



Physical and Motor Development Characteristics of Children Aged 7–12 Years and Their Implications for Learning in Primary Schools

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ABSTRACT

Understanding the physical and motor development characteristics of children aged 7–12 years is essential for designing effective learning in primary schools. However, previous studies have generally examined these aspects separately, with limited discussion of their implications for classroom practice. This study aims to synthesize current evidence on children's physical and motor development and its implications for primary education through a Systematic Literature Review (SLR). The review followed the PRISMA guidelines, analyzing peer-reviewed articles selected based on predefined inclusion and exclusion criteria from major academic databases. The findings indicate that physical growth and motor competence significantly influence students' learning readiness, classroom participation, cognitive engagement, and social interaction. These developmental characteristics require teachers to implement age-appropriate, movement-based, and differentiated learning strategies. This review contributes by integrating current evidence into a comprehensive framework that supports curriculum development and instructional planning, while providing practical recommendations for creating developmentally responsive learning environments in primary schools.

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1. INTRODUCTION

Physical and motor development during middle childhood (7–12 years) is a fundamental stage that influences children's readiness to participate in learning, social interaction, and physical activities in primary schools. During this developmental period, children experience continuous improvements in body growth, muscular strength, balance, coordination, and both gross and fine motor skills, enabling them to perform increasingly complex academic and everyday tasks.¹ These developmental changes contribute not only to children's physical health but also to their cognitive, emotional, and social development, making them an essential consideration in designing developmentally appropriate learning environments.

Despite the important role of physical and motor development in children's educational success, growing evidence indicates that many primary school-aged children continue to experience inadequate motor competence and insufficient levels of physical activity. According to the World Health Organization, more than 80% of children and adolescents worldwide do not achieve the recommended level of daily physical activity, increasing the risk of poor motor competence, reduced physical fitness, and delayed physical development.² These conditions are further exacerbated by sedentary lifestyles, excessive screen time, and reduced opportunities for outdoor play. As a result, many students enter classrooms with varying levels of physical and motor competence that influence their readiness to learn, concentration, participation, confidence, and social interaction.³ However, classroom instruction in many primary schools remains predominantly academically oriented and often pays limited attention to differences in children's developmental characteristics, creating a mismatch between students' developmental needs and instructional practices.

Recent studies consistently demonstrate that physical and motor competence is closely associated with children's academic achievement, executive functioning, classroom engagement, and socio-emotional well-being. Rather than functioning solely as biological indicators of growth, motor competence supports attention, self-regulation, memory, problem-solving, and participation in learning activities. Likewise, movement-based learning and physically active classroom interventions have been shown to enhance learning motivation, cognitive performance, and

¹ Lisa M Barnett et al., "Through the Looking Glass : A Systematic Review of Longitudinal Evidence , Providing New Insight for Motor Competence and Health," *Sports Medicine* 52, no. 4 (2022): 875–920, <https://doi.org/10.1007/s40279-021-01516-8>.

² World Health Organization, *Global Status Report on Physical Activity* 2024 (Geneva: World Health Organization., 2024).

³ UNESCO, *Guidance for Generative AI in Education and Research.*, 2023, <https://www.unesco.org/en/articles/guidance-generative-ai-education-and-research>.

academic achievement.⁴ Collectively, these findings suggest that physical and motor development should be recognized as an integral component of effective primary education rather than merely an outcome of physical education programs.

Although research on children's physical and motor development has expanded considerably, the existing literature remains fragmented. Previous studies have generally examined physical growth, motor competence, physical activity, cognitive development, or educational outcomes as separate domains of inquiry. Existing systematic reviews predominantly focus on specific topics, such as fundamental motor skills, motor competence assessment, physical education interventions, or motor learning, while providing limited discussion on how the characteristics of physical and motor development collectively influence instructional planning, classroom management, curriculum implementation, and learning design in primary schools.⁵ Consequently, teachers and educational practitioners still lack an integrated evidence base that translates developmental research into practical guidance for classroom instruction.

This limitation represents a significant research gap because effective learning in primary schools should be aligned with children's developmental characteristics. A comprehensive understanding of physical and motor development is necessary to support differentiated instruction, movement-integrated learning, inclusive classroom practices, and the creation of learning environments that foster children's holistic development. Therefore, an integrated synthesis of recent evidence is required to bridge developmental theory and educational practice.

