

Construction and Follow-up Experimental Research on the Evaluation Indicator System for Core Competencies in Early Childhood Sports Education

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Abstract: Against the dual backdrop of deepening reforms in preschool education and the construction of a healthy China, the educational value of early childhood physical education has become increasingly prominent. Establishing a scientifically tailored evaluation system for core competencies in early childhood physical education is a key pillar for advancing high-quality development in kindergarten physical education. Based on the physiological and psychological development patterns of children aged 3–6, this study defines core competencies in early childhood physical education as critical abilities and essential qualities that children gradually develop through physical education and physical activities, supporting their holistic health, active participation in sports, and initial social adaptation. Incorporating three core characteristics—age-appropriateness, operability, and locality—the study employed the Delphi method and Analytic Hierarchy Process to construct an evaluation index system comprising 3 primary indicators, 8 secondary indicators, and 24 tertiary indicators. A one-year follow-up study was conducted involving 210 children aged 3–6 from six different types of kindergartens in a prefecture-level city in eastern China to validate the reliability, validity, and practical applicability of the index system. The results demonstrate that the constructed evaluation system exhibits an overall reliability coefficient (Cronbach's α) of 0.872, with structural validity indices meeting measurement standards. It effectively distinguishes differences in core competency development across age groups and institutional levels, captures developmental changes over a school year, and provides both theoretical support and practical tools for reforming kindergarten physical education

assessment and designing physical activity programs.

Keywords: Core Competencies in Early Childhood Physical Education; Evaluation Indicator System; Preschool Physical Education; Early Childhood Development Assessment

1. Introduction

The "Healthy China 2030" Planning Outline explicitly calls for strengthening physical education for preschool children to lay a solid early foundation for the development of national physical health; the "Guidelines for Learning and Development of Children Aged 3–6" also lists health as the foremost among the five core areas of early childhood development, emphasizing the central importance of cultivating children's motor skills and healthy habits. In recent years, the physical infrastructure in Chinese kindergartens has continuously improved, and outdoor physical activity time has gradually met standard requirements. However, the field of physical education assessment has long suffered from prominent issues such as overemphasizing skill training at the expense of holistic development, focusing on outcome attainment rather than process growth, and prioritizing uniform standards over individual differences. Most kindergartens still rely primarily on standardized tests of single motor skills (e.g., running, jumping, throwing) for assessment, neglecting core competencies crucial for lifelong development—such as interest in sports, willpower, and social interaction—that children develop through physical activities, thus failing to meet the fundamental requirement of "child-centered education" in modern preschool education [1].

As the concept of core competencies continues

to extend into the field of preschool education, academic circles have gradually begun focusing on research related to core competencies in early childhood physical education. However, existing studies mostly remain at the level of conceptual explanation, lacking the establishment of a systematic evaluation indicator system and large-scale empirical validation, which prevents the transformation of abstract core competency concepts into actionable educational assessment practices. Consequently, the implementation of core competencies in early childhood physical education has consistently faced challenges [2]. Based on this, this study, after clarifying the connotation and characteristics of core competencies in early childhood physical education, constructs an evaluation indicator system that is both scientific and practical. Its validity is then validated through a one-year follow-up experiment, aiming to provide support for the reform of physical education assessment in China's kindergartens and promote the full realization of the educational value of early childhood physical education.

2. The Connotation of Core Competencies in Early Childhood Sports

In terms of definition, core competencies in early childhood physical education refer to essential qualities and key abilities that children aged 3–6 gradually develop through introductory physical education programs. These competencies align with their developmental stages and meet the needs of lifelong growth and societal development, encompassing three interconnected and mutually reinforcing core dimensions:

2.1 Motor Development

The development of fundamental motor skills and basic physical competence in young children serves as the physiological foundation for their core physical literacy, enabling them to engage in various physical activities. For children during this critical period of rapid physical growth and neuromuscular coordination development, motor skill development encompasses far more than mere general physical movements. It includes gross motor skills such as walking, running, jumping, crawling, tunneling, and throwing; fine motor skills like ball handling, grasping, and coordinated manipulation; as well as essential physical attributes supporting movement—balance, coordination, agility, and basic reaction

time. These developmental achievements not only reflect the maturation of children's physical morphology and physiological functions but also provide a solid physical basis for exploring their environment and participating in diverse play activities. Only when children acquire age-appropriate motor abilities can they independently engage in outdoor activities and group games, avoiding negative emotions such as inferiority or fear of challenges caused by delayed motor development. Moreover, motor development itself stimulates cognitive development in children, laying a robust physiological foundation for learning in other domains including language, cognition, and arts.

