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Development of a Physical Activity Literacy Program to Improve Motor Movement and Cognitive Abilities in Children Aged 6–8 Years

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Abstract

Background and Aims: Physical Activity Literacy (PAL) programs are essential for developing foundational motor skills and cognitive abilities during critical developmental periods. This study aimed to develop and validate a comprehensive 16-week PAL program specifically designed to enhance motor movement and cognitive abilities in children aged 6-8 years through systematic stakeholder consultation and expert consensus.

Methodology: A mixed-methods research design was employed across three phases: (1) Needs assessment through surveys of 150 stakeholders using the modified Priority Needs Index (PNI) analysis, (2) program development through the Delphi method with 19 experts achieving consensus, and (3) validation via connoisseurship evaluation by 9 experts. The program development was grounded in Long-Term Athlete Development (LTAD) theory and contemporary physical literacy frameworks.

Results: The needs assessment revealed that systemic factors (school management and policy (PNI=0.089; parent engagement, PNI=0.077) were prioritized over curriculum content. Expert consensus (median≥3.50, IQR≤1.50) was achieved on all program components. The final 16-week program encompasses four progressive phases: foundational skills and body awareness, skill development and cognitive integration, skill combination and social application, and advanced application with creative play. All validation experts rated the program as appropriate for implementation.

Conclusion: The systematically developed and expert-validated PAL program provides a strong foundational framework for enhancing motor and cognitive development in early childhood. The program uniquely integrates cultural activities with cognitive-motor training, offering a scalable framework for early childhood education.

Keywords: Physical Activity Literacy Program; Motor Skills; Cognitive Ability; Early Childhood

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Introduction

The physical and cognitive development of Chinese children aged 6-8 years has become a critical public health concern, with mounting evidence indicating significant declines in fundamental motor skills and increased prevalence of sedentary behaviors, a challenge that reflects broader global trends in childhood inactivity. Recent national surveillance data reveal that 23.1% of Chinese children aged 6-8 years exhibit below-average fundamental movement skill proficiency, while 67.2% fail to meet recommended daily physical activity guidelines (Chen et al., 2019). This developmental crisis is further compounded by excessive screen time exposure, with Chinese children in this age group averaging 3.2 hours daily of digital device usage, significantly exceeding international recommendations (Wang & Liu, 2021). The convergence of declining physical competence and increasing cognitive demands during this critical developmental period necessitates the development of intervention strategies that simultaneously address motor and cognitive development.

Contemporary theoretical frameworks emphasize the interconnected nature of physical and cognitive development during early childhood. The Long-Term Athlete Development (LTAD) model identifies ages 6-8 years as the "Fundamentals" stage, characterized by optimal neuroplasticity and motor learning capacity (Balyi et al., 2016). During this critical period, children develop approximately 85% of their fundamental movement skills repertoire, establishing the foundation for lifelong physical activity participation (Stodden et al., 2018). Concurrently, executive functions, including working memory, inhibitory control, and cognitive flexibility, undergo rapid maturation, creating unique opportunities for integrated motor-cognitive interventions (Diamond & Ling, 2020).

Physical literacy theory provides a comprehensive framework for addressing these developmental challenges through holistic approaches that integrate physical, cognitive, affective, and social domains. Whitehead's conceptualization of physical literacy as "the motivation, confidence, physical competence, knowledge and understanding to value and take responsibility for engagement in physical activities for life" has gained international recognition as a paradigm for youth development (Cairney et al., 2019). Recent meta-analyses demonstrate that well-designed physical literacy interventions can simultaneously improve fundamental movement skills (effect size d=0.89) and executive functions (effect size d=0.52) in children aged 6-8 years (Tomporowski et al., 2015). Training methodologies incorporating LTAD principles and physical literacy frameworks have shown promising results in addressing developmental deficits. Structured programs emphasizing fun, variety, and progressive skill development demonstrate superior outcomes compared to traditional sport-specific approaches (Logan et al., 2018). Specifically, interventions combining fundamental movement skill instruction with cognitive

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challenges yield synergistic effects, enhancing both motor competence and academic performance (Pesce et al., 2016).