This study addresses the identified gap by systematically synthesizing current evidence on the physical and motor development characteristics of children aged 7–12 years and examining their implications for learning in primary schools. Unlike previous reviews that focus on isolated aspects of physical or motor development, this study integrates evidence across physical growth, motor competence, and educational outcomes to develop a comprehensive framework that connects developmental characteristics with instructional strategies and learning design. Accordingly, this review contributes theoretically by consolidating fragmented findings into a coherent body of knowledge and contributes practically by providing evidence-based recommendations for teachers, curriculum developers, and educational policymakers in designing developmentally responsive learning environments.

⁴ Luca Petrigna et al., "Does Learning Through Movement Improve Academic Performance in Primary Schoolchildren? A Systematic Review," *SYSTEMATIC REVIEW Article* 10, no. March (2022): 1–13, <https://doi.org/10.3389/fped.2022.841582>.

⁵ Lisa E Bolger et al., "Global Levels of Fundamental Motor Skills in Children: A Systematic Review," *Journal of Sports Sciences* 39, no. 7 (April 3, 2021): 717–53, <https://doi.org/10.1080/02640414.2020.1841405>.

Accordingly, this study aims to systematically review the characteristics of physical and motor development among children aged 7–12 years and analyze their implications for learning in primary schools. Specifically, the review seeks to identify key developmental characteristics, synthesize recent empirical evidence, and explain how these characteristics can inform instructional strategies, classroom management, and curriculum design that support students' physical, cognitive, social, and academic development.

2. METHODS

This study employed a Systematic Literature Review (SLR) to synthesize empirical evidence on the physical and motor development characteristics of children aged 7–12 years and their implications for learning in primary schools.⁶ The review was conducted following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA 2020) guidelines to ensure that the literature identification, screening, eligibility assessment, and inclusion processes were transparent, systematic, and scientifically rigorous.

The literature search was carried out using four international academic databases, namely Scopus, Web of Science, ERIC, and Google Scholar, to obtain relevant empirical studies published between 2019 and 2026. The search strategy employed combinations of the keyword physical development, motor development, gross motor skills, fine motor skills, children aged 7–12 years, primary school, elementary education, and learning, connected using Boolean operators (AND and OR) to maximize the retrieval of relevant publications. Only peer-reviewed journal articles indexed in Scopus, written in English, and available in full text were considered for analysis.

The selection of articles was based on predetermined inclusion and exclusion criteria. The inclusion criteria comprised empirical studies involving children aged 7–12 years, focusing on physical development, motor development, or both within educational settings, and discussing their implications for learning in primary schools. Studies published as conference proceedings, book chapters, editorials, dissertations, review articles, duplicate publications, or those involving participants outside the target age range were excluded from the review.⁷ Following the PRISMA 2020 selection procedure, all retrieved records were screened systematically through the stages of

⁶ Ahmad Muktamar et al., *Metode Penelitian Pendidikan* (Jln. Sungai Lareh No.26, Kel. Lubuk Minturun, Kec. Koto Tangah, Kota Padang, Sumatera Barat: AIKOMEDIA PRESS, 2024).

⁷ Matthew J Page et al., "RESEARCH METHODS AND REPORTING The PRISMA 2020 Statement : An Updated Guideline for Reporting Systematic Reviews Systematic Reviews and Meta-Analyses," *BMJ*, 2021, 1–9, <https://doi.org/10.1136/bmj.n71>.

identification, screening, eligibility assessment, and final inclusion, resulting in 30 Scopus-indexed international journal articles that met all eligibility criteria and were included in the synthesis.

Data from the selected studies were extracted using a structured data extraction form, which served as the checklist instrument for this review. The extraction form was developed based on the PRISMA 2020 reporting framework and included information on the authors, publication year, country, research objectives, study design, participant characteristics, dimensions of physical and motor development investigated, principal findings, and educational implications. The extracted data were subsequently analyzed using thematic analysis, involving coding, categorization, theme development, and evidence synthesis to identify recurring patterns across the selected studies. The analysis generated four major themes: (1) characteristics of physical development, (2) characteristics of gross and fine motor development, (3) factors influencing physical and motor development, and (4) implications for learning strategies and instructional practices in primary schools. This analytical approach enabled the development of a comprehensive synthesis and evidence-based recommendations for teachers, curriculum developers, and educational policymakers.

