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Integrating Health and Motor Skill Component's in Developing a Physical Fitness Test for Malaysia Children Age 7 to 9 Years

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ABSTRACT - Physical fitness assessment among children has become increasingly important as an early indicator of health status, functional development, and future disease risk. Although numerous fitness test batteries have been established internationally, direct application to Malaysian children aged 7–9 years remains challenging due to differences in educational settings, cultural norms, anthropometric characteristics, and physical activity opportunities. In Malaysia, existing national screening for younger children such as BMI 5–9T primarily focuses on body mass index, while other health-related fitness components and motor competence are not comprehensively assessed in a systematic manner. This paper synthesises evidence supporting the integration of health-related fitness and motor skill components as a foundation for developing a holistic physical fitness test framework for Malaysian children aged 7–9 years. A structured review was conducted to examine major international field-based assessment batteries, particularly ALPHA-FIT, Performance and Fitness Test (PERF-FIT), and the Test of Gross Motor Development-Third Edition (TGMD-3), focusing on their test domains, feasibility for school settings, and relevance for developmental assessment. The synthesis indicates that combining health-related indicators such as cardiorespiratory endurance, muscular strength, flexibility, and body composition with motor skill domains such as balance, agility, coordination, and movement control provides a more developmentally appropriate profile than single-domain screening. Theoretically, this paper strengthens the conceptualisation of child physical fitness by highlighting the interdependence between physiological fitness and motor competence during early primary years. From a managerial perspective, it provides practical directions for school implementation and policy planning, including standardised administration procedures, teacher capacity building, development of Malaysian normative references, and systematic monitoring aligned with curriculum priorities. Overall, an integrated assessment framework is positioned as a feasible and context-sensitive approach to enhance early screening, targeted intervention, and evidence-based decision-making in Malaysian primary schools.

INTRODUCTION

Childhood physical fitness is an important factor in lifelong health trajectories, with a strong impact on both immediate health and lifelong disease prevention. More than performance by motor characteristics, paediatric fitness is seen as a multidimensional concept such as physiological efficiency, functional movement capacity, participation in everyday activities, and optimal participation

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in structured physical education. The evidence is compelling that greater levels of physical fitness during childhood contribute to more beneficial cardiometabolic profiles, improved psychosocial outcomes, and lower risk of non-communicable disease later in life (Ortega et al., 2008; Ruiz et al., 2008). Although recognized as an important construct, global surveillance data show that children's physical fitness and motor skill competence are consistently declining. These trends are associated with declining levels of physical activity participation and sedentary lifestyles, which are important public health and educational risk factors (Ortega et al., 2023a; Tomkinson et al., 2019; Hardy et al., 2013).

Middle childhood in the ages 7 to 9 is an important period of development characterized by rapid neuromotor maturation and learning of basic motor patterns. Competent exercise practices during this time have a substantial impact on future use of physical activity, sports participation and an active lifestyle for a prolonged period of time (Barnett et al., 2020; Barnett et al., 2016;). Modern neuromotor metrics frameworks like the ZNA-2 (Zurich Neuromotor Assessment–Second Edition) emphasize the importance of early performance monitoring by leveraging normative reference data through childhood and adolescence (Veer et al., 2021; Kakebeeke et al., 2018). In Malaysia, a focus on holistic child development is explicitly integrated into the national education philosophy through the JERIS framework (Bahagian Pembangunan Kurikulum, 2016). This policy orientation is being operationalised in the Revised Primary School Standard Curriculum (KSSR) for Physical and Health Education (PJPK) 2017 emphasizing the focus of training of skills (75%) over the fitness component (25%) from young primary school years. At its core, the curriculum explicitly focuses on learning key movement competencies: locomotor, manipulative, non-locomotor, and rhythmic movements, as building blocks for lifelong physical activities (Okely et al., 2023; Logan et al., 2018; Kementerian Pendidikan Malaysia, 2017).

Globally, a variety of field-based assessment batteries have been established to assess children's physical fitness and motor competence, such as the ALPHA-Fitness test battery, the Performance and Fitness Test (PERF-FIT) program and the Test of Gross Motor Development–Third Edition (TGMD-3). While these metrics show good psychometric properties when administered in their natural contexts (Reyneke et al., 2022; Smits-Engelsman et al., 2021, 2020a), Mehmedinović et al., 2021; Doe-Asinyo et al., 2021) caution has to be taken in their implementation in Malaysia because of significant variation in school settings and availability of equipment and cultural congruity. Thus, it is clearly imperative to integrate and synthesise international evidence to guide an integrated, context-based assessment scheme for Malaysian child's assessment during the age of 7-9 years.

