p)	r _s (p)	r _s (p)	r _s (p)	r _s (p)	r _s (p)	r _s (p)	r _s (p)	r _s (p)	r _s (p)
Indoor multipurpose active playroom or gym	−0.01 (0.97)	−0.09 (0.74)	0.07 (0.81)	−0.31 (0.24)	0.49 (0.06)	0.59 * (0.02)	0.49 (0.06)	−0.18 (0.52)	−0.31 (0.25)	0.47 (0.06)
Indoor physical gross motor play area for preschoolers	0.14 (0.61)	0.17 (0.53)	−0.16 (0.55)	−0.37 (0.16)	0.21 (0.43)	0.64 ** (0.01)	−0.04 (0.90)	0.08 (0.78)	−0.14 (0.60)	0.14 (0.60)
Inside Physical area separated from the others	0.14 (0.61)	0.04 (0.89)	0.10 (0.72)	−0.43 (0.10)	0.24 (0.37)	0.52 * (0.04)	0.19 (0.49)	−0.06 (0.82)	−0.39 (0.14)	0.24 (0.38)
Inside Physical area appropriate for a range of GMA ^a	−0.08 (0.78)	0.02 (0.95)	0.08 (0.76)	−0.36 (0.18)	0.23 (0.40)	0.53 * (0.53)	0.46 (0.07)	−0.35(0.19)	−0.64 ** (0.01)	0.30 (0.26)
Useable outdoor area / child	0.41 (0.11)	0.04 (0.89)	−0.24 (0.38)	0.35 (0.19)	−0.04 (0.89)	−0.00 (1.00)	0.11 (0.69)	−0.30 (0.26)	0.06 (0.82)	0.16 (0.56)
Outdoor open and largely flat	0.03 (0.91)	−0.12 (0.66)	−0.38 (0.15)	−0.07 (0.80)	−0.17 (0.54)	0.29 (0.27)	0.02 (0.95)	−0.12 (0.65)	−0.09 (0.75)	−0.18 (0.50)
Outdoor roofed area	0.30 (0.25)	−0.10 (0.71)	0.11 (0.67)	0.42 (0.11)	−0.12 (0.65)	−0.28 (0.29)	−0.59 * (0.02)	0.21 (0.44)	0.65 ** (0.01)	−0.12 (0.66)
Outdoor diversity and variety surfaces	0.30 (0.25)	0.07 (0.81)	−0.21 (0.43)	0.53 * (0.03)	0.26 (0.33)	0.17 (0.54)	−0.19 (0.49)	−0.08 (0.76)	0.38 (0.15)	0.35 (0.19)
Outdoor large and small areas to play	0.55 * (0.03)	0.03 (0.90)	0.03 (0.92)	0.54 * (0.03)	0.23 (0.40)	0.02 (0.94)	−0.12 (0.65)	−0.26 (0.33)	0.24 (0.37)	0.40 (0.13)
Outdoor safe and challenging contours	0.50 * (0.05)	−0.13 (0.62)	−0.27 (0.32)	0.47 (0.07)	−0.02 (0.93)	−0.27 (0.31)	−0.22 (0.41)	0.00 (1.00)	0.20 (0.45)	0.18 (0.51)
Building site with natural features	0.52 * (0.04)	0.35 (0.19)	−0.27 (0.32)	0.55 * (0.03)	0.08 (0.77)	0.22 (0.42)	0.03 (0.91)	0.06 (0.81)	0.26 (0.33)	0.16 (0.55)

^a Gross Motor Activities. Note: ρ coefficients only shown when they are significant. * moderate correlation; ** strong correlation.

4. Discussion

This study aimed, firstly, to describe the quality of the opportunities provided by the physical attributes and social guidelines to promote PA and, secondly, to investigate the relationship between the quality of the physical design attributes and existing daily practices to support PA in Portuguese kindergartens.