3. FINDINGS AND DISCUSSION

Based on the synthesis of 30 scientific articles published in nationally accredited journals (SINTA) and internationally reputable Scopus-indexed journals, this review provides a comprehensive overview of the physical and motor development characteristics of children aged 7–12 years and their implications for learning in primary schools. Overall, the reviewed studies consistently indicate that primary school age represents a critical period for physical and motor development, as children experience rapid improvements in movement competence that serve as the foundation for acquiring sports skills, performing daily activities, and participating effectively in learning activities involving physical movement.

The findings reveal that physical development during the ages of 7–12 progresses gradually with increasing age. Improvements in height, body weight, muscular strength, endurance, balance, agility, coordination, and flexibility were consistently identified as the primary indicators of physical development. However, the rate of development varies considerably among children due to multiple interacting factors, including genetic characteristics, nutritional status, levels of physical activity, health conditions, family environment, and opportunities to participate in sports and recreational activities.

Regarding motor development, most studies reported that primary school children gradually transition from mastering fundamental movement skills to developing more advanced and complex motor competencies. Children aged 7–9 years generally focus on refining locomotor, non-locomotor, and manipulative skills, whereas those aged 10–12 years demonstrate greater proficiency in integrating multiple movement patterns with improved coordination, enabling them to participate successfully in sports and games that require higher levels of accuracy, speed, and motor control.

The synthesis further indicates that age is one of the most consistent determinants of motor development. As children grow older, their coordination, balance, speed, agility, and movement control improve significantly. In addition to age, several studies identified gender-related differences in motor performance. Boys generally outperform girls in activities requiring muscular strength, speed, and explosive power, whereas girls tend to demonstrate superior performance in balance, coordination, and flexibility. Nevertheless, many studies emphasize that these differences are not absolute but are strongly influenced by training intensity, learning experiences, and opportunities to engage in regular physical activity.

Another consistent finding across the reviewed literature is the crucial role of physical activity in promoting motor development. Nearly all studies reported that children who actively participated in Physical Education, Sports, and Health (PESH) classes, traditional games, extracurricular sports programs, and regular physical activities outside school exhibited significantly higher levels of motor competence than children with sedentary lifestyles. Regular physical activity was consistently associated with improvements in movement coordination, balance, muscular strength, endurance, and fundamental movement skills, which collectively provide the basis for more advanced motor development.

In addition to physical activity, nutritional status and overall health emerged as important determinants of children's physical and motor development. Children with normal nutritional status generally demonstrated more optimal motor development than those who were underweight or overweight. These findings suggest that physical growth and motor development are closely interconnected and should be considered simultaneously when designing educational programs for primary school children.

The review also highlights the important role of motor skill assessment in supporting effective learning. Numerous studies recommend the periodic implementation of standardized motor

assessments to identify students' initial abilities, monitor developmental progress, and design instructional strategies that accommodate individual developmental characteristics. Such assessments enable teachers to develop more adaptive, effective, and developmentally appropriate learning experiences.

From an educational perspective, almost all reviewed studies conclude that instructional practices in primary schools should be aligned with children's physical and motor developmental characteristics. Learning approaches that emphasize active participation, movement-based activities, educational games, and developmentally appropriate teaching strategies have been shown to enhance students' learning motivation, classroom participation, and academic achievement, particularly in Physical Education as well as integrated thematic learning.

Furthermore, several studies revealed that motor development is closely associated with other developmental domains, including cognitive functioning, social competence, emotional development, and self-confidence. Children with higher levels of motor competence tend to participate more actively in school activities, demonstrate stronger collaborative skills, and exhibit greater readiness for learning than children experiencing motor development difficulties.

Overall, the synthesis of the reviewed literature demonstrates that the physical and motor development characteristics of children aged 7–12 years are dynamic and influenced by a wide range of internal and external factors. Therefore, primary school teachers should design learning experiences that consider students' developmental characteristics, implement regular motor assessments, provide diverse movement experiences, and establish active, safe, and enjoyable learning environments. Such an integrated approach is expected to optimize children's physical, motor, cognitive, social, and emotional development while supporting the achievement of primary education goals more effectively.

The synthesis of the 30 reviewed studies demonstrates that the physical and motor development of children aged 7–12 years is a gradual process shaped by the interaction of biological maturation, environmental influences, and learning experiences. During the primary school years, children exhibit substantial improvements in coordination, balance, muscular strength, agility, and movement skills, which form the foundation for more advanced physical activities and lifelong participation in sports and active lifestyles. This finding supports the motor development theory proposed by Gallahue et, which identifies middle childhood as a critical

period for refining fundamental movement skills.⁸ Similarly, Robinson et al. argued that motor competence acquired during childhood serves as an important predictor of future physical activity and overall health.