PHYSICAL FITNESS.

The connection between physical fitness and health in children and adolescents has been consistently demonstrated (Ruiz et al., 2006b; Ortega et al., 2008b; Smith et al., 2014). Therefore, assessing physical fitness has emerged as a key measure of the health status among young people and is thus relevant from a public health standpoint (Ortega et al., 2008b; Cadenas-Sanchez et al., 2016). In this regard, many studies have been conducted to ascertain normative values among school-aged individuals (Castro-Piñero et al., 2009; Ortega et al., 2011a; De Miguel-Etayo et al., 2014; Tomkinson et al., 2017; Cadenas-Sanchez et al., 2019; Kolimechkov et al., 2019) as well as cut-off points of fitness test results used to characterize health risk profiles of children and youth (Ruiz et al., 2016; Castro-Piñero et al., 2019; Cristi-Montero et al., 2019; Lang et al., 2019). Cross-sectional designs are common to these studies; thus, they provide insights from particular timeframes.

Physical fitness has been traditionally defined as an ability to perform daily tasks effectively with decreased risk of fatigue (Council of Europe, 1983). Though, modern paediatric research has expanded this notion, noting that childhood fitness cannot be separated from movement competence and development of fundamental motor capabilities that can sustain the body in regular physical activity throughout the lifespan (Kolimechkov, 2017; Ortega et al., 2008). Physical fitness assessment plays a dual strategic role in schools. It is an objective measure of children's health status and physical capabilities and the development of an evidence-based intervention and physical education program (Kolimechkov, 2017; Ortega et al., 2010). Health-related fitness often includes cardiovascular endurance, muscular strength, muscular endurance, flexibility, body composition (Ismail & Abdul Razak, 2017; Kolimechkov, 2017).

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Conversely, skill-related fitness encompasses agility, balance, coordination, power, reaction time, and speed and in combination indicate the quality and efficiency of movement (Cvejić et al., 2013; Caspersen et al., 1985;). While these domains are conceptually distinct, the evidence from multiple studies suggests an interdependence of health-related fitness and ability as well as motor competence in childhood, with multiple studies revealing such patterns (Coe et al., 2024; Štefan et al., 2021; Robinson et al., 2015;). Higher motor competence children maintain consistently better fitness profiles and more physical exercise participation (Coe et al., 2024; Štefan et al., 2021; Robinson et al., 2015;). Recent studies have also evidenced the joint effect between these domains in modulating physical performance outcomes and learning mechanisms in PE contexts (Brazo-Sayavera et al., 2024; Štefan et al., 2021). Although there are over 15 international fitness assessment batteries for children and adolescents across the whole world with which to assess children's fitness (Castro-Piñero et al., 2010), there is still little systematic implementation and centralised data monitoring.

Human development is widely recognised as a multidimensional process encompassing biological, psychological, social, and motor domains. However, many physical fitness assessment practices continue to place greater emphasis on anthropometric indicators, which may not fully reflect children's functional and motor capacities (Ruiz et al., 2011; Ortega et al., 2008; Malina et al., 2004). A lack of practical resources and specialist personnel further limit comprehensive assessment within school populations. Together, these limitations underscore an imperative for an integrated and realistic assessment framework that captures health-related fitness alongside motor skill competence. In particular, such an approach can give a more valid, reliable, and meaningful representation of children's physical development, especially during early primary years, and may identify functional movement limitations that would have gone undetected by anthropometric screening alone.

Assessment of Physical Fitness

Previous European studies have consistently demonstrated that physical fitness is a key indicator of health status in children and adolescents and serves as a predictor of health outcomes in adulthood (Ruiz et al., 2006; Ruiz et al., 2009). Consequently, monitoring levels of physical fitness and physical activity among children should be regarded as a public health priority (World Health Organization, 2010). In this context, physical fitness assessment should not be limited to health-related components alone but should also incorporate functional capacity and motor skill proficiency that support holistic physical development in children.

In practice, physical activity levels are commonly estimated using self-reported measures such as questionnaires and activity diaries, whereas physical fitness can be objectively assessed through laboratory-based tests. However, the application of laboratory assessments in school settings is constrained by limitations related to equipment, time, and technical expertise. As a result, field-based tests are widely adopted as a more practical, cost effective, and time efficient alternative for large scale assessments (Castro-Piñero et al., 2010). Beyond evaluating health related components such as endurance and muscular strength, field-based fitness tests also provide valuable insights into fundamental motor skills that reflect children's movement competence (Ortega et al., 2008b).

