COMPETITOR:
JURNAL PENDIDIKAN KEPELATIHAN OLAHRAGA
e-ISSN: 2657-0734 & p-ISSN: 2085-5389 ‖ Volume 18, Number 1, 2026 ‖ P.0001-0012

Standardization Of Physical Fitness Assessment Based On The Independent Curriculum: Scoping Review Of The Physical Education Instrument

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ABSTRACT

This study aims to examine the standardization and effectiveness of locally contextualized physical fitness assessment instruments within physical education, particularly in the implementation of the Independent Curriculum (Merdeka Curriculum). The urgency of this scoping review arises from persistent limitations in current fitness assessment practices, which often lack adequate validity, reliability, and contextual relevance to students' real-life conditions. The misalignment between standardized assessment tools and local socio-cultural contexts has frequently resulted in inaccurate interpretations of students' physical fitness levels and reduced educational impact. This study employed a qualitative scoping review design, systematically analyzing scholarly literature from accredited national and international journals, conference proceedings, academic books, and policy-related documents published within the last decade. Data were analyzed using content analysis, encompassing stages of data reduction, categorization, interpretation, and synthesis to identify dominant patterns, methodological trends, and empirical outcomes related to physical fitness assessment in physical education. The findings indicate that local context-based fitness assessment models consistently demonstrate superior effectiveness compared to conventional approaches. Empirical evidence synthesized across studies shows an average 30% improvement in students' physical fitness, markedly higher than the 10% improvement associated with traditional assessment methods. The most significant gains were observed in cardiovascular endurance (34%) and agility, reflecting the influence of authentic, contextually relevant physical activities. Moreover, approximately 85% of students exhibited increased intrinsic motivation and learning engagement, underscoring the critical role of affective dimensions and structured feedback in assessment practices. In conclusion, locally contextualized physical fitness assessment instruments represent a strategic and evidence-based alternative for enhancing the quality of physical education. These findings provide a robust foundation for educators and policymakers to develop valid, relevant, and meaningful assessment frameworks aligned with the goals of the Independent Curriculum in fostering a healthy, adaptive, and competitive generation.

ARTICLE HISTORY
Received: 2025/12/03
Accepted: 2025/12/23
Published: 2026/02/01

KEYWORDS
Physical Fitness Assessment;
Independent Curriculum;
Physical Education;
Local Context;
Scoping Review.

AUTHORS' CONTRIBUTION
A. Conception and design of the study;
B. Acquisition of data;
C. Analysis and interpretation of data;
D. Manuscript preparation;
E. Obtaining funding

Cites this Article : Setiawan, Ardiansyah; Mangawiang, A. Muh Dzakawan; Pangalingan, Ega; Zulkifli, Zulkifli; Fadli, Fadli. (2026). Standardization Of Physical Fitness Assessment Based On The Independent Curriculum: Scoping Review Of The Physical Education Instrument. **Competitor: Jurnal Pendidikan Kepelatihan Olahraga**. 18 (1), p.0001-00012

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INTRODUCTION

Physical education is a fundamental component of the modern education system due to its strategic role in developing students' physical fitness, mental health, and social competence. Numerous studies confirm that physical education is not only oriented towards improving physical capacity but also contributes to the development of positive character, discipline, responsibility, and social skills relevant to daily life (Bailey et al., 2019; Mardiana, 2022; Kirk, 2023). Therefore, physical fitness evaluation is a crucial instrument for assessing the effectiveness of educational programs while ensuring the ongoing quality of learning.

In the context of Indonesian education, measuring physical fitness has become increasingly urgent with the implementation of the Independent Curriculum, which emphasizes flexibility, differentiation, and contextual learning. This curriculum provides teachers with the freedom to adapt the learning and assessment process to student characteristics and the learning environment (Kemdikbudristek, 2022). However, this flexibility also presents serious challenges, particularly in providing valid, reliable, objective, and fair assessment instruments. In physical education, weaknesses in assessment instruments have the potential to produce biased assessments that do not authentically reflect students' fitness abilities (Setiawan & Rahman, 2023; Thomas et al., 2020).

Another emerging issue is the predominant use of generic fitness assessment instruments that are poorly adapted to students' social, cultural, and environmental contexts. Several studies report that physical fitness assessments used in schools often adopt international standards without contextual modification, making them less relevant to students' local conditions (Dwi, 2021; Zhu et al., 2021). As a result, assessment data does not fully represent students' actual fitness levels and tends to reduce learning motivation and trust in the assessment system (Santoso & Utami, 2022; Hidayati et al., 2023).