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The significance of addressing these developmental challenges extends beyond individual health outcomes to broader societal implications. Motor skill deficits in early childhood predict decreased physical activity participation, increased obesity risk, and reduced academic achievement throughout the lifespan (Lubans et al., 2017). For China, with approximately 100 million children in the 6-8 age group, addressing these challenges represents both a public health imperative and an economic necessity. Conservative estimates suggest that comprehensive early intervention programs could reduce healthcare costs by $2.3 billion annually while improving educational outcomes and workforce productivity (Zhang et al., 2020).

Current intervention approaches, however, lack systematic development methodologies that incorporate stakeholder perspectives, cultural considerations, and evidence-based design principles. This research addresses these gaps by developing and validating a comprehensive Physical Activity Literacy program specifically designed for Chinese children aged 6-8 years, utilizing rigorous mixed methods approaches to ensure theoretical grounding, practical feasibility, and cultural appropriateness. Despite evidence supporting integrated motor-cognitive interventions, no validated PAL program exists for Chinese children aged 6-8 years.

Objectives

The primary objective of this research was to develop and validate a Physical Activity Literacy program to improve motor movement and cognitive abilities in children aged 6-8 years. Specific objectives included: (1) conducting systematic needs assessment among key stakeholders to identify priority development areas, (2) developing a theoretically grounded program through expert consensus methodology, and (3) validating the program's appropriateness and feasibility for real-world implementation.

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Literature Review

Theoretical Synthesis for Physical Activity Literacy Program Development

Physical Activity and Physical Literacy Framework: Physical literacy represents a holistic concept encompassing motivation, confidence, physical competence, knowledge, and understanding to engage in lifelong physical activity (Whitehead, 2019). This multidimensional approach extends beyond traditional physical education by integrating cognitive, affective, and physical domains. Research demonstrates that physical literacy serves as a foundation for sustained physical activity participation and overall well-being in children (Cairney et al., 2019).

Motor Movement Development: Motor movement ability in children aged 6-8 years focuses on fundamental movement skills (FMS) development, including locomotor, manipulative, and stability skills. According to Long-Term Athlete Development (LTAD) theory, this age group represents the "Fundamentals" stage, emphasizing skill acquisition through play-based activities (Balyi et al., 2013). Research indicates that mastery of FMS during this critical period significantly influences future physical activity participation and motor competence (Barnett et al., 2016).

Cognitive Ability Integration: The relationship between physical activity and cognitive function is well-established, particularly regarding executive functions such as working memory, inhibitory control, and cognitive flexibility (Diamond, 2015). Studies demonstrate that cognitively engaging physical activities enhance academic performance and brain development in children (Hillman et al., 2014). Integrating cognitive challenges within movement activities creates dual-task scenarios that simultaneously develop both domains.

Cultural Context Integration: Incorporating Chinese cultural elements enhances program relevance and engagement. Traditional activities like Wushu, Jianzi, and cultural games provide culturally appropriate movement experiences while maintaining educational objectives (Chen & Liu, 2021). This cultural integration supports identity development and increases intrinsic motivation for participation.

Program Design Principles: Effective program development requires progressive skill sequencing, age-appropriate challenges, and inclusive participation opportunities. The integration of play-based learning, peer interaction, and family engagement creates comprehensive developmental experiences that address multiple learning domains simultaneously (Roetert & Jefferies, 2014). However, many prior studies in this area are limited by a lack of direct stakeholder involvement in the development process and insufficient cultural adaptation, which this research aims to address.

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Conceptual Framework

The conceptual framework integrates three theoretical foundations: Whitehead's physical literacy model, LTAD developmental principles, and dynamic systems theory. Physical literacy provides the overarching framework emphasizing motivation, confidence, physical competence, and knowledge as interdependent domains. LTAD principles guide age-appropriate content selection and progression, while dynamic systems theory informs the integration of motor and cognitive challenges.