For Malaysian primary school children aged 7 to 9 years, schools represent the most strategic environment for implementing standardized and integrated physical fitness assessments. Integrating health-related fitness components with motor skill elements within a single test battery enables early identification of children at risk, supports the planning of targeted physical education interventions, and promotes the development of active and healthy lifestyles aligned with children's developmental stages and the local educational context (España-Romero et al., 2010). To provide an overview of existing approaches, table 1 summarises major international field-based physical fitness test batteries developed for children and adolescents, including their target age ranges and countries of origin. Accordingly, this paper synthesises evidence supporting such integration by examining major international field-based batteries, with particular attention and focuses on their measurement domains, feasibility for school implementation, and relevance for informing an integrated assessment direction that could be adapted to the Malaysian context.

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Table 1: **Physical Fitness Test Batteries for Children and Adults** *(adapted from Castro-Piñero et al., 2009)*

Age Range	Acronym	Test Battery	Country / Year
5–9	BMI 5–9T	BMI 5–9T	Malaysia, 2023
5–17	FITNESSGRAM	The Cooper Institute	USA, 1982
5–17	NYPFP	National Youth Physical Program, The United States Marine Youth Foundation	USA, 1967
5–18	HRFT	Health-Related Fitness Test, American Association for Health, Physical Education and Recreation (AAHPER)	USA, 1980
5–18	Physical Best	American Association for Health, Physical Education and Recreation (AAHPER)	USA, 1988
6–17	PCPF	President's Challenge: Physical Fitness, The President's Council on Physical Fitness and Sports / American Association for Health, Physical Education and Recreation	USA, 1986
6–17	AAUTB	Amateur Athlete Union Test Battery, Chrysler Foundation / Amateur Athlete Union	USA, 1988
6–17	PCPF	President's Challenge: Physical Fitness, The President's Council on Physical Fitness and Sports / American Association for Health, Physical Education and Recreation (AAHPER)	USA, 1986
6–17	PFAAT*	Physical Fitness and Athletic Ability Test (Japan) (Shingo & Takeo, 2002)	Japan, 1964
6–17	YMCA YFT	YMCA Youth Fitness Test	USA, 1989
6–18	ALPHA-FIT*	The ALPHA (Assessing Level of Physical Activity and Fitness) Project (ALPHA, 2009)	Europe, 2009
6–18	EUROFIT	Council of Europe Committee for the Development of Sport	Europe, 1983
7–69	CAHPER-FPT II	Fitness Performance Test II, Canadian Association for Health, Education and Recreation (CAHPER)	Canada, 1980
9–18	AFEA	Australian Fitness Education Award, The Australian Council for Health, Education and Recreation (ACHER)	Australia
9–19	IPFT	International Physical Fitness Test (United States Sports Academic / General Youth and Sports of Bahrain)	Middle East, 1977

Although international batteries are already available, a question remains in relation to their feasibility in Malaysian children as they differ in their context on the school environment, sample populations, and implementation limits. BMI 5–9T can be used as a national screening tool for children aged from 5 to 9 years and is considered a fundamental indicator in the control to monitoring school health in Malaysia. Although BMI is necessary for establishing whether children are at risk of underweight and overweight, it does not fully capture children's functional fitness, movement competence or neuromotor development, which results in a gap in practice and in theory regarding holistic surveillance in 7- to 9-year-old children. This is especially pertinent in view of recent evidence of declining physical fitness associated with sedentary behaviours and reduced exposure to physical activities (Active Healthy Kids Malaysia, 2023; Shahril et al., 2023; Ortega et al., 2023) and increased

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differences in anthropometric and fitness performance among the population based on sex, setting and relative age (Mat-Rasid et al., 2022).

Cross-cultural validation, establishment of localised standards and consideration to determine its appropriateness are as yet lacking (Galvani et al., 2024; Štefan et al., 2021) and evidence synthesis of structured combination between health-related fitness and motor competence for children in Malaysia is incomplete. Accordingly, this study is also responding to this by conducting a systematic literature review to systematically identify and evaluate evidence on the integration of health-related fitness and motor skill components in physical fitness assessment of children from 7 to 9 years, it is intended to provide a conceptual ground and then to develop a more holistic and context-related and realistic integrated model to be conducted in schools in Malaysia.