Recent studies in physical education and fitness assessment have shown significant developments in evidence-based assessment approaches and authentic assessments. International research emphasizes the importance of construct validity, reliability, and instrument sensitivity in detecting changes in student fitness (Castelli et al., 2018; Ruiz et al., 2020). Furthermore, recent trends point to the integration of formative and summative assessments, which support continuous learning and improve student health literacy (Ennis, 2019; Keegan et al., 2022).

Furthermore, student engagement in the assessment process through self- and peer-assessment is gaining increasing attention. This approach has been shown to increase students' intrinsic motivation, health awareness, and sense of responsibility for their personal fitness (Rahmani et al., 2023; Leisterer & Jekauc, 2019). School-based research in several Asian and European countries also shows that participatory assessments are more effective when combined with local cultural and environmental contexts (Chen et al., 2021; Kokkonen et al., 2020).

In the Indonesian context, several studies have attempted to develop physical fitness instruments tailored to the characteristics of elementary and secondary school students.

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For example, Dewi et al. (2024) and Surya & Lestari (2022) emphasize the need for fitness assessments aligned with the Independent Curriculum (Kurikulum Merdeka) and based on students' actual activities. However, most of these studies still focus on technical aspects of measurement, such as norming and reliability testing, without comprehensively integrating the socio-cultural context and stakeholder participation. Thus, although the literature demonstrates methodological progress, the implementation of contextual and applicable fitness assessments in schools remains limited.

Based on the current literature review, there is a clear gap between the conceptual development of physical fitness assessments and their practical implementation in schools, particularly in the context of physical education in Indonesia. First, most of the instruments used do not fully meet validity and reliability standards in the flexible and diverse context of the Independent Curriculum (Setiawan & Rahman, 2023; Thomas et al., 2020). Second, research integrating local context dimensions—such as culture, social environment, and school infrastructure—is still very limited (Dwi, 2021; Hidayati et al., 2023).

Third, multi-stakeholder involvement (teachers, students, and parents) in the development of fitness assessment instruments has not been systematically explored. Yet, studies show that stakeholder collaboration can increase the relevance, acceptability, and sustainability of assessment instruments (Widiastuti & Prihatna, 2021; Kurniawan, 2022). Fourth, there is still a lack of research specifically analyzing the challenges of implementing physical fitness assessments under the Independent Curriculum framework, from the perspective of policy, pedagogy, and teacher preparedness. This gap highlights the need for research that is not only evaluative, but also transformative and contextual.

Based on these research issues and gaps, the primary objective of this study is to comprehensively explore the physical fitness assessment instruments used in physical education and analyze the challenges of their implementation within the context of the Independent Curriculum. This study also aims to identify principles for developing fitness assessments that are valid, reliable, and relevant to the local context of Indonesian students.

The novelty of this research lies in its integrative approach, which combines conceptual and empirical analysis of physical fitness assessments with a contextual and participatory perspective. Unlike previous research, which tends to focus on the technical aspects of measurement, this study emphasizes the importance of integrating socio-cultural contexts, stakeholder involvement, and alignment with the Independent Curriculum policy. Therefore, this research is expected to not only contribute to enriching the academic literature but also generate practical recommendations for teachers, schools, and policymakers in improving the quality of physical education assessments.

More broadly, the findings of this study are expected to serve as a basis for developing more inclusive and sustainable physical fitness assessment instruments, while also supporting the realization of a healthy, fit, and character-based Indonesian generation, as demanded by the challenges of education and public health in the modern era (Mansyur, 2023; Bailey et al., 2019).

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METHODS

This study employed a qualitative approach with a scoping review design, chosen to systematically, comprehensively, and transparently map the development of physical fitness assessment instruments in the context of physical education based on the Independent Curriculum. A scoping review was deemed appropriate because it allowed researchers to identify key concepts, methodological characteristics, instrument types, and research gaps without being limited to a specific study design, as recommended by Arksey and O'Malley and recent developments by Levac et al. and Peters et al. (Arksey & O'Malley, 2005; Levac et al., 2010; Peters et al., 2020).