Having an indoor and outdoor PA-friendly physical environment prompts children to practice PA more frequently and regularly at the kindergarten [13,15,16]. However, indoors, children tend to spend more time sitting [49] and have better opportunities for constructive and fantasy play than for active play [50]. In this study, the presence of some physical design attributes and equipment was identified as facilitating factors to promote higher levels of PA, such as having specific mobile indoor equipment (e.g., tumbling mats, mini tramps, balls, tunnels, and balance toys), enough space for all children to run outside, an open and large outdoor play yard, and outdoor mobile (e.g., loose parts, riding toys, and hula hoops) and fixed equipment (e.g., slides and swings). On the other hand, the absence of some design attributes and equipment could inhibit preschoolers' PA or make it a challenge for staff to offer adequate PA opportunities. First, we noted scarce conditions indoors for children to engage in a range of GMA and a lack of some mobile equipment indoors (e.g., twirling play equipment, riding toys). In addition, the outdoor environment had limited outdoor weather protection and a lack of variety and diversity in surfaces and natural elements (e.g., hills to climb or roll down and trees and rocks to go up). These identified weaknesses must be carefully reviewed and modified to create a resource-rich environment that encourages higher-quality PA for children, which is vital to facilitating their development [1,2] and learning [51,52].

In most of the evaluated kindergartens, the activity rooms and gyms were used for other pedagogical or care activities (e.g., playing in different play areas; taking a nap or eating) and as multipurpose spaces where children watched TV, played active games, painted, played fantasy, or did puzzles. Not having a space always available and prepared for children to experience all levels of PA, dissuade children from GMAs and vigorous PA [5]. In addition, teachers may be afraid that children's vigorous behaviors are not safe or will damage fragile equipment (e.g., TVs, mirrors, computers with low windows, toys) in these shared spaces, prompting them to limit activities that require a higher intensity of movement. Moreover, when space is limited, teachers may feel hindered from promoting active moments. Indeed, in a previous study, teachers felt that having to rearrange the room for children to engage in PA moments was challenging and tiring [18].

Our findings also showed the need for more equipment and natural elements that invite children to engage in more challenging or "risky" motor behaviors outdoors. This type of physicality—climbing, jumping from safe heights, balancing, sliding, running fast, or cycling on varied terrain—motivates children to experience different body abilities in their physical active play [53,54], which likely improves the quality of their movement and gives them the confidence to explore their surroundings through movement [34,55–57]. Such experiences seem to be critical for preschoolers, where the body is a vehicle to feel, interact [58], learn [51,52], and affect other bodies and materials and be affected by them within playful encounters [59,60]. Indeed, many children prefer outdoor designs that allow for variation in movement and controlled "risk" taking [55,56].

Regarding the social guidelines, or policies, that can influence children's PA, outcomes helped identify several written policies with higher compliance to the best practice standards for PA, namely the daily promotion of PA (e.g., including PA in routines and transitions) and outdoor play time (e.g., children have appropriate clothes to go outdoor in all seasons). However, compliance with best practice policies was lower for teacher trainings on PA, screen time, and outdoor and play learning topics. Furthermore, many kindergartens do not have policies that meet best practice standards for adult-led PA each day or scheduled active play time in the indoor or outdoor spaces.

Our findings suggest that most of the evaluated kindergartens are promoting daily PA in routines and transitions and are reserving adequate time for children to play outdoors.

These two strategies are critical to encouraging children to actively explore their bodies and surroundings [39,61]. Even though these policies showed higher compliance with the best PA indicators, they may not be enough to ensure that children engage in vigorous PA or other important GMAs [39]. In fact, according to the responses from the participating teachers, children spend most of their time indoors sitting and most of their time outside in lower-moderate physical activities (e.g., walking). In this sense, children never engaged in particularly vigorous PA (e.g., running) in their mostly used play spaces. These findings highlight an important topic where training, environment, and policy interactions may be essential to optimizing children's PA behaviors in the kindergarten setting.

Research has shown that teachers with PA training report higher perceived importance and personal responsibility relative to PA teaching [62], facilitating children's PA during daily kindergarten care [35]. This suggests that providing training and teacher education may be a more effective strategy to increase children's active behaviors compared to only promoting adult-led PA or costly changes in the physical environment's design. Through training in PA, teachers will be strengthened to stimulate child movement throughout the day, making them less dependent on specialized PA classes mainly provided by staff external to the institution (e.g., a physical education teacher) [63].

