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Relationship between physical activity and comprehensive development in early childhood education according to teachers' perceptions

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ABSTRACT

Background: Physical activity during early childhood is an important component of healthy growth and may contribute to motor, cognitive, social, and emotional development. Understanding its relationship with children's holistic development may support educational practices aimed at promoting well-being from the preschool stage. **Objective:** To determine the association between physical activity and holistic development in preschool children according to teachers' perceptions. **Methods:** An observational, analytical, cross-sectional study with a quantitative approach was conducted. The entire accessible population of 50 preschool children aged 3 to 5 years was included using a census approach. Teachers assessed physical activity and holistic development using structured questionnaires with evidence of content validity and adequate internal consistency. Categorical variables were summarized using frequencies and percentages, and the association between the study variables was evaluated using the chi-square test, with statistical significance set at $p < 0.05$. **Results:** Physical activity was classified as fair in 46.0% of children, good in 46.0%, poor in 6.0%, and excellent in 2.0%. Holistic development was predominantly moderate (70.0%), followed by high (26.0%) and low (4.0%) levels. No statistically significant association was found between physical activity and holistic development ($p = 0.070$). **Conclusions:** Physical activity and holistic development were not significantly associated according to teachers' perceptions. Nevertheless, both represent relevant components of preschool development and should be considered within comprehensive educational strategies for early childhood.

Keywords: Physical Activity; Child Development; Child, Preschool; Early Childhood Education; Teachers.

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Introduction

Physical activity during early childhood is an essential component of healthy growth and well-being. International guidelines recommend that children under 5 years of age engage in regular physical activity while limiting prolonged sedentary and screen-based behaviors [1]. Beyond its health-related benefits, physical activity during the preschool years is closely linked to opportunities for movement, active play, and the acquisition of fundamental motor skills. Longitudinal evidence has shown that motor competence and physical activity are interrelated during early childhood, supporting the importance of providing children with sufficient opportunities to move and develop their motor abilities from an early age [2].

Holistic development in early childhood involves the progressive integration of motor, cognitive, communicative, social, and emotional capacities. Educational environments therefore play an important role in providing experiences that support children's development beyond academic learning alone. UNESCO emphasizes that quality physical education should contribute to the development of physical, social, and personal competencies [3], while recent international guidance on early childhood development recognizes that optimal development requires coordinated opportunities for health, learning, responsive interaction, and supportive environments [4].

Recent scientific evidence supports the potential contribution of movement-based experiences to several developmental domains. A systematic review of interventions in children aged 3 to 7 years found that motor-skill and physical-activity interventions may support cognitive and academic development, particularly when movement is intentionally integrated with learning activities [5]. Similarly, a systematic review and meta-analysis of randomized controlled trials reported that physical-activity interventions may improve cognitive performance during early childhood, particularly attention, inhibitory control, working memory, cognitive flexibility, and vocabulary [6]. These findings suggest that the relevance of physical activity during the preschool years may extend beyond motor development alone.

The preschool educational environment is particularly relevant because children spend a substantial proportion of their daily routine under the supervision and guidance of educators. A recent scoping review showed that early childhood teachers recognize the importance of physical activity but differ in their knowledge, perceptions, and approaches to incorporating movement opportunities into educational practice [7]. Furthermore, research conducted during the preschool day has shown that teachers' practices and physical activity may be related to the opportunities for movement experienced by children [8]. Consequently, teachers constitute relevant observers of children's participation in physical activities and their behavior within the educational context.

Nevertheless, promoting physical activity in early childhood education settings may depend on several contextual factors. Educators have identified barriers and facilitators related to professional knowledge, institutional organization, available resources, leadership, and parental involvement when implementing structured physical activity [9]. In addition, characteristics of the physical and social preschool environment may influence opportunities for physical activity, motor competence, and social interaction [10]. Therefore, holistic development should be understood as a multidimensional process that may be associated not only with physical activity but also with educational, family, social, and environmental conditions.

Although physical activity is widely recognized as an important component of early childhood development, its relationship with broader holistic development may vary according to the context in which children learn and interact. Examining this relationship from teachers' perspectives may provide relevant information about children's physical activity and development within their usual educational environment and contribute to the design of more comprehensive educational strategies. Accordingly, the objective of this study was to determine the association between physical activity and holistic development in preschool children according to teachers' perceptions in Trujillo, Peru. The study also sought to describe the levels of physical activity and holistic development among the children evaluated.