METHODS

This study is a structured literature review that synthesises empirical evidence on physical fitness assessment among children aged 7 to 9 years, with a specific focus on integrating health-related fitness components and motor competence/skill-related fitness. The scope of the review centres on internationally established field-based test batteries that are widely applied and supported by psychometric evidence, namely the ALPHA-Fitness Test Battery, PERF-FIT, and the Test of Gross Motor Development (TGMD-3), Third Edition. These instruments were selected because each battery captures distinct yet complementary domains, including health indicators for surveillance purposes, functional movement performance and motor-related physical fitness, as well as standardised evaluation of gross motor development.

In terms of population and context, the review focuses on children in middle childhood (7–9 years), a critical period for neuromotor maturation and the development of foundational fitness and movement skills. The contextual scope includes studies conducted in Malaysia and international studies from settings with comparable socio-cultural characteristics and physical education ecosystems, to support more meaningful interpretation and inform the potential adaptation of assessment tools for school-based implementation. This review does not involve primary data collection; rather, it evaluates existing empirical findings that report the use of field-based test batteries in children, including evidence on validity, reliability, and feasibility of administration.

Overall, the scope of this study is limited to synthesising conceptual perspectives, test domains, and empirical evidence that support the development of a more holistic, practical, and context-sensitive physical fitness assessment framework for Malaysian children aged 7 to 9 years. The synthesis emphasises comparisons of measured components, strengths and limitations of each instrument, and implementation considerations such as equipment requirements, administration time, and age appropriateness within primary school settings. The findings are expected to provide a stronger scholarly foundation for proposing an integrated assessment direction and to serve as an initial reference for the development of local instruments and normative data suitable for national use.

DISCUSSION

ALPHA-FIT is widely recognised as a robust field-based reference battery for assessing health-related physical fitness in children and adolescents. Developed through a pan-European initiative funded by the European Union, ALPHA-FIT was designed to support standardised and comparable physical fitness surveillance across countries and is underpinned by strong empirical evidence from cross-sectional and longitudinal studies involving more than 10,000 youths (Ruiz et al., 2011). The selection of test components followed stringent criteria of validity, reliability, feasibility, and safety, ensuring suitability for large-scale school-based and community implementation. Conceptually, the battery targets three core domains of health-related fitness—cardiorespiratory fitness, musculoskeletal fitness, and body composition—which are consistently associated with present and future health outcomes in young populations (Ortega et al., 2008). These domains are operationalised using the 20-m shuttle run, handgrip strength, standing long jump, and anthropometric indicators such as body mass index, waist circumference, and skinfold thickness (Ruiz et al., 2011). The practicality, low cost, and strong epidemiological relevance of these measures have contributed to their widespread use, with feasibility

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studies demonstrating that the battery can be administered efficiently within school settings (Ruiz et al., 2011).

To accommodate time constraints in schools, a high-priority version of ALPHA-FIT was proposed, excluding skinfold measurements while retaining components with the strongest scientific support, thereby enhancing feasibility for routine monitoring (Ruiz et al., 2011). An extended version incorporating a 4 × 10 m shuttle run was also suggested for research or sport contexts, although evidence for its criterion validity remains limited (Ortega et al., 2008; Ruiz et al., 2011). Despite its strengths, ALPHA-FIT primarily emphasises physiological and anthropometric indicators and provides limited direct assessment of motor competence elements such as balance, coordination, neuromotor control, and movement quality. For children aged 7–9 years, physical performance reflects not only physiological capacity but also motor development and coordination efficiency. Consequently, reliance on health-related fitness measures alone may result in incomplete interpretations. Current evidence supports the need for an integrated, field-based assessment approach that combines health-related fitness and motor competence components to provide a more developmentally appropriate and holistic profile of children's physical functioning, particularly within diverse school contexts such as Malaysia.

Table 2: ALPHA Fitness Test Battery (ALPHA-Fit)

Domain	Test	Outcome
Body composition	Body Mass Index (BMI)	kg/m²
Muscular strength	Handgrip strength	kg
Muscular power	Standing long jump	cm
Cardiorespiratory endurance	20 m shuttle run	stages/laps (estimated VO_2max)
Speed-Agility	4 x 10 m Shuttle Run	seconds

PERF-FIT supplements this deficiency through consideration of motor skill-related fitness and functional movement performance. It is designed to evaluate domains such as agility, balance, coordination, and power, and has been shown to discriminate effectively between typically developing children and those with motor coordination difficulties. The practicality of PERF-FIT, particularly in settings with limited resources, provides a strong rationale for its relevance to Malaysian school contexts. Nevertheless, PERF-FIT does not explicitly emphasise key health surveillance indicators such as BMI screening or endurance measures that are central to public health monitoring. This reinforces the argument that PERF-FIT is best positioned as a complementary motor competence assessment within and integrated framework rather than as a standalone battery. Table 3 presents the core PERF-FIT domains, which emphasise functional motor fitness through agility, balance, coordination, and power tasks.