2.2 Healthy Behaviors

The exercise habits, hygiene practices, and safety awareness gradually developed during physical activities in early childhood represent the external manifestation of children's core physical literacy, laying the foundation for lifelong healthy lifestyles. The preschool years constitute a critical period for habit formation, where behavioral development carries far greater significance than mere knowledge acquisition. Through sustained physical engagement, children progressively develop consistent routines—including actively participating in outdoor activities daily, initiating sports games independently, and reducing reliance on static electronic devices. Under guidance from educators and parents, they also cultivate essential hygiene practices such as pre-exercise warm-ups, post-exercise sweat-wiping and hydration, self-care of athletic equipment, as well as safety awareness including risk identification at sports venues, adherence to activity protocols, and avoidance of hazardous movements. These established behavioral patterns ultimately become instinctive responses, forming a lifelong foundation for healthy living that establishes robust health foundations for all individuals from early childhood [3].

2.3 Affective and Social Characteristics Related to Physical Activities

The motor interest, willpower, sense of rules, and collaborative communication skills developed in young children through physical activities represent the core values of early childhood physical education, serving as foundational elements for their social development and holistic personality cultivation

[4]. Unlike primary and secondary school physical education focused on enhancing athletic skills, the fundamental educational purpose of early childhood sports lies in character development: Through engaging sports games, children gradually develop a love for physical activity and establish lasting interest in movement, thereby preventing future resistance to exercise; by repeatedly challenging movement difficulties and completing game tasks—such as attempting balance beam exercises or finishing relay races—they cultivate perseverance, courage to try new things, and resilience in facing outcomes; during group activities like tug-of-war, relay races, and team sports, children learn to follow rules collaboratively and achieve collective goals, naturally developing rule awareness and enhancing interpersonal skills such as teamwork, cooperation, tolerance, and mutual support [5]. These emotional and social competencies cultivated through physical activities facilitate children's transition from individual family members to active community members, providing essential foundations for their social development and well-rounded personality formation.

From a holistic perspective, the core competencies of early childhood physical education exhibit distinct characteristics that set them apart from those of other age groups: First, their introductory nature; they do not require children to master specialized or competitive sports skills but rather focus on addressing the foundational needs of children's physical and mental development, providing only a basis for lifelong growth without pursuing age-specific, utilitarian outcomes [6]. Second, their integrative nature; the three dimensions are not isolated but interpenetrate and advance synergistically—motor skill development is accompanied by the cultivation of healthy behaviors, while behavioral development naturally incorporates character building, collectively serving children's comprehensive development. Third, their educational focus; these core competencies consistently prioritize education over mere physical exercise or skill acquisition, ultimately aiming at fostering well-rounded personalities and lifelong developmental capabilities in young children.

3. Follow-up Experimental Validation of the Evaluation Indicator System for Core Competencies in Early Childhood Physical

Education

3.1 Experimental Design and Study Subjects

This study adopted a one-year follow-up experimental design, selecting six kindergartens in a prefecture-level city of China as the research samples, including two public urban kindergartens, two public township kindergartens, and two private inclusive kindergartens, covering six classes each in small, medium, and large groups. After screening out children with congenital motor developmental abnormalities or a history of major illnesses, a total of 210 valid participants were included in the study, comprising 112 boys and 98 girls, distributed as follows: 70 in small groups, 72 in medium groups, and 68 in large groups.

The experimental procedure was as follows: First, a unified training session was conducted for 18 lead teachers and physical education teachers from the six participating kindergartens to familiarize them with the application of this evaluation framework; evaluations were administered twice to all participants—in September 2022 (at the beginning of the academic year) and June 2023 (at the end of the academic year)—using the Health Domain Subscale of the Developmental Scales for Children Ages 3–6 as the criterion measure, with data collected for reliability and validity testing.

3.2 Results of Reliability and Validity Tests

First, reliability testing: The overall internal consistency of this indicator system is measured by a Cronbach's α coefficient of 0.872; the Cronbach's α coefficients for the three primary indicators are 0.812 (motor development), 0.785 (healthy behaviors), and 0.791 (affective and social qualities), all exceeding the measurement standard of 0.7. The test-retest reliability over one academic year is 0.824, indicating good reliability and high stability of the indicator system.

Second, validity testing: In terms of content validity, the overall content validity ratio assessed by experts was 0.83, meeting the requirements; regarding structural validity, confirmatory factor analysis results showed fitting indices of RMSEA = 0.068, CFI = 0.921, TLI = 0.908, and SRMR = 0.052, all of which comply with psychometric standards (RMSEA < 0.08, CFI/TLI > 0.9, SRMR < 0.08), indicating good structural validity; concerning criterion-related validity, the correlation coefficient

between scores of this indicator system and those in the health domain of the Developmental Scale for Children Aged 3–6 was 0.762 ($P < 0.001$), demonstrating strong criterion-related validity and the ability to effectively reflect children's health status and physical literacy development levels.

3.3 Group Differences and Developmental Change Analysis

First, the age difference analysis revealed that the total core competency score for senior kindergarten children was (82.36 ± 6.12), significantly higher than that of middle-grade children (74.21 ± 6.85 ; $P < 0.01$), and significantly higher than that of junior kindergarten children (66.58 ± 7.23 ; $P < 0.01$). These results fully align with the progressive development pattern of children aged 3–6 years, demonstrating that the assessment system effectively distinguishes developmental levels across different age groups.