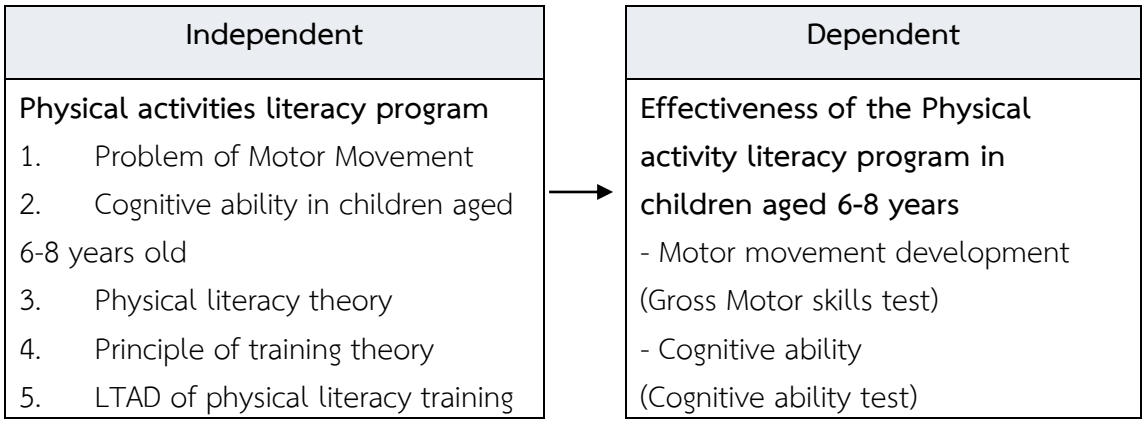

Figure 1 Conceptual Framework

Methodology

This research employed a sequential mixed-methods design across three phases aligned with educational program development best practices. The study received ethical approval. Informed consent was obtained from all adult participants before data collection from Bangkokthonburi University's Institutional Review Board (BTUIRB No: 2568/51(4)). All participants provided written informed consent after receiving a full explanation of the study's purpose and procedures.

Phase 1: Needs Assessment involved quantitative data collection from 150 stakeholders (school administrators, physical education department heads, teachers, and parents) using a structured questionnaire. Participants were selected through a purposive sampling strategy resembling quota sampling to ensure balanced representation from primary schools in Pingdingshan City, Henan Province, China. Data analysis employed descriptive statistics and Priority Needs Index (PNI modified) calculations to identify implementation priorities.

Phase 2: Program Development utilized qualitative methods beginning with in-depth interviews of 9 experts to gather foundational concepts. Subsequently, the Delphi method with

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19 experts (5 school administrators, 5 physical education teachers, 1 sports association representative, 4 physical activity committee members, 4 PAL-focused coaches) achieved consensus on program components. Experts were selected through snowball sampling, a method chosen for its efficiency in reaching specialists, while acknowledging its potential for selection bias, based on a minimum 5-year experience criterion. Consensus was defined as median ≥3.50 and IQR ≤1.50.

Phase 3: Validation employed connoisseurship methodology with 9 experts evaluating program appropriateness and feasibility. This qualitative approach leveraged expert judgment to assess program quality and implementation readiness.

Data analysis

Data analysis procedures included descriptive statistics for needs assessment, median and interquartile range calculations for Delphi consensus, and qualitative synthesis for validation feedback.

Results

Phase 1: Needs Assessment Results Summary

The needs assessment phase surveyed 150 stakeholders comprising school administrators (24.70%), physical education department heads (25.30%), teachers (25.30%), and parents/guardians (24.70%) from primary schools in Pingdingshan City, China. Additional Demographics: Female 58.00% (n=87), Male 42.00% (n=63), and educational experience ranging from <5 years (32.74%) to >20 years (18.58%). Using the Priority Needs Index (PNI modified), the analysis revealed significant gaps between current practices and desired implementation standards across four key domains.