Materials and methods

Study design and setting

An observational, analytical, cross-sectional study with a quantitative approach was conducted among preschool children attending an early childhood educational institution in Trujillo, Peru. The study examined the association between physical activity and holistic development according to teachers' perceptions. Data collection was conducted during the 2026 academic year.

The study was reported in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines for observational studies [11].

Population, sample, and sampling

The accessible population consisted of 50 preschool children aged 3 to 5 years enrolled at the educational institution during the study period. Because all eligible children in the accessible population were included, a census approach was used; therefore, no sampling procedure was required. The final analysis included all 50 preschool children.

The preschool teachers served as informants for the assessment of both physical activity and holistic development based on their observations of the children during regular educational and physical activities.

Eligibility criteria

Preschool children aged 3 to 5 years of both sexes who were enrolled at the educational institution during the study period, attended classes regularly, participated in scheduled physical activities, and whose parents or legal guardians provided informed consent were included. Children whose parents or legal guardians did not authorize their participation, those with medical conditions or physical limitations that prevented participation in physical activities, and participants who withdrew from the study were excluded.

Study variables

The main study variables were physical activity and holistic development.

Physical activity was assessed using three dimensions: frequency, intensity, and duration. The variable was measured using a 21-item questionnaire with a five-point Likert response scale: never (1), almost never (2), sometimes (3), almost always (4), and always (5). Total scores ranged from 21 to 105 and were classified as poor (21–42), fair (43–63), good (64–84), or excellent (85–105).

Holistic development was assessed through the motor or physical, socioemotional, cognitive, and communicative dimensions. It was measured using a 20-item questionnaire with three response options: never (1), sometimes (2), and always (3). Total scores ranged from 20 to 60 and were classified as low (20–33), moderate (34–47), or high (48–60).

Data collection instruments

Data were collected using two structured questionnaires completed by the preschool teachers according to their observations of the participating children.

The physical activity questionnaire consisted of 21 items distributed across the dimensions of frequency, intensity, and duration. Content validity was assessed through the judgment of three experts, obtaining a validity coefficient of 0.909. Internal consistency was evaluated using Cronbach's alpha, with a coefficient of 0.908, indicating high internal consistency.

The holistic development questionnaire consisted of 20 items covering the motor or physical, socioemotional, cognitive, and communicative dimensions. Its content validity was assessed through expert judgment. Internal consistency was evaluated using Cronbach's alpha, yielding a coefficient of 0.937, indicating high internal consistency.

Procedure

After obtaining the corresponding authorization to conduct the study, information about the research and informed consent forms were provided to the parents or legal guardians of the eligible children. Only children whose parents or legal guardians provided informed consent were included.

Data collection was conducted during regular school hours. The preschool teachers completed the questionnaires based on their observations of each child's behavior, participation, and performance during routine classroom activities, active play, and scheduled physical activities. The assessment required approximately five minutes per child.

After data collection, the questionnaires were reviewed for completeness and consistency. The information was subsequently coded and entered into a Microsoft Excel database for organization and preparation prior to statistical analysis.

Statistical Analysis

Statistical analyses were performed using IBM SPSS Statistics, version 27.0. Categorical variables were summarized using absolute frequencies and percentages.

Physical activity and holistic development were described according to their respective categories.

The association between physical activity and holistic development was assessed using Pearson's chi-square test. Statistical significance was established at $p < 0.05$, and the resulting p value was interpreted according to this predefined threshold. Because some categories contained small frequencies, the inferential findings were interpreted cautiously and this issue was considered when evaluating the study limitations.

Ethical considerations

The study was conducted in accordance with internationally accepted ethical principles for research involving human participants and the ethical principles of the Declaration of Helsinki [12]. Participation was voluntary, and written informed consent was obtained from the parents or legal guardians before data collection.

The privacy and confidentiality of the participating children were protected throughout the study. Personal identifiers were excluded from the analytical database, and the information collected was used exclusively for scientific purposes. The principles of respect for persons, beneficence, non-maleficence, confidentiality, and scientific integrity were observed throughout the research process.

