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Pedagogical implications of physical condition assessments: Guiding training programs in early-age *pencak silat* extracurriculars

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Abstract

Background: Physical condition assessment is not merely a physiological tool for injury prevention, but an essential pedagogical instrument for coaches to design targeted instruction and evaluate training curricula. **Objectives:** This study aims to evaluate the physical condition profiles of student-athletes in an early-age *pencak silat* extracurricular program in Yogyakarta and analyze its pedagogical implications for instructional design. **Methods:** This empirical survey involved 53 student-athletes (32 boys and 21 girls). Data were collected using a 7-item physical fitness test battery. Descriptive statistics were utilized to map the students' diverse instructional needs and physical capacities. **Results:** The overall findings indicated that the majority of male and female student-athletes possess good physical condition. However, the data mapping revealed a diversity in abilities, specifically identifying a subset of students whose physical condition remains sub-optimal. **Conclusion:** The current extracurricular training curriculum has broadly produced positive impacts. Pedagogically, this assessment framework is crucial for coaches to identify students requiring differentiated instruction. Future research should explore the integration of formative assessment literacy into coach education programs.

Keywords: Pedagogical Assessment; Differentiated Instruction; Coach Education; *Pencak silat*; Early Childhood

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INTRODUCTION

Pencak silat is an indigenous cultural heritage of Indonesia that must be nurtured by the nation's future generations through structured educational integration (Burhan et al., 2026; Fikri et al., 2025; Lestari & Wijayanti, 2026). One of the government's efforts to preserve this cultural heritage is integrating *pencak silat* into the school curriculum as a featured sport in the National Student Sports Olympics (O2SN), held annually across elementary, junior

high, and high school levels (Yunita et al., 2026). To participate and succeed in these educational competitions, student-athletes must master basic technical skills alongside foundational physical conditioning (Firdaus et al., 2026).

Physical condition is a fundamental aspect of every sport (Hilmawan et al., 2026). In the context of early-age extracurricular programs, biomotor components—such as body composition, flexibility, speed, agility, strength, and cardiovascular endurance (Hasan, 2026; Riyandi et al., 2026)—serve as essential indicators of a student's developmental readiness. Achieving optimal physical condition requires a structured and consistent training curriculum (Bompa & Haff, 2009). For long-term athletic development, instructors must strategically adjust training volumes according to age, gender, and individual physical baselines to ensure developmentally appropriate practice (Bompa & Carrera, 2015).

From a pedagogical perspective, evaluating a student-athlete's initial physical condition is a critical instructional competency. Formative physical assessments allow coaches to map diverse learning needs and implement differentiated instruction. This approach minimizes the risk of excessive physical strain, which can hinder growth and lead to sports injuries that disrupt the student's learning progression (Arsyandi et al., 2025). Furthermore, periodic physical condition assessments are necessary to evaluate the effectiveness of the implemented training curriculum.

Despite its critical instructional value, coaches frequently neglect periodic physical condition assessments, particularly for young *pencak silat* athletes. This omission often highlights a gap in pedagogical assessment literacy, leading to the application of uniform, one-size-fits-all training programs. Early childhood is a vulnerable developmental stage; when training intensity ignores individual physical capacities, growth can be stunted, and susceptibility to injury increases. Recognizing the pedagogical importance of formative evaluation, this study aims to assess the physical fitness profiles of student-athletes in an early-age *pencak silat* extracurricular program at an elementary school in Yogyakarta. Rather than solely reporting physiological outcomes, this study utilizes these assessments to evaluate the current

training syllabus, providing a data-driven foundation for coaches to design targeted and differentiated follow-up training curricula.

METHOD

Study Design and Participants

This empirical survey study was designed to evaluate the physical condition profiles of early-age student-athletes, serving as a formative assessment to inform pedagogical practices in an extracurricular *pencak silat* program in Yogyakarta. A total of 53 student-athletes—comprising 32 boys and 21 girls—participated in this study. The sample represents the typical diversity of physical capacities present in a standard early-childhood sports education setting, providing a basis for evaluating instructional effectiveness.

Ethical Approval Statement

Prior to data collection, the research team conducted a briefing with all parents and guardians to explain the pedagogical purpose and procedures of the assessments. Following the explanation, written informed consent was obtained from all guardians for their children to participate as subjects. All student data is stored securely by the research team to guarantee confidentiality, and access is strictly restricted to the research team.

Research Instruments

To ensure an accurate formative evaluation, the study utilized a validated 7-item physical test battery specifically designed for early-age *pencak silat* (Nurhidayah et al., 2025). This battery serves as a comprehensive assessment tool covering key biomotor components required for the sport. The psychometric properties of each test item, categorized by gender, are detailed in Table 1.