Table 1 Priority Needs Assessment Results for Physical Activity Literacy Program Implementation

Priority Rank	Domain	PNI Modified	Current State (M±SD)	Ideal State (M±SD)	Top Priority Items within Domain
1	School Management and Policy	0.089	3.84±0.99	4.18±0.85	1. Clear PAL vision and policy (PNI=0.103) 2. Budget and resource support (PNI=0.090) 3. Teacher training support (PNI=0.084)

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Priority Rank	Domain	PNI Modified	Current State (M±SD)	Ideal State (M±SD)	Top Priority Items within Domain
2	Curriculum and Instruction	0.086	3.85±1.00	4.18±0.85	1. Holistic student assessment (PNI=0.093) 2. Cross-curricular integration (PNI=0.092) 3. Teacher capability development (PNI=0.083)
3	Components of PAL Training Activities	0.077	3.90±1.00	4.20±0.82	1. Fun, safe, confidence-building activities (PNI=0.088) 2. Cognitive-motor integration (PNI=0.086) 3. Fundamental movement skills focus (PNI=0.072)
3	Parent and Community Engagement	0.077	3.90±1.00	4.20±0.82	1. Effective school-parent communication (PNI=0.092) 2. Parent participation opportunities (PNI=0.088) 3. Home activity guidance (PNI=0.088)

The results demonstrate that systemic and institutional factors received higher priority than content-specific program elements. School Management and Policy emerged as the most critical need, indicating that successful PAL implementation requires strong administrative support, clear institutional vision, and adequate resource allocation. The relatively small gap between current and ideal states (all domains rated "High") suggests that while stakeholders recognize the importance of PAL components, implementation quality remains inconsistent. The narrow range of PNI values (0.077-0.089) suggests that these priorities are closely related, and differences should be interpreted cautiously regarding their practical significance. Notably, all stakeholder groups rated the importance of PAL program elements highly (M>4.0), demonstrating strong consensus on program value. However, current implementation levels consistently fell below desired standards, with the largest gaps in areas requiring systematic institutional change rather than individual teacher efforts. The findings align with implementation science principles emphasizing organizational readiness as a prerequisite for successful program adoption. The prioritization of

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communication channels and parent engagement reflects growing recognition of the ecological approach to child development, where home-school partnerships are essential for sustainable behavioral change.

These results informed subsequent program development phases by highlighting the need for comprehensive implementation support addressing policy, training, and community engagement alongside curriculum content development.

Phase 2: Delphi Method Results Summary

The Delphi method involved 19 experts across three rounds to achieve consensus on Physical Activity Literacy program components. Experts included school administrators (n=5), physical education teachers (n=5), sports association representatives (n=1), physical activity committee members (n=4), and PAL-focused coaches (n=4). Consensus was defined as median ≥3.50 and interquartile range (IQR) ≤1.50.

Table 2 Expert Consensus Results from Delphi Method (Final Round)

Program Domain	Items	Consensus Achievement	Median Score	IQR	Key Consensus Areas
Overall Perspective and Importance	4	100%	5.00	1.00	1. PAL definition for ages 6-8 2. Motor-cognitive complementarity 3. Holistic development benefits 4. Foundation for future growth
Training Program Components	11	100%	4.00-5.00	1.00-1.50	1. Progressive skill development 2. Cognitive-motor integration 3. Motivational strategies 4. Social interaction emphasis 5. Cultural activity inclusion
Implementation and Evaluation	2	100%	5.00	1.0	1. Multi-dimensional assessment 2. Challenge mitigation strategies

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Program Domain	Items	Consensus Achievement	Median Score	IQR	Key Consensus Areas
Additional Suggestions	4	75%	2.00-5.00	1.00-2.00	1. Parent-child activities (consensus) 2. Growth profiles (consensus) 3. Community exchanges (consensus) 4. Digital platforms (no consensus)

Consensus Strength Analysis:

Strong Consensus (Median = 5.00, IQR = 1.00): Experts demonstrated unanimous agreement on fundamental PAL principles, including the definition emphasizing ability, awareness, and positive attitudes toward physical activity. The complementary relationship between motor skills and cognitive abilities received the strongest support, validating the program's integrated approach.