Results

The distribution of physical activity across levels of holistic development showed that children with moderate holistic development were mainly classified as having good (36.0%) or fair (30.0%) physical activity. Among those with high holistic development, 14.0% had fair physical activity, 10.0% had good physical activity, and 2.0% had excellent physical activity. Pearson's chi-square test showed no statistically significant association between physical activity and holistic development ($p = 0.070$) according to teachers' perceptions (Table 1).

Regarding physical activity, equal proportions of children were classified at the fair and good levels (46.0% each). A smaller proportion presented poor physical activity (6.0%), while only 2.0% were classified at the excellent level (Table 2).

Table 2. Level of physical activity in preschool children

Physical activity	n	%
Poor	3	6.0
Fair	23	46.0
Good	23	46.0
Excellent	1	2.0
Total	50	100.0

Holistic development was predominantly moderate, accounting for 70.0% of the children evaluated. High holistic development was observed in 26.0%, whereas only 4.0% were classified at the low level (Table 3).

Table 3. Level of holistic development in preschool children

Holistic development	n	%
Low	2	4.0
Moderate	35	70.0
High	13	26.0
Total	50	100.0

Discussion

The main finding of this study was that physical activity was not significantly associated with holistic development in preschool children according to teachers' perceptions ($p = 0.070$). This finding should not be interpreted as evidence that physical activity is unrelated to child development, but rather that a significant relationship was not identified between the global categories assessed in this population. This interpretation is consistent with the systematic review by D'Cruz et al. [13], which found heterogeneous results regarding

Table 1. Association between physical activity and holistic development in preschool children according to teachers' perceptions

Holistic development	Poor n (%)	Fair n (%)	Good n (%)	Excellent n (%)	Total n (%)
Low	1 (2.0)	1 (2.0)	0 (0.0)	0 (0.0)	2 (4.0)
Moderate	2 (4.0)	15 (30.0)	18 (36.0)	0 (0.0)	35 (70.0)
High	0 (0.0)	7 (14.0)	5 (10.0)	1 (2.0)	13 (26.0)
Total	**3 (6.0)**	**23 (46.0)**	**23 (46.0)**	**1 (2.0)**	**50 (100.0)**

physical activity and self-regulation during early childhood, including positive, mixed, inverse, and null associations. Similarly, Aadland et al. [14] reported that a staff-based physical activity intervention did not produce overall improvements in preschoolers' mental health or self-regulation, although some subgroup-specific effects were observed. Together, these findings indicate that associations between physical activity and broader developmental outcomes may vary according to the dimension assessed, the characteristics of the children, and the context in which physical activity occurs.

Regarding physical activity, 46.0% of the children were classified at the fair level and another 46.0% at the good level, whereas only 6.0% showed poor physical activity and 2.0% reached the excellent category. These findings suggest that most children participated in physical activity at intermediate levels rather than at the highest level established by the instrument. Haugland et al. [15], in the ACTNOW cluster-randomized trial involving children aged 3–5 years, reported small favorable effects of a staff-led intervention on some fundamental motor skills and preschool physical activity, although the effects were not uniform across all outcomes or maintained throughout follow-up. Caldwell et al. [16] similarly found that an outdoor loose-parts play intervention increased objectively measured physical activity among preschoolers but did not significantly improve physical competence, despite educators reporting perceived benefits in several domains of physical literacy. These findings reinforce the idea that greater participation in physical activity does not necessarily produce equivalent changes across all developmental outcomes.

Recent intervention studies nevertheless provide strong evidence that appropriately designed physical activity programs can improve specific motor outcomes. He et al. [17] found that a family-based intervention increased moderate-to-vigorous physical activity and fundamental movement skills among preschool children. Likewise, Bai et al. [18] reported that an eight-week planned active-play program significantly improved fundamental movement skills compared with free play. At a broader level, Wang and Zhou [19], in an updated meta-analysis of randomized studies in healthy preschool children, found large effects of motor development-focused exercise training on locomotor skills, object-control skills, and overall gross motor performance when compared with ordinary physical activity or free play. These findings may help explain why the absence of a significant association in the present study differs from intervention-based evidence: the current research assessed habitual physical activity globally through teachers' perceptions rather than examining the effect of a structured, targeted motor program.