Table 1. Validity and Reliability of the Early-Age *Pencak silat* Physical Test Battery

Biomotor Component	Test Instrument	Validity (Male)	Validity (Female)	Reliability (Male)	Reliability (Female)
Flexibility	Sit-and-reach test	0.982	0.976	0.991	0.988
Speed	30-meter sprint	0.924	0.732	0.961	0.820
Upper Body Strength	Push-ups	0.967	0.939	0.983	0.967
Core Strength	Sit-ups	0.963	0.913	0.981	0.953
Agility	Side step	0.747	0.745	0.855	0.850

Biomotor Component	Test Instrument	Validity (Male)	Validity (Female)	Reliability (Male)	Reliability (Female)
Lower Body Endurance	Wall sit	0.997	0.996	0.998	0.998
Cardiovascular Endurance	Beep test	0.989	0.978	0.993	0.989

Data Analysis

Data were analyzed using descriptive statistics, specifically percentage distributions, computed via Microsoft Excel. The raw measurement results were classified and interpreted using established physical test norms for early age *pencak silat* (Nurhidayah et al., 2024). From a pedagogical standpoint, rather than solely reporting central tendencies, the percentage distributions were analyzed to map the diverse skill levels across the cohort. This analytical approach highlights the specific proportion of students in the lower percentiles, thereby identifying where coaches must implement differentiated instructional interventions within the training curriculum.

RESULT

The physical condition assessments serve as a formative evaluation tool to map the diverse instructional needs of the student-athletes. The results for the seven biomotor components are presented in Tables 2 through 8.

Table 2. Flexibility Test Results (Sit-and-Reach)

Classification	Male Frequency	Male (%)	Female Frequency	Female (%)
Excellent	10	31%	7	33%
Good	17	53%	8	38%
Average	4	13%	5	24%
Poor	1	3%	1	5%
Very Poor	0	0%	0	0%

Table 2 illustrates the flexibility profiles of the student-athletes. While the majority of both male (84% excellent/good) and female (71% excellent/good) students demonstrate adequate flexibility, a notable proportion—16% of males and 29% of females—fall into the average or poor categories. Pedagogically, this indicates a subset of students who require targeted stretching modifications and differentiated instruction within the warm-up curriculum to support their physical development.

Table 3. Speed Test Results (30-Meter Sprint)

Classification	Male Frequency	Male (%)	Female Frequency	Female (%)
Excellent	5	16%	4	19%
Good	12	38%	14	67%
Average	12	38%	3	14%
Poor	3	9%	0	0%
Very Poor	0	0%	0	0%

Table 3 shows the speed assessment outcomes. Although 54% of males and 86% of females achieved good to excellent scores, nearly half of the male student-athletes (47%) are classified as average or poor. This variance highlights a need for coaches to adjust the intensity of speed-based drills, ensuring that students in the lower percentiles are not overexerted while still receiving appropriate stimuli for motor skill acquisition.

Table 4. Upper Body Strength Results (30-Second Push-Up)

Classification	Male Frequency	Male (%)	Female Frequency	Female (%)
Excellent	9	28%	1	5%
Good	15	47%	17	81%
Average	7	22%	1	5%
Poor	1	3%	2	10%
Very Poor	0	0%	0	0%

Table 4 presents the upper body strength profiles. The assessment reveals that 75% of males and 86% of females possess good to excellent upper body strength. However, the presence of students in the average and poor categories (25% of males, 15% of females) suggests that the training syllabus should incorporate exercise regressions (e.g., knee push-ups or incline push-ups) to accommodate diverse strength levels safely.

Table 5. Core Strength Results (30-Second Sit-Up)

Classification	Male Frequency	Male (%)	Female Frequency	Female (%)
Excellent	13	41%	8	38%
Good	11	34%	9	43%
Average	8	25%	4	19%
Poor	0	0%	0	0%
Very Poor	0	0%	0	0%

Table 5 indicates the core strength assessment results. The data shows strong foundational core strength across the cohort, with no students falling into the poor or very poor categories. From a curriculum perspective, the current core training methods appear developmentally appropriate and effective for this age group, though the 25% of males and 19% of females in the average category still require consistent monitoring.

Table 6. Agility Test Results (Side Step)

Classification	Male Frequency	Male (%)	Female Frequency	Female (%)
Excellent	1	3%	1	5%
Good	20	63%	12	57%
Average	9	28%	5	24%
Poor	2	6%	3	14%
Very Poor	0	0%	0	0%

Table 6 outlines the agility capabilities of the participants. While most students are categorized as good, 34% of males and 38% of females fall into the average to poor range. Because agility is crucial for spatial awareness and evasion techniques in *pencak silat*, educators should integrate more foundational, low-complexity footwork drills into the curriculum for these specific students before advancing them to complex sparring maneuvers.

Table 7. Leg Strength Results (Wall Sit)

Classification	Male Frequency	Male (%)	Female Frequency	Female (%)
Excellent	15	47%	2	10%
Good	15	47%	8	38%
Average	2	6%	10	48%
Poor	0	0%	1	5%
Very Poor	0	0%	0	0%

Table 7 displays lower body endurance data. There is a distinct variance between genders; while 94% of males scored good or excellent, 53% of females scored in the average to poor range. This significant demographic disparity signals a critical pedagogical intervention point. Coaches must evaluate whether the current instructional cues and lower-body training volumes are adequately engaging female student-athletes, and adjust the programming accordingly.