As expected, in kindergartens with an indoor and outdoor PA-friendly physical environment, the daily PA practices were better and more likely to meet best practice recommendations. While the correlations do not imply causality, they indicate that in kindergartens where indoor spaces allowed children to engage freely in a range of physical activities, children spent less time sitting and more time in teacher-led PA. In addition, in kindergartens that had more outdoor time, more natural elements and surface variation, small and large areas to play outdoors, and a safe and challenging design, teachers reported that children engaged in more intense physical activities while in the outdoor play yards. It is important to note that having a roofed protection area seems not to be sufficient to decrease indoor sitting time. This finding might suggest that the promotion of PA in kindergartens implies a combination of optimal physical environment design, administration-written policies, and teacher training.

These findings emphasize the ecological theoretical premise that the physical and social environment act together to promote or constrain children's PA [9,10]. Moreover, our study outcomes support what has been previously suggested in theoretical expositions and qualitative studies [17,18] by objectively demonstrating that the physical environment should be designed to adequately support teachers as they guide children to engage in regular PA.

Strengths, Limitations, and Future Directions

To our best knowledge, our study is the first to objectively characterize the quality of the physical and social environment to promote preschoolers' PA at the kindergartens in Gondomar and is also one of the first to investigate the relationship between physical environment design attributes and social guidelines in these early educational settings. While the precision and generalizability of our findings may be limited due to the small sample size, this study provides results and a framework that support the need for larger-scale surveillance and targeted intervention efforts. National efforts could easily build on the methods that optimized the use of site-level observation and teacher/director reports to investigate best practices in kindergartens and establish an ongoing system for monitoring long-term trends in this area.

In future studies, it will be interesting to analyze the impact that the kindergartens' physical environment features and social guidelines have on objective estimates of children's play and physical active behavior. Our group plans to combine the use of EAEFC and EPAO type scales with measures of child-level PA (e.g., accelerometers, pedometers) and instruments focused on potential opportunities offered in the indoors and outdoors, like the Knauf's (2019) visual environment rating scale [64] the Heft's (1988) affordances taxonomy of children's outdoor environments [65], or also by coding child-child and teacher-child

interactions to capture social environments, as in Smith and colleagues (2014) [13]. In addition, a more complete understanding of the children's perceptions about the physical and social elements of the kindergarten environment that modulate their play and movement would be of great benefit. Research work carried out using other methodologies, such as behavior-mapping approaches [13], participatory techniques, including child-led tours and photography, photographic elicitation and conversations [66] drawings [67] and focus groups [68], has also offered valuable contributions to the field. Nevertheless, the outcomes of the present study clearly identify environmental attributes and PA best practice opportunities that merit discussion by administrators, teachers, parents, policy makers, and organizations that support and promote the health and wellbeing of young children. Furthermore, these results provided a picture of the current physical conditions and social guidelines that can contribute to rethinking the physical environment and social approaches that might ensure a higher-quality kindergarten experience for children.

5. Conclusions

The present study brings to light relevant findings about how kindergarten might be modified to meet preschoolers' developmental needs by providing richer physical and social environments that promote children's physical and active behavior. This is exceedingly important in the aftermath of the COVID-19 pandemic, which negatively impacted preschoolers' PA and development [43,69]. To ensure children a rich developmental environment and improved PA behaviors: (i) interventions should be initiated to examine the design of indoor PA play areas and the facilities that foster all types of movement; (ii) the outdoor play areas must be configured to ensure more opportunities for children to engage in various activity types and intensities, including challenging or "risky" play; (iii) a greater investment must be made in teacher training regarding PA, motor behaviors, and outdoor play and learning; and (iv) administrators need to be more aware of the importance of the environmental design to support daily practices that promote PA. We believe this study adds progress on the understanding and developing of diverse opportunities for young children to engage in various types of movement in kindergarten settings, which are pivotal for their healthy development.

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