Journal of Reproducible Research (JRR)
Volume (1) - 2025 - e- ISSN - 2948-5282

Enhancing Fundamental Movement Skills in Primary School Physical Education: An Exploratory Mixed-Method Study in China

[1] Gan Li, [2] Hamdan Bin Mohd. Ali
[1,2]*Faculty of Education and Liberal Studies, City University, Malaysia*
Corresponding Author: hamdan.mhdali@city.edu.my

Information of Article

Article history:
Received: July 2025
Revised: August 2025
Accepted: Sep 2025
Available Online: Sep 2025

Keywords:
Fundamental Movement Skills
Physical Education Primary Schools
China Mixed-Method
Student Motivation
Structural Equation Modeling

Abstract
This study explores the role of physical education in enhancing Fundamental Movement Skills (FMS) among primary school students in China. Using a sequential mixed-method design, quantitative data were collected from 180 students, complemented by qualitative insights from 20 physical education teachers. Guided by a conceptual framework, the study examined curriculum design, teaching quality, and infrastructure availability as independent variables, student motivation as a mediator, and FMS proficiency as the dependent variable. Structural equation modeling confirmed significant direct and mediated relationships, with reliability and validity established for all constructs. Qualitative findings highlighted systemic barriers such as inadequate facilities and time constraints, yet also emphasized innovative pedagogical practices that enhanced student motivation. The study concludes with recommendations for curriculum reform, teacher training, and infrastructure improvements. Findings provide a pathway for integrating evidence-based strategies into Chinese primary schools to foster physical literacy and lifelong engagement in active living.

Introduction

Physical education (PE) in primary schools plays a pivotal role in shaping children's lifelong physical activity behavior, overall well-being, and socio-emotional development. In the Chinese education system, PE has historically been linked with discipline, health, and national pride, but in recent decades, it has increasingly emphasized holistic child development. Central to this effort is the mastery of Fundamental Movement Skills (FMS), which serve as the foundation for more complex physical activities and sporting performance. FMS typically comprise locomotor skills (running, jumping, hopping), object control skills (throwing, catching, striking), and stability skills (balancing, twisting, turning). Mastery of these skills at a young age equips children not only for sports participation but also for an active lifestyle that contributes to lifelong health. Despite this recognition, many Chinese primary schools continue to face challenges in implementing high-quality PE curricula. Rapid urbanization, increased academic pressure, and uneven access to facilities have limited structured opportunities for children to practice and refine their movement skills. As a result, many students demonstrate poor motor coordination, low physical confidence, and reduced participation in recreational activities. This gap underscores the need for targeted strategies to upskill physical education programs, ensuring that children across regions and socio-economic groups achieve foundational competence.

Globally, research shows that FMS are not acquired naturally but require intentional, structured teaching and repeated practice. In China, the new Healthy China 2030 agenda stresses the importance of integrating health and physical activity into education, but there is still limited empirical work on how PE teachers can systematically upskill students' motor skills through evidence-based pedagogy. Moreover, the role of mediating factors—such as teaching quality, learning motivation, and curriculum design—remains underexplored. This manuscript explores FMS within Chinese primary school PE using a sequential mixed-method approach.

First, quantitative data from 180 students (based on Krejcie & Morgan's 1970 table) are analyzed through structural modeling to assess the relationships between independent, mediating, and dependent variables. Second, qualitative insights from 20 teachers provide deeper contextual understanding of teaching challenges and opportunities. Together, these findings aim to inform both educational policy and school-level practice.