Moderate Consensus (Median = 4.00, IQR = 1.00-1.50): Training program components achieved solid consensus despite some variation in expert emphasis. Notable agreement emerged on progressive skill sequencing from simple to complex, incorporating cognitive challenges into movement activities (e.g., "sports math"), and using games and rewards as motivational tools while avoiding overly utilitarian approaches.

Controversial Area: Digital technology integration for communication platforms failed to achieve consensus (Median = 2.00, IQR = 2.00), revealing expert concerns about screen time. Consequently, this component was omitted from the final program, highlighting a preference for direct physical engagement in this age group.

Critical Findings: The results validate the theoretical foundation while highlighting practical implementation considerations. Expert hesitation regarding digital platforms reflects broader debates about technology's role in children's physical development. Strong consensus on cultural integration (combining traditional Chinese activities with international sports) supports inclusive programming approaches.

The achievement of consensus across diverse expert backgrounds strengthens the program's credibility and implementation potential. Expert agreement on multidimensional evaluation approaches (motor quality, cognitive function, motivation, social interaction) provides comprehensive assessment frameworks essential for program refinement and outcome measurement. These consensus results directly informed the final 16-week program structure,

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ensuring evidence-based design aligned with expert professional judgment and contemporary best practices in physical literacy development.

Phase 3: Connoisseurship Validation Results Summary

The connoisseurship validation phase employed 9 experts to evaluate the final 16-week Physical Activity Literacy program's appropriateness and implementation feasibility. The expert panel included school administrators (n=2), Physical education teachers (n=3), Sports association representatives (n=2), and Youth sports coaches (n=2).

Table 3 Connoisseurship Validation Results for 16-Week PAL Program

Evaluation Domain	Components Assessed	Expert Rating	Validation Outcome	Key Expert Feedback
Overall Perspective and Importance	4 items	Appropriate (100%)	100% Validation	1. Strong theoretical foundation 2. Clear PAL definition alignment 3. Age-appropriate developmental focus
Training Program Components	11 items	Appropriate (100%)	100% Validation	1. Progressive skill sequencing 2. Effective cultural integration 3. Need for low-resource alternatives 4. Age-specific benchmarks required
Implementation and Evaluation	2 items	Appropriate (100%)	100% Validation	1. Comprehensive challenge identification 2. Multi-dimensional assessment approach 3. Differentiated instruction guidelines needed
Additional Suggestions	4 items	Appropriate (100%)	100% Validation	1. Parent-child activity value 2. Community engagement importance 3. Family inclusion strategies required

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Critical Validation Findings: All program components received unanimous expert approval, confirming readiness for implementation. Experts particularly praised the program's theoretical grounding in LTAD principles and cultural inclusivity through traditional Chinese activities with international sports.

Implementation Enhancement Recommendations: Despite universal approval, experts provided crucial refinement suggestions: developing resource-efficient activity alternatives for schools with limited equipment, establishing age-specific performance benchmarks to guide progression, and creating differentiated instruction protocols for diverse learner needs. The validation confirmed the program's 16-week structure with twice-weekly 45-minute sessions as developmentally appropriate. Expert endorsement of the four-phase progression (foundational skills ⟶ cognitive integration ⟶ social application ⟶ creative play) validates the systematic skill-building approach.

This comprehensive validation provides confidence for pilot implementation while identifying specific areas requiring operational enhancement to ensure successful real-world application across diverse educational contexts.