Table 3: Performance Fitness Test Battery (PERF-FIT)

Domain	Task Category	Outcome
Agility	Change-of-direction / shuttle tasks	time/score
Balance	Static and dynamic balance tasks	time/score
Coordination	Upper- and lower-limb coordination tasks	score
Power	Jumping/hopping tasks	distance/repetitions

TGMD-3 provides further support for integration by offering a standardised evaluation of gross motor development through locomotor and object control skills. The instrument is widely used internationally and contributes a developmental perspective by assessing movement patterns and skill acquisition quality. Nonetheless, TGMD-3 does not measure physiological fitness components such as endurance or muscular strength. Therefore, TGMD-3 alone cannot provide a complete picture of children's health-related fitness status, reinforcing the need for integration with psychological fitness indicators. As outlined in Table 4, TGMD-3 evaluates gross motor competence through locomotor and object control (ball) skills, providing a developmental perspective on movement quality. Accordingly, an

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integrated assessment framework is proposed (Table 5), detailing key domains, test sources, recommended measures, and their relevance to Malaysian children.

Table 4: TGMD-3 Test Component

Domain	Subtest	Outcome
Locomotor skills	Locomotor	performance criteria score
Ball skills (object control)	Ball skills	performance criteria score

Table 5: Integrated Fitness Test Battery ALPHA-Fit, PERF-FIT and TGMD-3

Assessment Domain	Key Component	Recommended Test Source	Suggested Measure	Rationale (Why included for 7–9 years)
Body composition (health indicator)	Weight status	ALPHA-FIT	BMI (kg/m²)	Supports early screening of underweight/overweight risk and aligns with national monitoring practice
Muscular strength	Upper-limb strength	ALPHA-FIT	Handgrip strength (kg)	Simple, reliable indicator of general strength relevant to health and functional performance
Muscular power	Lower-limb explosive power	ALPHA-FIT	Standing long jump (cm)	Captures lower-limb power important for movement tasks and physical education performance
Cardiorespiratory endurance	Aerobic fitness	ALPHA-FIT	20 m shuttle run (stages/laps)	Core health-related indicator linked to cardiometabolic risk and overall fitness
Speed–agility	Change-of-direction speed	ALPHA-FIT	4 × 10 m shuttle run (s)	Reflects agility demands common in games and school PE activities
Balance (motor competence)	Postural control	PERF-FIT	Balance task score/time	Identifies neuromotor control limitations that may affect participation and movement quality
Coordination (motor competence)	Movement precision	PERF-FIT	Coordination task score	Captures neuromotor efficiency that influences performance across fitness tasks
Functional agility (motor competence)	Movement adaptability	PERF-FIT	Agility task score/time	Complements speed and agility by emphasising functional movement control
Fundamental movement skills	Locomotor competence	TGMD-3	Locomotor criteria score	Assesses movement pattern quality critical for early primary development and skill learning
Fundamental movement skills	Object control competence	TGMD-3	Ball skills criteria score	Assesses manipulative skill competence that aligned with the outcomes for PE curriculum

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Theoretically, the integrated approach offers the possibility to reinforce the conceptualization of childhood physical fitness, drawing attention to the dynamic relationship between health-related fitness and motor competence at ages 7–9. However, it needs to be enacted in a process of standardised administration protocols, and of trained teachers to be valid and comparable across schools. Finally, we argue that enhancing standards around Malaysian normative references is essential for delivering fair interpretations, pertinent benchmarking, and evidence-informed planning for interventions across regions and states. At the policy level, an integrated framework can support national monitoring and enable monitoring beyond a simple “BMI screening” to enhanced surveillance of overall child fitness. This way it would give coordination and enable Ministry of Education and other participants in the field to track health related fitness and gross and fine motor skill development on an ongoing basis and to form assessment practices in line with curriculum priorities and general national public health requirements.