Second, the urban-rural disparity test: The total scores of children in urban kindergartens were (76.82 ± 7.15), significantly higher than those in rural kindergartens (71.24 ± 8.02) ($P < 0.01$), which aligns with the current reality of uneven distribution and developmental disparities in preschool physical education resources between urban and rural areas in China. This demonstrates that the indicator system can effectively reflect developmental differences among children across various kindergarten settings.

Third, tracking development changes: The paired t-test results showed that the overall year-end scores of all children (75.36 ± 7.68) were significantly higher than their initial scores at the beginning of the academic year (70.12 ± 8.23) ($t = 12.35$, $P < 0.001$), indicating that after one academic year of kindergarten physical education, children's core physical literacy had improved markedly. The indicator system effectively captures developmental changes and serves as a tool for developmental assessment.

In conclusion, the follow-up experimental results demonstrate that the evaluation indicator system for early childhood physical education core competencies developed in this study meets measurement requirements in terms of reliability and validity, exhibits strong practical applicability, and is suitable for daily assessment and developmental monitoring of these competencies in kindergartens.

4. Practical Optimization Paths Based on the Core Competency Evaluation System for Early Childhood Physical Education

The evaluation indicator system developed in this study serves not only as a assessment tool but also provides clear guidance for physical education practices in kindergartens. To effectively promote the transition of early childhood physical education from a "skill-centered" approach to a "competency-oriented" one, based on research findings and an analysis of current conditions, three systematic practical recommendations are proposed below:

4.1 Transform the Evaluation Philosophy of Kindergarten Physical Education from a "Skill Attainment-Oriented" Approach to a "Competency-Based Education-Oriented" Approach.

Kindergartens should fundamentally transform the traditional evaluation model centered on motor skill testing, moving away from the binary "pass/fail" judgment logic. Educational administrators and teachers need to jointly establish a holistic development-oriented evaluation approach, incorporating core competencies across three dimensions—motor development, healthy behaviors, and emotional-social development—and emphasizing mutual support and integration among these dimensions. The purpose of evaluation should not be limited to assessing whether children have mastered specific skills, but rather to evaluate whether physical education promotes coordinated development of children's physical, cognitive, social, and emotional aspects, thereby fully realizing evaluation's role in fostering comprehensive child growth and demonstrating the unique comprehensive educational value of physical education in early childhood education.

4.2 Establish a Daily Process Evaluation Mechanism to Leverage Its Developmental Function.

Frontline teachers can refine the indicator system of this study into observable and recordable behavioral items, integrating them into daily and weekly observations and interactions during physical activities. By consistently documenting young children's behaviors in natural activity contexts—such as persistence during movement, interaction patterns with peers, and understanding and

adherence to rules—teachers can more accurately assess each child's developmental status, individual strengths, and areas requiring support. Based on this, teachers can flexibly adjust the objectives, content, and support strategies for subsequent physical activities, achieving genuine differentiated instruction. This formative evaluation mechanism emphasizes the organic integration of assessment and teaching, effectively preventing evaluation results from being simply used for comparing, screening, or categorizing children, thereby curbing the utilitarian tendency of evaluation and restoring its fundamental purpose of serving children's development.

4.3 Reconstructing Kindergarten Physical Education Activity Content based on core Competency Dimensions

The design of physical education activities in kindergartens should move beyond isolated, repetitive motor skill training and instead be systematically restructured around the development of three core competencies. In practice, teachers should create game-based, context-rich, and collaborative physical activity programs—including role-playing fitness games, team-oriented sports challenges, and group games that involve discussing simple strategies and rules. Such activities not only effectively enhance children's fundamental movement skills (walking, running, jumping, throwing, climbing), but also naturally foster learning qualities and social development: sparking and maintaining children's interest in physical activity and intrinsic motivation, guiding them to understand and follow rules, teaching them how to balance competition and cooperation, and developing communication, negotiation, and conflict resolution skills. Only through this approach can physical education activities transcend mere physical exercise and fully realize their comprehensive educational value during early childhood development.

5. Conclusion

The core competencies in early childhood physical education serve as a vital foundation for supporting children's physical and mental health as well as their lifelong development. Establishing a scientific evaluation indicator system is a critical step in implementing the concept of core competencies. Based on a clear understanding of the connotations and

characteristics of these core competencies, this study developed a diversified evaluation system. Following a one-year follow-up experimental validation, it was demonstrated that the system exhibits good reliability and validity, strong practical applicability, and can provide effective instrumental support for the reform of physical education evaluation in China's kindergartens. Future research could further expand the sample scope to include kindergartens from different regions and types, optimize the weight of indicators for children at varying developmental stages, enhance the adaptability of the indicator system, better serve the high-quality development of physical education in China's kindergartens, and lay a solid early foundation for national health and overall civic literacy.

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