Physical Activity Literacy Program for Children Aged 6-8 Years: A Validated Framework Program Overview

Table 4 Four-Phase PAL Program Structure (16 Weeks)

Phase	Duration	Primary Focus	Key Activities	Assessment Methods
I: Foundational Skills	Weeks 1-4	Basic motor skills, body awareness, safety	Animal Kingdom, Eagle Catches Chick, Jianzi Play, Red Light-Green Light Zodiac	TGMD-3 pre-test, motor skills checklist, participation observation
II: Skill Development	Weeks 5-8	Cognitive integration, skill refinement	Maze Dribble, Target Math, Ribbon Dance, Activity Stations	Reaction time tests, spatial awareness assessment, and motivation surveys

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Phase	Duration	Primary Focus	Key Activities	Assessment Methods
III: Social Application	Weeks 9-12	Teamwork, modified sports, peer teaching	Modified Soccer, Wushu Stances, Invent-a-Game, Team Keep-Up	Social skills observation, leadership assessment, creativity evaluation
IV: Advanced Integration	Weeks 13-16	Performance, self-direction, showcase	Modified Basketball, Movement Story, PAL Festival, Certificate Ceremony	TGMD-3 post-test, comprehensive assessment, and self-reflection portfolios

Program Description and Validation

The PAL-Kids Development Program represents a systematically developed intervention designed to enhance motor movement and cognitive abilities in children aged 6-8 years through evidence-based programming. Following comprehensive stakeholder consultation (n=150) and expert validation through Delphi consensus (n=19) and connoisseurship evaluation (n=9), this program addresses identified implementation priorities while maintaining theoretical integrity.

Theoretical Foundation and Cultural Integration Grounded in Whitehead's physical literacy framework and LTAD principles, the program emphasizes the critical "Fundamentals" stage where children develop foundational movement competencies. The culturally integrated approach combines traditional Chinese activities (Jianzi, Wushu, Eagle Catches Chick) with international movement forms, creating inclusive learning environments that validate diverse backgrounds while developing universal motor competencies. Expert validation confirmed this integration as addressing significant gaps in existing programming.

Progressive Development Structure The four-phase progression follows developmental principles, advancing from basic motor skills and body awareness through cognitive integration and social application to advanced performance and self-direction. Each phase incorporates twice-weekly 45-minute sessions structured as warm-up (5-10 minutes), main activities (15-20 minutes), applied games (15-20 minutes), and cool-down (5 minutes). This timeframe aligns with motor learning research while remaining practically feasible for educational implementation.

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Cognitive-Motor Integration A distinctive program feature involves systematic integration of cognitive challenges within physical activities. "Sports Math" activities combine arithmetic with throwing accuracy, while "Maze Dribble" requires simultaneous route planning and ball control. Expert consensus (median=5.0, IQR=1.0) validated these approaches as developmentally appropriate for enhancing executive functions, including working memory, inhibitory control, and cognitive flexibility.

Implementation and Assessment Framework The program employs multidimensional assessment encompassing motor skills (TGMD-3), cognitive abilities (reaction time, spatial awareness), and affective outcomes (motivation, confidence). Implementation requires 20-hour teacher preparation covering PAL concepts, inclusive pedagogy, and assessment techniques. Resource adaptations accommodate diverse settings through low-cost alternatives and flexible space utilization.

Validation Outcomes Unanimous expert validation across all program components confirms readiness for implementation while identifying critical success factors, including comprehensive teacher training, family engagement strategies, and systematic assessment protocols. The validated framework provides educational institutions with an evidence-based tool for enhancing children's physical literacy development during this critical developmental window.

Discussion

This study successfully achieved its primary objective of developing and validating a Physical Activity Literacy program for children aged 6-8 years. The results systematically addressed each specific objective: (1) the needs assessment identified key stakeholder priorities, revealing that systemic factors were paramount; (2) a theoretically grounded program was developed through a rigorous Delphi method, achieving expert consensus on all core components; and (3) the final program was validated for its appropriateness and feasibility by a panel of connoisseurs, confirming its readiness for implementation.