Scoping Review Design and Framework

The scoping review in this study adhered to PRISMA-ScR (Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews) to ensure transparency, replicability, and methodological rigor (Tricco et al., 2018). The research framework includes five main stages: (1) identifying the research question, (2) identifying relevant studies, (3) selecting studies, (4) mapping and extracting data, and (5) synthesizing and reporting the results. This approach is widely used in studies of physical education and fitness assessment because it captures the complexity of the curriculum context, policies, and learning practices (Ennis, 2019; Castelli et al., 2018).

Data Search Sources and Strategies

Data sources in this study came from primary and secondary literature. Primary literature included articles from nationally and internationally accredited journals (Scopus, WoS, SINTA), reputable scientific seminar proceedings, and research reports relevant to physical fitness assessment and physical education. Secondary literature included textbooks, academic handbooks, educational policy documents, and assessment guidelines that provide a broader conceptual and contextual framework (Setiawan & Rahman, 2023; Bailey et al., 2019).

The literature search was conducted through major academic databases, namely Google Scholar, ResearchGate, Garuda Portal, and other supporting databases. The search strategy used a combination of keywords and Boolean operators, such as "physical fitness assessment" AND "physical education," "Independent Curriculum," "curriculum-based assessment," and "fitness test instrument." The publication range was limited to the last 10 years (2015–2024) to ensure the relevance and currency of the data, as recommended in recent studies on physical education fitness and assessment (Thomas et al., 2020; Ruiz et al., 2020).

Inclusion and Exclusion Criteria

Inclusion criteria included: (1) articles discussing physical fitness assessment instruments or models in the context of physical education, (2) research relevant to school curricula or educational policy, (3) reputable and fully accessible publications, and (4) empirical and conceptual studies. Meanwhile, exclusion criteria included articles not directly related to fitness assessment, focused on elite athletes without an educational context, or did not provide adequate methodological information. This selection approach aligns with scoping review practices in education and sport science (Peters et al., 2020; Kokkonen et al., 2020).

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Data Collection Techniques and Research Instruments

Data collection was conducted through documentation studies, identifying, collecting, and systematically reviewing relevant documents. The research instrument used was a document analysis matrix designed to extract key information from each source, including: research objectives, types of fitness instruments, validity and reliability aspects, curriculum context, and practical implications. The use of this matrix aims to increase analytical consistency and reduce researcher bias, as recommended in literature-based qualitative research (Bowen, 2009; Braun & Clarke, 2021).

Data Analysis Techniques

Data analysis was conducted using content analysis with a descriptive-analytical approach. The analysis process was carried out in stages and iteratively, including: (1) data reduction, by filtering information relevant to the research focus; (2) data categorization, based on key themes such as assessment standards, instrument validity, and curriculum suitability; (3) data interpretation, by linking empirical and conceptual findings from various studies; and (4) synthesis and drawing conclusions to formulate patterns, trends, and recommendations for the development of physical fitness assessments.

This iterative approach allows researchers to review and deepen their analysis until a comprehensive and accurate understanding is achieved (Miles et al., 2014; Tricco et al., 2018). Therefore, this method is expected to produce a mapping of physical fitness assessment standards that is academically robust, contextually relevant, and applicable for the implementation of the Independent Curriculum in physical education.

RESULTS AND DISCUSSION

Result

Based on a comprehensive analysis of various empirical studies, substantial evidence was found regarding the significant contribution of a local context-based physical fitness assessment model to the development of students' physical competencies in the context of physical education. Quantitative findings indicate a progressive transformation in physical fitness aspects, where the implementation of a local context-based approach resulted in objectively measurable improvements in fitness parameters (Mardiana, 2022). Experimental research showed that the group of subjects who received intervention through this approach experienced accelerated development with a magnitude of improvement reaching 30%, in contrast to the control group, which only achieved 10% progress through conventional methods (Setiawan & Rahman, 2023).

Hypothesis testing using the FitnessGram instrument confirmed the validity of the local context-based assessment model's influence on two key domains of physical fitness. Statistical analysis demonstrated an increase in the mean score from 65.20 in the pretest to 81.50 in the posttest, with a p-value <0.05, indicating strong statistical significance (Rahmani et al., 2023). Interesting findings were revealed in the distribution of improvements across fitness dimensions, with cardiovascular endurance showing a

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34% higher acceleration compared to muscular strength, which reached 26% (Widiastuti & Prihatna, 2021). The most substantial improvements were observed in endurance parameters, with a percentage increase of 22.7% and agility, reaching 20%, reflecting high responsiveness to local context-based learning stimuli.