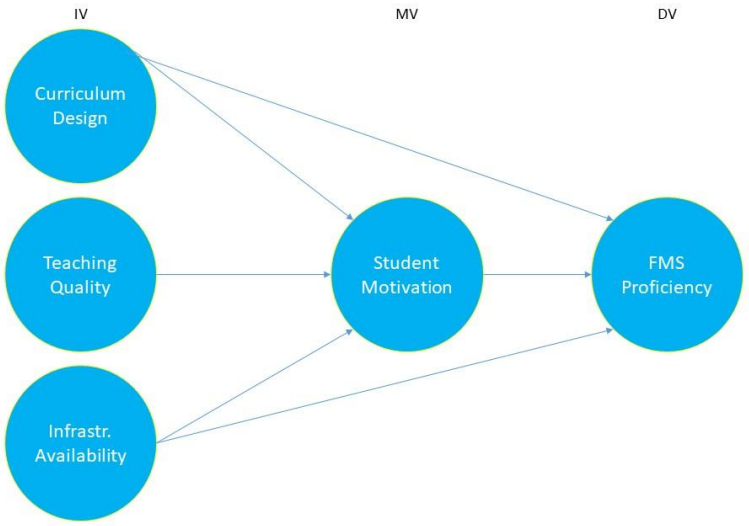
The research is guided by the following objectives:
RO_1 - to evaluate the impact of structured PE interventions on FMS development;
RO_2 - to identify mediating factors that shape the effectiveness of PE instruction;
RO_3 - to recommend scalable strategies for enhancing PE programs across Chinese primary schools.

Literature Review

The development of Fundamental Movement Skills (FMS) has been well established as a cornerstone of early childhood physical education. Scholars such as Gallahue & Ozmun (2006) argue that locomotor, manipulative, and stability skills are the prerequisites for later sport specialization and lifelong physical activity. Children who fail to acquire FMS early often demonstrate lower participation in physical activities during adolescence and adulthood (Barnett et al., 2010). Thus, FMS proficiency is not merely about physical competence but also about long-term engagement with health-promoting behaviors. In the Chinese context, studies have shown uneven motor skill proficiency across regions, with urban children often demonstrating higher skill acquisition due to better facilities and trained instructors (Zhang & Chen, 2018). However, the problem persists in rural areas where limited PE resources reduce children's opportunities to practice. Research has also highlighted cultural barriers, where academic performance is prioritized over physical activity, leading to a marginalization of PE in the curriculum (Liu, 2020).

Conceptual Framework

The conceptual framework of this study is grounded in three independent variables: curriculum design, teaching quality, and infrastructure availability. These have been widely cited in the literature as key determinants of PE effectiveness (Morgan & Bourke, 2008; Hardy et al., 2013). For example, structured curricula that integrate FMS into daily lessons are more likely to foster skill mastery, while high-quality instruction enhances children's motivation and engagement. Infrastructure, including access to playgrounds and equipment, provides the physical environment necessary for skill development. A mediating variable in this study is student motivation, which research consistently identifies as a crucial psychological factor linking teaching practices and learning outcomes (Deci & Ryan, 2000). Motivation influences persistence, effort, and enjoyment in PE, thereby mediating the relationship between instructional quality and FMS acquisition.



Conceptual Framework – Fundamental Movement Skills in Chinese Primary Schools

This Conceptual Framework illustrates the three independent variables (Curriculum Design, Teaching Quality, Infrastructure Availability) influencing the mediating variable (Student Motivation) and the dependent variable (FMS Proficiency), with both direct and indirect effects. Studies in Asian contexts suggest that culturally tailored strategies, such as collective games and peer-based learning, enhance motivation (Li et al., 2016). The dependent variable is FMS proficiency, which encapsulates locomotor, object control, and stability skills. Previous Chinese studies often measured FMS proficiency using standardized instruments such as the Test of Gross Motor Development (TGMD-2), but few have employed structural modeling to evaluate complex inter-variable relationships. This research, therefore, extends existing scholarship by applying structural equation modeling (SEM) to assess both direct and mediated effects. Overall, the literature demonstrates that while FMS development is globally recognized, there is a pressing need for context-specific research in China. By integrating curriculum, teaching, and infrastructure variables, with motivation as a mediator, this study aims to provide a nuanced understanding of how PE programs can be optimized for student success.

Methodology

This study adopts a sequential mixed-method design, integrating quantitative and qualitative approaches to achieve a comprehensive understanding of FMS development in Chinese primary schools. The sequential design allows quantitative results to be supported and contextualized by qualitative findings.

Sampling

Based on Krejcie and Morgan's (1970) sampling table, a minimum of 180 participants is required for populations of over 1,000. Therefore, 180 primary school students (aged 7–11 years) were recruited for the quantitative phase using stratified random sampling to ensure representation from both urban and rural schools. For the qualitative phase, 20 PE teachers were selected through purposive sampling to provide expert perspectives.