A consistent pattern across the reviewed literature indicates that increasing age is positively associated with motor competence. Children aged 10–12 years generally demonstrate better coordination, movement control, agility, and balance than those aged 7–9 years due to neurological maturation, musculoskeletal development, and greater exposure to structured and unstructured physical activities. These findings are consistent with Atradin et al., who reported significant improvements in motor competence among Indonesian primary school children as age increased.⁹ Likewise, Lawson et al., emphasized that mastery of fundamental movement skills develops progressively according to children's developmental stages.¹⁰ Nevertheless, several studies noted that chronological age alone does not guarantee optimal motor development, as opportunities for practice and environmental stimulation substantially influence developmental outcomes. This finding highlights the importance of providing equitable opportunities for movement experiences throughout primary education.

Among the various determinants examined, physical activity emerged as the most influential factor contributing to children's motor competence. Nearly all reviewed studies concluded that students who actively participated in Physical Education, Sports, and Health (PESH) classes, extracurricular sports, traditional games, and recreational activities achieved higher levels of motor competence than children with sedentary lifestyles. The meta-analysis conducted by Yin et al., demonstrated that school-based interventions produced moderate to large improvements in fundamental movement skills.¹¹ Comparable findings were reported by Sun and Chen, who concluded that structured sport-based activities significantly enhanced locomotor, manipulative, and balance skills among primary school students.¹² Collectively, these findings reinforce the view

⁸ J. Gallahue, DL, Ozmun, JC dan Goodway, *Memahami Perkembangan Motorik: Bayi, Anak-Anak, Remaja, Dewasa*. (New Yor: McGraw-Hill, 2012).

⁹ Syahrial Bakhtiar and Arischo Mardiansyah, "Motor Competence in Rural Indonesian Children: Gender and Developmental Differences Across," *International Journal of Human Movement and Sports Sciences* 14, no. 3 (2026): 619–27, <https://doi.org/10.13189/saj.2026.140305>.

¹⁰ Jinhao He et al., "Acta Psychologica Role of Focus of Attention in Learning a Fundamental Movement Skill in Preschool Children with Differing Perceived Motor Competence: A Pilot Study," *Acta Psychologica* 260, no. August (2025): 105493, <https://doi.org/10.1016/j.actpsy.2025.105493>.

¹¹ Xinyi Yin et al., "Effectiveness of School-Based Interventions on Fundamental Movement Skills in Children: A Systematic Review and Meta-Analysis," *SYSTEMATIC REVIEW* 25, no. 1522 (2025): 1–15, <https://doi.org/https://doi.org/10.1186/s12889-025-22696-2>.

¹² Shengchuan Sun and Changzhou Chen, "The Effect of Sports Game Intervention on Children's Fundamental Motor Skills: A Systematic Review and Meta-Analysis," *Children (Basel, Switzerland)* 11, no. 2 (February 2024), <https://doi.org/10.3390/children11020254>.

that regular participation in diverse physical activities is not only beneficial for physical fitness but also essential for developing movement competence that supports children's broader educational experiences.

Nutritional status and health conditions also play substantial roles in shaping children's physical and motor development. Children with normal nutritional status consistently demonstrate superior coordination, balance, and movement skills compared with those who are underweight or overweight. Mardiansyah et al., similarly reported that body weight status and age significantly influence motor coordination among primary school children.¹³ These findings suggest that physical growth and motor competence should not be considered independently but rather as interrelated dimensions of child development. Consequently, promoting healthy nutrition and lifestyles requires collaboration among schools, families, and healthcare providers to support children's holistic development.

The reviewed studies further revealed differences in motor performance between boys and girls. Boys generally exhibited stronger performance in activities requiring muscular strength, speed, and manipulative skills, whereas girls tended to perform better in balance and flexibility tasks. However, this review also indicates that these differences are not solely attributable to biological factors. Instead, learning opportunities, participation in physical activities, cultural expectations, and environmental support substantially influence children's motor competence.¹⁴ This finding challenges traditional assumptions regarding gender differences and underscores the need for equitable access to physical activity experiences regardless of gender.