Qualitative analysis revealed that this assessment model not only accelerated physical competency but also simultaneously optimized the psychological dimension of learning. Empirical data showed that 85% of study subjects experienced a significant increase in intrinsic motivation after participating in this learning approach (Hidayati et al., 2023). This phenomenon correlates with the learning characteristics that provide a meaningful context through direct experience and constructive feedback. The transformation of physical fitness scores from below average with a score of 80 to average with a score of 100 demonstrated the effectiveness of the structured intervention over an eight-week period (Dewi et al., 2024).

Validation from the Teaching Physical Education for Understanding (TPEfU) perspective strengthens the argument that a contextual approach to fitness assessment produces a significant effect size on physical fitness development. Action research studies show a progressive increase in completion rates from 5% before the cycle to 22% in the first cycle, and reaching a culmination of 94% in the second cycle, reflecting a cumulative increase of 89% (Purwanto, Rejeki, & Mentara, 2024). The integration of local elements into the assessment framework improves coordination, balance, and agility through more relevant and tailored learning experiences to student characteristics (Karim et al., 2024). The synthesis of findings confirms that a local context-based assessment model has significant potential to optimize physical fitness development by creating a learning atmosphere that is not only pedagogically effective but also enjoyable for students (Kristina, Ayu, & Putri, 2023).

Discussion

Effectiveness of Local Context-Based Physical Fitness Assessment Model

The main findings of this scoping review indicate that local context-based physical fitness assessment models are consistently more effective than conventional approaches in improving students' physical competencies. A synthesis of various empirical studies revealed that fitness gains in groups using local context-based assessments averaged 30%, while conventional approaches only showed an increase of around 10%. This pattern indicates that the relevance of students' social, cultural, and environmental contexts plays a crucial role in enhancing physical fitness engagement and learning outcomes (Setiawan & Rahman, 2023; Hidayati et al., 2023; Castelli et al., 2018).

Theoretically, this effectiveness can be explained through Vygotsky's social constructivism perspective, specifically the concept of the zone of proximal development (ZPD). Local context-based assessments provide meaningful and collaborative learning situations, enabling students to develop fitness capacities through social interactions and authentic experiences. In contrast to rigidly standardized, mechanistic assessments, a contextual approach allows students to relate physical activity to the realities of everyday

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life, which in turn enhances understanding, motivation, and internalization of fitness values (Dewi et al., 2024; Kirk, 2023; Ennis, 2019).

The transformation of fitness scores from below-average (±80) to average and above-average (±100) found in several studies strengthens the argument that structured and contextually designed assessments can accelerate fitness development beyond natural developmental patterns. These findings align with international research confirming that contextually relevant assessments function not only as measurement tools but also as learning drivers that encourage sustainable changes in physical behavior (Bailey et al., 2019; Ruiz et al., 2020).

Comparative Improvement in Endurance and Muscular Strength Components

Comparative analysis of physical fitness components reveals distinct patterns of improvement across domains. A literature synthesis indicates that endurance experienced the most significant improvement, with an average increase of 34%, compared to muscle strength, which increased by approximately 25%. This difference was particularly evident in studies using standardized instruments such as FitnessGram, which measures fitness components separately and specifically (Mardiana, 2022; Karim et al., 2024; Plowman & Meredith, 2019).

The greater increase in endurance may be attributed to the characteristics of local context-based activities, which tend to involve repetitive movements, longer durations, and moderate-to-high intensities, such as traditional games, environment-based activities, and contextual movement tasks. These types of activities provide a stronger physiological stimulus to the cardiovascular system than strength training, which generally requires a more specific training design (Zhu et al., 2021; Thomas et al., 2020).

From the perspective of motor learning theory, these findings align with the theory of variability of practice, which emphasizes that varying training conditions enhances the consolidation of movement patterns and physiological adaptation. Local context-based assessments create varied and authentic practice conditions, encouraging students to practice repeatedly in different situations (Kristina et al., 2023; Schmidt et al., 2019). Furthermore, significant increases in muscle endurance (±24%) and muscle strength (±21%) indicate that contextually relevant assessment designs are highly responsive to the developmental characteristics of school-age students.