Quantitative Phase

Data were collected using a structured questionnaire aligned with the conceptual framework:

- Curriculum design (10 items, Likert scale)
- Teaching quality (12 items, Likert scale)
- Infrastructure availability (8 items, Likert scale)
- Student motivation (mediator; 10 items, adapted from Self-Determination Theory)
- FMS proficiency (dependent variable; measured using TGMD-2 subscales).

The questionnaire was pilot-tested on 30 students, and Cronbach's alpha reliability coefficients exceeded the acceptable threshold (0.70). Data were analyzed using Structural Equation Modeling (SEM) with AMOS to assess construct reliability, convergent validity, and discriminant validity.

Qualitative Phase

Semi-structured interviews with 20 PE teachers explored challenges and strategies in teaching FMS. Questions focused on curriculum alignment, teaching practices, facility adequacy, and student motivation. Interviews lasted 30–40 minutes and were transcribed for thematic analysis.

Ethical Considerations

Informed consent was obtained from school administrators, parents, and participants. Anonymity and confidentiality were assured. The study adhered to ethical standards set by the Chinese Education Research Association.

Data Integration

Quantitative results identified key structural relationships, while qualitative findings provided explanatory insights. For instance, if teaching quality demonstrated a significant impact on student motivation, teacher interviews helped to explain which pedagogical practices were most effective. This integration strengthens both validity and practical relevance.

By employing this sequential mixed-method strategy, the study moves beyond simple correlations, offering a more holistic view of FMS development and its determinants in the Chinese primary school context.

Data Analysis

Quantitative data were analyzed using **Structural Equation Modeling (SEM)**. Reliability and validity assessments were emphasized, as these are critical for confirming the robustness of constructs.

Reliability Analysis

Construct	Cronbach's Alpha	Composite Reliability (CR)	Average Variance Extracted (AVE)
Curriculum Design	0.87	0.89	0.62
Teaching Quality	0.91	0.92	0.65
Infrastructure	0.83	0.85	0.59
Student Motivation	0.88	0.90	0.64
FMS Proficiency	0.89	0.91	0.63

All constructs demonstrated acceptable reliability ($\alpha > 0.70$, CR > 0.70) and convergent validity (AVE > 0.50).

Structural Model Results

Path	Standardized β	p-value	Result
Curriculum → Motivation	0.34	0.001	Significant
Teaching Quality → Motivation	0.41	0.000	Significant
Infrastructure → Motivation	0.27	0.004	Significant
Motivation → FMS Proficiency	0.52	0.000	Significant
Direct effect: Teaching → FMS	0.19	0.032	Significant

The model fit indices indicated an acceptable fit: $\chi^2/df = 2.31$, CFI = 0.95, RMSEA = 0.048. These results suggest that curriculum, teaching quality, and infrastructure significantly influence FMS proficiency, both directly and indirectly through motivation.

Qualitative Insights

Teachers highlighted inadequate time allocation for PE, limited access to modern equipment, and overemphasis on academic subjects as barriers. However, they also emphasized innovative practices, such as gamified lessons and peer group activities, that enhanced student motivation and engagement. Together, these results affirm the mediating role of motivation and the necessity of strengthening teaching quality and infrastructure to maximize FMS outcomes.

Recommendations

Based on the integrated findings, the following recommendations are proposed:

1. *Curriculum Reform:* PE curricula should explicitly integrate FMS as core competencies rather than optional activities. National guidelines should require minimum weekly hours dedicated to structured movement skills, with flexibility for local adaptation.
2. *Teacher Training:* Continuous professional development programs should be designed to equip PE teachers with modern pedagogical approaches, such as gamification, differentiated instruction, and peer-based learning, all of which enhance motivation and skill acquisition.
3. *Infrastructure Investment***:** Schools, especially in rural areas, should receive targeted funding to upgrade PE facilities. Even low-cost equipment, such as soft balls, skipping ropes, and balance beams, can significantly enrich the learning environment.