From the point of view of management, linking health and motor competence domains indeed has significant practical value to schools and policy makers. Integrated assessment allows teachers to notice particular class of children and individualize interventions, while making decision-making for school administrators, in the process, much easier through having an integrated evidence base in place when planning resources. At the policy level, an integrated framework can offer the national level support, to overcome the limitations of BMI-only surveillance and to move to overall child fitness surveillance. Standardised administration practices and teacher preparedness are essential for successful implementation to achieve consistency and equivalency between schools. Third, the creation of Malaysian normative references is essential to assure just treatment or a fair interpretation by meaningful benchmarking and development of evidence-based intervention planning across districts and states.

At a policy level, an integrated framework can help reinforce national monitoring by moving beyond BMI-only screening, and towards broader surveillance of children’s fitness. This has to be done through standardised administration protocols and organised teacher training so that it can be reliable and cross-school comparable. Finally, we argue that the construction of standards for Malaysian normative references is important for fair application, relevant comparison to benchmarks, and evidence-based planning of interventions across districts and states. At the policy level, national level monitoring could be underpinned by an overarching framework that is more than just a “BMI screening”, increasing the ability to improve child fitness surveillance overall. This strategy would help organize systematizing the approach and enable the Ministry of Education, among other stakeholders, to systematically track health-related fitness and motor competence evolution, form assessment practices that align with curriculum priorities and the national public health agenda.

These findings of this analysis imply that the process of physical fitness monitoring for Malaysian 7 to 9 years old children needs to shift from an exclusive focus on fields to a more complete, holistic monitoring of physical fitness. A more complete model of physical functioning in terms of fitness dimensions that includes health and motor skills may be more suitable to measure children’s general physical functioning and ultimately assist with the earlier identification of children and the design of targeted interventions. Implementation of an integrative assessment such as this will be influenced by standardized field testing, standardized scoring and structured teacher education to secure inter-school reliability and comparability. The study further reinforces the need for setting up local normative references based on its findings that international norms could result in lower interpretations in view of the differences between anthropometric features and the learning setting in Malaysian schools. Hence establishing the Malaysian age and sex specific norms with local validation and the feasibility test in schools to be a fair, meaningful, influential national framework in the field of child fitness monitoring improves.

CONCLUSIONS

This paper synthesised evidence from major international field-based assessment batteries (ALPHA-FIT, PERF-FIT, and TGMD-3) to inform the development of a more holistic physical fitness test framework for Malaysian children aged 7–9 years. While ALPHA-FIT offers strong population-relevant measures of health-related fitness, it does not sufficiently capture movement quality and neuromotor competence. Conversely, PERF-FIT and TGMD-3 contribute meaningful insights into functional motor

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fitness and fundamental movement competence, but do not fully address key health surveillance components such as aerobic endurance and muscular strength. Accordingly, an integrated assessment direction is proposed to combine core health-related fitness measures with motor competence domains to better reflect the interdependence between physiological capacity and movement competence in early primary children. Such integration supports more developmentally appropriate profiling for early screening and targeted intervention planning in schools, while improving alignment with Malaysian curriculum priorities that emphasise movement skill development.

From an implementation point of view, the effectiveness of an integrated model requires standardised field-based protocols, consistent scoring, and sufficient teacher training protocols in general to provide reliability and comparability between schools. Furthermore, as international norms may not suit local anthropometric and contextual features, it is also crucial to introduce Malaysian normative references in order to allow for fair comparison and benchmarking between districts and states. Furthermore, the literature review suggested that future work needs to be more rigorous in the areas of local validation, feasibility testing in schools and age- and sex-specific normative values to ensure that systematic child fitness monitoring will be a valuable framework in future research in Malaysia. In summary, a multidimensional, integrated field-based assessment of health-related fitness coupled with motor competence should serve as a more developmentally appropriate foundation for screening and intervention design among Malaysian children aged 7–9 years than single-domain monitoring.

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CONFLICT OF INTEREST

The authors declare no conflicts of interest" should be included if there is no conflict of interest.

AUTHORS CONTRIBUTION

Noraini Zainudin.: Conceptualization, Methodology, Writing – Original Draft. **Siti Hartini Azmi.**: Supervision, Validation, Writing – Review & Editing. **Ganathevan Elumalai.**: Investigation, Resources, Writing – Review & Editing.

AVAILABILITY OF DATA AND MATERIALS

Data available within the article or its supplementary materials.

DECLARATION OF GENERATIVE AI

During the preparation of this work, the authors used ChatGPT to enhance the clarity and readability of the writing. After using ChatGPT, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

ETHIC STATEMENTS

Not applicable

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