With respect to holistic development, 70.0% of the children were classified at the moderate level, 26.0% at the high level, and 4.0% at the low level. Because holistic development in the present study incorporated motor, socioemotional, cognitive, and communicative dimensions, its relationship with physical activity may be more complex than the relationship observed with a single developmental domain. Grady et al. [20], in a systematic review and meta-analysis of interventions delivered in early childhood education and care settings, found that such interventions can improve physical activity and fundamental movement skills, although effects across cognitive and social-emotional outcomes were less consistent. Zhang et al. [21] also examined physical activity in relation to social-emotional learning within an early childhood education and care context, illustrating that developmental associations may occur at different individual and classroom levels. In addition, Martinez-Merino and Rico-González [22] concluded that preschool physical education may contribute to physical activity and motor, cognitive, and social competencies, while emphasizing the importance of structured programs and educators' decisions. Therefore, evaluating development as a single global category may obscure associations that could be present within particular developmental dimensions.

The absence of statistical significance in the present study may also be related to the multidimensional nature of child development. Family participation, opportunities for active play, nutritional conditions, teaching practices, the physical characteristics of the preschool environment, and the type and organization of physical activity may contribute simultaneously to developmental outcomes. Previous evidence has also emphasized the role of educators and the preschool environment in creating opportunities for movement and social interaction [8–10]. Consequently, physical activity should be considered as one relevant component within a broader network of educational, family, social, and environmental influences rather than as an isolated determinant of holistic development.

From an educational perspective, these findings do not diminish the importance of promoting physical activity during the preschool years. Instead, they suggest that educational strategies should combine regular opportunities for active play and structured movement

with activities directed toward cognitive, communicative, social, and emotional development. The evidence from recent intervention studies further suggests that the quality, structure, purpose, and guidance of physical activity may be as relevant as the amount of activity itself [15–19]. Accordingly, strengthening teachers' capacity to design age-appropriate movement experiences could help integrate physical activity more effectively into comprehensive early childhood education.

Among the strengths of this study were the inclusion of the entire accessible population through a census approach, the use of structured instruments with evidence of content validity and high internal consistency, and the assessment of both physical activity and holistic development within the children's usual educational environment. Nevertheless, several limitations should be considered. The cross-sectional design did not allow temporal or causal relationships to be established. The study was conducted in a single educational institution with a relatively small population, which limits the generalizability of the findings. In addition, both variables were assessed according to teachers' perceptions rather than through direct objective measures, which may have introduced observer-related variability. The low frequencies observed in some categories should also be considered when interpreting the chi-square analysis.

Future research should include larger and multicenter samples, objective measures of physical activity such as accelerometry, and validated assessments for the specific motor, cognitive, communicative, and socioemotional dimensions of child development. Longitudinal and intervention studies would also help clarify whether particular types, intensities, or structures of physical activity are associated with specific developmental domains and whether family and educational characteristics modify these relationships.

Conclusions

Physical activity and holistic development were not significantly associated in preschool children according to teachers' perceptions. Most children showed intermediate to favorable levels of physical activity and predominantly moderate holistic development. These findings suggest that physical activity represents an important component of early childhood development, although holistic development may also be influenced by multiple educational, family, social, and environmental factors. Comprehensive educational strategies should therefore integrate opportunities for regular physical activity with actions aimed at strengthening children's motor, cognitive, communicative, social, and emotional development.

Author Contributions Statement (CrediT)

MAC: Conceptualization, Methodology, Investigation, Data Curation, Project Administration, Writing – Review & Editing. **LBG:** Conceptualization, Methodology, Formal Analysis, Validation, Writing – Original Draft, Writing – Review & Editing. **SHL:** Investigation, Resources, Data Curation, Visualization, Writing – Original Draft. **MS:** Investigation, Resources, Supervision, Validation, Writing – Review & Editing.

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Conflict of Interest

The authors declare that they have no financial, institutional, professional, or personal conflicts of interest that could have influenced the design, conduct, analysis, interpretation, or reporting of this study.

Data Availability

The anonymized dataset supporting the findings of this study is available from the corresponding author upon reasonable and justified academic request. The data have not been made publicly available because the study involved preschool children, and public disclosure could potentially compromise the confidentiality of the participants and the participating educational institution. Access to the dataset will therefore be subject to appropriate confidentiality and ethical safeguards.

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