Table 8. Cardiovascular Endurance Results (Beep Test)

Classification	Male Frequency	Male (%)	Female Frequency	Female (%)
Excellent	5	16%	3	14%
Good	16	50%	13	62%
Average	11	34%	4	19%
Poor	0	0%	1	5%
Very Poor	0	0%	0	0%

Table 8 reflects the cardiovascular endurance levels. Overall, the extracurricular program has fostered robust aerobic capacity, with a majority of students performing well. However, the 34% of males and 24% of females in the average-to-poor categories represent students who may struggle with sustained focus and technique fatigue during prolonged practice sessions.

Instructors should use these insights to strategically schedule rest intervals during training.

DISCUSSION

The formative assessment of the student-athletes' physical conditions provides critical insights for pedagogical intervention and curriculum evaluation in early-age *pencak silat* extracurricular programs. The overall positive results in flexibility and speed validate the current instructional approach used by the educators. The consistent integration of diverse stretching modalities in the curriculum—including static, dynamic, active, passive, and Proprioceptive Neuromuscular Facilitation (PNF)—has proven pedagogically effective in enhancing students' flexibility (Fahrizal et al., 2026; Gözaçık & Aysan, 2026; Ikeda et al., 2026). Furthermore, educators must recognize that age and gender biologically intersect with motor learning; prepubescent children and female students naturally exhibit higher baseline flexibility (Novianti et al., 2026; Preti et al., 2026). Instructionally, the favourable speed profiles suggest that the learning environment adequately stimulates the students' biomotor capacities, serving as a robust foundation for more complex motor skill acquisition (Bompa & Buzzichelli, 2014). Despite the generally positive outcomes, the assessments of strength (via push-ups, sit-ups, and wall sits) and agility (via side steps) underscore the necessity for differentiated instruction within the physical education setting. The healthy average strength levels validate the use of developmentally appropriate bodyweight training for young learners (Mengistu et al., 2025; Sutoro et al., 2026; Wijaya et al., 2023). However, physical capacity is not homogenous. Strength is fundamental for producing force against an external load (Bompa et al., 2012), while agility dictates the ability to rapidly change direction in dynamic, unpredictable environments (Ye et al., 2026). For students mapping in the lower percentiles for these metrics, coaches cannot apply a uniform training stimulus. Instructors must design individualized progressions and regressions—such as modified push-ups or low-complexity footwork drills—ensuring all learners safely develop the physical prerequisites for evasive and offensive maneuvers without the risk of overtraining. Finally, while the robust cardiovascular endurance scores indicate that the current

training volume adequately prepares students for the metabolic demands of competitive matches, physical evaluation is only one facet of comprehensive coaching pedagogy. To foster holistic student development, coach education programs must emphasize the integration of psychological assessments alongside physical tests, as mental readiness and achievement motivation significantly impact learning outcomes and athletic performance (Gandinni et al., 2025). Although this study provides actionable pedagogical frameworks, it is subject to limitations. The small sample size restricts the broader generalizability of the findings to a localized context. Future educational research should incorporate qualitative, in-depth interviews with coaches and physical education teachers to explore the instructional decision-making processes they apply after receiving these formative assessment results.

CONCLUSIONS

The physical fitness profiles of young male and female *pencak silat* athletes indicate generally good to very good fitness levels across the biomotor components assessed. However, individual differences suggest that some athletes need targeted training to improve specific fitness components. Therefore, individualized training programs may be more effective than a uniform approach. Since this study used a cross-sectional design, it cannot determine the effects of training on physical fitness over time. Future research should use longitudinal or intervention-based designs and include psychological, technical, tactical, and biological maturation assessments. These approaches may help develop age-appropriate training programs that support athlete development and competitive performance.

AUTHOR CONTRIBUTIONS

Conceptualization: D.N., T.P., F.A.N., & D.M.; Methodology: D.N., T.P., F.A.N., & D.M.; Investigation: D.N., T.P., F.A.N., & D.M.; Data curation: F.A.N., & D.M.; Formal analysis: D.N. & D.M.; Project administration: T.P., & F.A.N.; Visualization: D.N. & F.A.N.; Writing – original draft: D.N., T.P., F.A.N., & D.M.; Writing – review & editing: D.N., T.P., F.A.N., & D.M. All authors have read and approved the final version of the manuscript and agree to be accountable for the integrity and accuracy of the work.

ETHICAL STATEMENT

The study was conducted in accordance with ethical principles for research involving human participants. Formal permission to conduct the study was obtained from the relevant educational authorities and school prior to data collection. The research procedures were coordinated with the coach before the study was conducted.

INFORMED CONSENT

Written informed consent was obtained from the participants' parents or legal guardians prior to participation in the study. In addition, assent was obtained from all participating students. Participation was voluntary, and participants were informed that they could withdraw from the study at any time without penalty.

DECLARATION OF GENERATIVE AI AND AI-ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

During the preparation of this manuscript, the authors used ChatGPT (OpenAI) solely to improve language, grammar, and readability. After using this tool, the authors reviewed and edited the content as needed and take full responsibility for the accuracy, integrity, and content of the publication.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest with any party in the implementation of this research.

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