This systematic development process yielded a comprehensive 16-week Physical Activity Literacy program addressing identified stakeholder priorities while maintaining theoretical integrity. The research employed a rigorous mixed-methods approach involving 150 stakeholders for needs assessment, 19 experts for consensus building, and 9 experts for validation, culminating in unanimous approval for program implementation. Key Distinctive Findings and Theoretical Alignments:

1. Systemic Factors Prioritization Over Curriculum Content. The finding that school management and policy (PNI=0.089) ranked higher than training activities (PNI=0.077). This finding indicates that aligns with implementation science frameworks emphasizing organizational

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readiness as a prerequisite for successful program adoption (Fixsen et al., 2015). This supports Durlak and DuPre's (2008) meta-analysis demonstrating that implementation factors often determine intervention success more than content quality. Recent research by Moore et al. (2019) confirms that administrative support and institutional policies significantly predict physical education program sustainability.

2. Cultural Integration Approach in Program Design The successful consensus on integrating traditional Chinese activities with international sports reflects culturally sustaining pedagogy principles (Paris & Alim, 2017). This approach addresses Gay's (2018) call for culturally responsive teaching that validates students' cultural backgrounds while developing universal competencies. Edwards et al. (2017) support this inclusive approach in physical literacy contexts, demonstrating enhanced engagement when cultural activities are meaningfully integrated.

3. Mixed-Methods Development Framework Validation The systematic three-phase development process aligns with contemporary program development best practices outlined by Creswell and Plano Clark (2017). This approach addresses Cairney et al.'s (2019) criticism that most physical literacy programs lack stakeholder consultation and validation. The combination of quantitative needs assessment with qualitative expert consensus reflects evidence-based program development principles advocated by Wandersman et al. (2016).

4. Expert Hesitation Toward Digital Technology Integration The failure to achieve consensus on digital platforms (Median=2.0, IQR=2.0) reflects broader concerns about screen time in early childhood documented by Poitras et al. (2017). This finding supports Tremblay et al.'s (2018) position statements emphasizing direct physical engagement over digital mediation for this age group. Recent research by Gao et al. (2020) similarly reveals practitioner ambivalence toward technology integration in elementary physical education.

5. Multidimensional Assessment Framework The unanimous expert support for holistic evaluation approaches aligns with contemporary physical literacy assessment frameworks developed by Longmuir et al. (2018). This finding supports Diamond's (2015) executive function research, demonstrating the interconnected nature of motor and cognitive development, requiring comprehensive measurement approaches rather than isolated skill testing.

Limitations of the Study

Despite the rigorous methodology, this study has several limitations that should be acknowledged. First, the expert sample size in the Delphi and connoisseurship phases, while appropriate for qualitative consensus, was relatively small, which may limit the generalizability of their specific recommendations. Second, the needs assessment was confined to stakeholders in a single Chinese province (Pingdingshan City, Henan Province), and perceptions may differ in other

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regions. Finally, and most importantly, the developed program has been validated for appropriateness but has not yet been piloted in a real-world classroom setting to measure its effectiveness on children's motor and cognitive outcomes. Future research should aim to address these limitations through larger, more geographically diverse samples and controlled intervention trials.

Recommendation

Implications for Practice

Based on research findings, several recommendations emerge for program implementation and future research. Immediate implementation priorities should focus on developing comprehensive teacher training protocols addressing PAL concepts, inclusive pedagogy, and assessment strategies. Educational institutions should establish clear PAL policies and allocate necessary resources, including equipment, space, and professional development time.

Parent and community engagement strategies require systematic development to support home-school connections identified as critical success factors. Regular parent education workshops, home activity guides, and community demonstration events can strengthen these vital relationships.

Directions for Future Research

Effectiveness Studies: Conduct controlled effectiveness studies measuring motor skill development (using TGMD-3), cognitive function changes, and long-term physical activity participation. Longitudinal designs tracking participants across multiple years would provide valuable insights into program impacts on physical literacy trajectories.

Adaptation and Refinement: Cross-cultural adaptation studies could explore program transferability to diverse contexts while maintaining core principles. Program refinement based on implementation feedback should be ongoing, with particular attention to resource optimization and accessibility enhancement.

Technology and Assessment: Investigation of technology integration approaches may resolve expert concerns while leveraging digital tools' potential benefits. Furthermore, the development of new, validated assessment tools that capture the multidimensional outcomes of PAL would greatly support program evaluation and continuous improvement efforts.

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