Another important aspect emerging from this review concerns the role of motor assessment in supporting effective instructional planning. Standardized assessment instruments such as the Test of Gross Motor Development (TGMD-3) and the Canadian Agility and Movement Skill Assessment (CAMSA) provide valuable information regarding students' developmental levels and enable teachers to design instruction that is responsive to individual needs. Scheuer et al., emphasized that continuous motor assessment allows teachers to monitor developmental progress, evaluate instructional effectiveness, and identify children requiring additional support.¹⁵ Rather than

¹³ Arischo Mardiansyah et al., "Motor Coordination in Relation to Weight Status and Age in Primary School Children in Indonesia Coordinación Motora En Relación Con El Peso y La Edad En Niños de Primaria de Indonesia *," *Retos* 2041, no. 57 (2024): 72–79, <https://recyt.fecyt.es/index.php/retos/index>.

¹⁴ Bakhtiar and Mardiansyah, "Motor Competence in Rural Indonesian Children : Gender and Developmental Differences Across."

¹⁵ Luís Lopes et al., "A Narrative Review of Motor Competence in Children and Adolescents: What We Know and What We Need to Find Out," *International Journal of Environmental Research and Public Health* 18, no. 1 (December 2020), <https://doi.org/10.3390/ijerph18010018>.

functioning solely as evaluation tools, these assessments should be integrated into ongoing instructional planning to facilitate individualized learning.

The educational implications of this review extend beyond physical education classes. The evidence consistently suggests that developmentally appropriate teaching practices should integrate movement into daily classroom learning through educational games, collaborative activities, problem-solving tasks, and movement-based learning experiences. Such approaches have been shown to increase students' learning motivation, classroom engagement, and mastery of fundamental movement skills while simultaneously supporting cognitive, social, and emotional development.¹⁶ These findings reinforce the importance of adopting Developmentally Appropriate Practice (DAP) principles across the primary school curriculum.

Recent advances in educational technology also provide new opportunities to enrich motor learning experiences. Several studies indicate that digital media, including instructional videos, interactive games, augmented reality, and virtual reality, can enhance students' motivation and engagement when integrated appropriately into physical education. Geovani et al., reported that combining digital learning resources with practical movement activities produced better learning outcomes than using either approach independently. Nevertheless, the reviewed literature consistently emphasizes that technology should complement rather than replace direct physical activity, as authentic movement experiences remain fundamental for children's motor development.

Overall, this review contributes to the current literature by synthesizing recent evidence demonstrating that physical and motor development constitutes a fundamental prerequisite for successful learning in primary schools. Unlike previous studies that predominantly examined physical or motor development separately, this review highlights their interconnected nature and their collective influence on children's cognitive readiness, classroom participation, and holistic development. These findings underscore the need for teachers to design active, adaptive, and learner-centered instructional environments supported by continuous motor assessment, diverse movement experiences, and strong collaboration with families. Such an integrated approach is expected to optimize children's physical, motor, cognitive, social, and emotional development while improving the overall quality of primary education.

¹⁶ Hua-ping Sun et al., "How Does Natural Resource Dependence Affect Public Education Spending?," *Environmental Science and Pollution Research* 26, no. 4 (2019): 3666–74, <https://doi.org/10.1007/s11356-018-3853-6>.

4. CONCLUSION

This systematic literature review demonstrates that the physical and motor development characteristics of children aged 7–12 years play a fundamental role in supporting learning readiness, academic engagement, cognitive performance, social interaction, and participation in school activities. The findings indicate that developmental differences among primary school children require learning approaches that are responsive to their physical growth and motor competencies. Therefore, instructional strategies should incorporate movement-based activities, differentiated instruction, and age-appropriate learning experiences to optimize students' overall development.

The main scientific contribution of this review lies in integrating current evidence on physical and motor development into a comprehensive framework that connects developmental characteristics with effective teaching and learning practices in primary schools. This synthesis provides a clearer understanding of how developmental factors can inform curriculum planning, classroom instruction, and educational decision-making. Practically, the findings offer valuable guidance for teachers, curriculum developers, and school administrators in designing developmentally appropriate learning environments that foster both academic achievement and holistic child development. Future research is recommended to conduct empirical and longitudinal studies across diverse educational settings to examine the effectiveness of movement-integrated learning strategies and explore additional factors, such as socio-cultural contexts and digital learning environments, that may influence children's physical and motor development.

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