Pedagogical Mechanisms and Contributions to Physical Fitness Assessment Theory

The success of the local context-based physical fitness assessment model can be understood through three main pedagogical mechanisms. First, this approach emphasizes situational understanding, namely the ability of students to relate fitness concepts to real-world situations in their environment. This situational understanding enriches the learning experience and enhances the transfer of knowledge from the learning context to everyday life (Kirk, 2023; Chen et al., 2021).

Second, the integration of direct and structured feedback in contextual assessments enables students to make movement corrections quickly and effectively. Studies show that immediate feedback in physical education contributes significantly to

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improving movement quality and learning efficiency, especially when linked to clear and relevant objectives (Keegan et al., 2022; Leisterer & Jekauc, 2019).

Third, creating a fun and meaningful learning environment plays a significant role in increasing students' intrinsic motivation. Increases in learning engagement of up to 85% reported in several studies confirm that affective aspects are a critical component in the success of physical fitness assessments (Budiman, 2024; Kokkonen et al., 2020).

In terms of theoretical contribution, the findings of this scoping review expand the theory of physical fitness assessment by simultaneously integrating cognitive, affective, and psychomotor dimensions. The increase in completion rates from 5% before the intervention to 94% after the implementation of context-based assessments demonstrates that this model is responsive to the developmental characteristics of students and the demands of the adaptive Independent Curriculum (Purwanto et al., 2024; Kemdikbudristek, 2022).

Thus, this discussion emphasizes that standardization of physical fitness assessments does not have to be mechanistically uniform but rather needs to accommodate contextual flexibility. These findings provide a strong empirical basis for educators and policymakers to design valid, relevant, and sustainable fitness assessment instruments, while enriching the body of physical education pedagogy with effective assessment models both quantitatively and qualitatively.

CONCLUSION

Based on the results of data synthesis and critical discussion, this study concludes that a local context-based physical fitness assessment model is demonstrably more effective than conventional assessment approaches in improving students' physical competence within physical education learning. Empirically, the model produced a 30% acceleration in physical fitness development, which substantially exceeded the 10% improvement observed in groups assessed using traditional methods. The upward shift in fitness scores from the below-average category (score ≈80) to the average and above-average categories (score ≈100) confirms that contextualized assessment is capable of optimizing students' physical development beyond normative patterns of progression.

Further comparative analysis revealed differentiated improvements across fitness components, with endurance showing the highest gain (34%), followed by muscular strength (25%), indicating that assessments grounded in authentic and locally relevant activities provide stronger physiological stimuli, particularly for cardiovascular endurance and agility. Beyond quantitative outcomes, this study highlights important affective benefits, as 85% of students demonstrated increased motivation and learning engagement, reflecting the role of contextual relevance and immediate feedback in fostering meaningful learning experiences.

Conceptually, these findings reinforce contemporary pedagogical perspectives that view assessment not merely as a measurement tool, but as an integral component of learning. This study contributes to physical education pedagogy by offering robust

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empirical support for innovative, flexible, and context-responsive assessment strategies that align with the Independent Curriculum and support sustainable physical development in students.

ACKNOWLEDGMENTS

The authors would like to express their sincere gratitude to all parties who contributed to the completion of this study. Special appreciation is extended to the academic institutions and educational stakeholders who provided valuable access to scholarly resources, policy documents, and empirical studies that formed the foundation of this scoping review. They support enabled a comprehensive and systematic exploration of physical fitness assessment instruments within the framework of the Independent Curriculum.

The authors also acknowledge the contributions of researchers and educators in the field of physical education whose previous empirical findings and theoretical insights significantly informed the conceptual framework and analytical perspectives of this study. The integration of diverse and high-quality literature is essential in ensuring the rigor, relevance, and credibility of the research outcomes.

Furthermore, appreciation is conveyed to peer reviewers and academic colleagues for their constructive feedback and critical insights, which substantially enhance the clarity, coherence, and scholarly quality of the manuscript. Their comments were instrumental in refining the methodological approach and strengthening the interpretation of findings.

Finally, the authors gratefully acknowledge the support of academic database providers and open-access platforms that facilitated access to reputable national and international publications. This study would not have been possible without the collective contributions of these individuals and institutions, whose support has played a vital role in advancing research and innovation in physical education assessment.

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