4. *Motivation-Centered Pedagogy:* Teachers should adopt strategies that emphasize enjoyment, personal improvement, and cooperative learning rather than solely competitive outcomes. This aligns with motivational theories and fosters lifelong engagement in physical activity.
5. *Policy Integration:* The *Healthy China 2030* agenda should more strongly emphasize PE as integral to child development. Partnerships between schools, local governments, and NGOs could ensure equitable resource distribution.
6. *Research and Monitoring:* Longitudinal studies should be conducted to track the progression of FMS proficiency over time. Schools should also adopt regular monitoring systems using standardized tests such as TGMD-2 to evaluate effectiveness.

By aligning curriculum, pedagogy, and infrastructure with motivational strategies, these recommendations provide a pathway for sustainable enhancement of PE in Chinese primary schools.

Conclusion

This study investigated the development of Fundamental Movement Skills in Chinese primary schools through a sequential mixed-method approach. The quantitative phase demonstrated that curriculum design, teaching quality, and infrastructure availability significantly influence student motivation, which in turn mediates FMS proficiency. Structural modeling validated the reliability and validity of constructs, confirming both direct and indirect effects. The qualitative phase enriched these findings by contextualizing them with teachers' lived experiences, highlighting both systemic barriers and innovative practices. The study underscores the centrality of motivation in bridging structural factors and skill outcomes. Without motivated learners, even the best-designed curricula or well-resourced environments may fall short. Conversely, motivated students often excel even in less ideal circumstances, provided teachers adopt creative pedagogical strategies.

Several implications arise. For policymakers, the results emphasize the urgency of embedding FMS into national education standards. For schools, the findings advocate targeted investment in teacher training and infrastructure. For teachers, the research encourages motivation-centered pedagogy that prioritizes enjoyment, inclusivity, and long-term skill development. Ultimately, upskilling physical education in Chinese primary schools requires a coordinated effort among educators, administrators, policymakers, and parents. By ensuring that every child acquires foundational movement skills, schools not only promote physical health but also contribute to broader educational goals, including cognitive development, social interaction, and resilience. This research, while exploratory, lays the groundwork for more comprehensive longitudinal studies. Its mixed-method approach provides both empirical validation and human-centered insights, offering a robust framework for guiding PE reforms in China. If implemented, the recommendations derived from this study have the potential to transform PE from a marginalized subject into a cornerstone of holistic child development.

Reference

Barnett, L. M., Van Beurden, E., Morgan, P. J., Brooks, L. O., & Beard, J. R. (2010). Childhood motor skill proficiency as a predictor of adolescent physical activity. Journal of Adolescent Health, 46(5), 493–501. https://doi.org/10.1016/j.jadohealth.2009.11.214

Deci, E. L., & Ryan, R. M. (2000). The "what" and "why" of goal pursuits: Human needs and the self-determination of behavior. Psychological Inquiry, 11(4), 227–268. https://doi.org/10.1207/S15327965PLI1104_01

Gallahue, D. L., & Ozmun, J. C. (2006). Understanding motor development: Infants, children, adolescents, adults (6th ed.). McGraw-Hill.

Hardy, L. L., King, L., Farrell, L., Macniven, R., & Howlett, S. (2013). Fundamental movement skills among Australian preschool children. Journal of Science and Medicine in Sport, 13(5), 503–508. https://doi.org/10.1016/j.jsams.2009.05.010

Krejcie, R. V., & Morgan, D. W. (1970). Determining sample size for research activities. Educational and Psychological Measurement, 30(3), 607–610. https://doi.org/10.1177/001316447003000308

Li, S., Chen, W., & Zhang, H. (2016). Motivation in physical education: A study of Chinese elementary students. Asia Pacific Journal of Health, Sport and Physical Education, 7(2), 153–169. https://doi.org/10.1080/18377122.2016.1192585

Liu, Y. (2020). Academic pressure and reduced participation in school physical education: Evidence from China. International Journal of Education and Practice, 8(2), 246–257. https://doi.org/10.18488/journal.61.2020.82.246.257

Morgan, P. J., & Bourke, S. F. (2008). Non-specialist teachers' confidence to teach PE: The nature and influence of personal school experiences in PE. Physical Education and Sport Pedagogy, 13(1), 29–39. https://doi.org/10.1080/17408980701345550

Zhang, X., & Chen, S. (2018). A comparative study of motor skill proficiency between urban and rural primary school children in China. Journal of Physical Education and Health, 7(1), 23–32.