Assessment of Physical Literacy Levels of Elementary School Students in Physical Education Learning Using CAPL-2: A Cross-Sectional Study

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Abstract

Background and Study Aim. This study aims to analyze and classify the physical literacy levels of elementary school students using CAPL-2 and identify potential differences based on gender across three key domains: Physical Competence, Motivation & Confidence, and Knowledge & Understanding.

Material and methods. A cross-sectional study design was employed, involving 169 students aged 8–12 years from ten elementary schools in Lombok, West Nusa Tenggara, Indonesia. Data were collected using CAPL-2, focusing on three domains: Physical Competence (assessed via CAMSA), Motivation & Confidence, and Knowledge & Understanding. Descriptive statistics, Independent Sample Test, and categorical classification were used for data analysis.

Results. The findings revealed that the majority of students were categorized in the Beginning and Progressing levels across all domains. Boys scored slightly higher in Physical Competence, while girls outperformed boys significantly in Knowledge & Understanding (p = 0.017). No significant gender differences were observed in the Motivation & Confidence domain.

Conclusions. The overall physical literacy levels of Indonesian elementary school students remain below optimal standards, with significant gaps in Knowledge & Understanding. Holistic interventions are needed, including improved curriculum design, teacher training, equal access to facilities, and community involvement, to enhance physical literacy outcomes in Indonesia.

Key words: physical Literacy, Canadian Assessment of Physical Literacy (CAPL-2), physical competence, motivation and confidence, knowledge and understanding.

Анотація

Оцінка рівня фізичної грамотності учнів початкової школи під час навчання фізичному вихованню з допомогою CAPL-2: перехресне дослідження

Передумови та мета дослідження. Метою даного дослідження є аналіз та класифікація рівнів фізичної грамотності учнів початкової школи з використанням CAPL-2 та виявлення потенційних відмінностей залежно від статі за трьома ключовими областями: фізична компетентність, мотивація та впевненість, а також знання та розуміння.

Матеріал і методи. Було застосовано дизайн перехресного дослідження, у якому брали участь 169 учнів віком 8–12 років з десяти початкових шкіл у Ломбок, Західна Мала Тенгара, Індонезія. Дані були зібрані за допомогою CAPL-2, зосереджуючись на трьох областях: фізична компетентність (оцінена за допомогою CAMSA), мотивація та впевненість, а також знання та розуміння. Для аналізу даних використовувалася описова статистика, незалежний вибірковий тест та категоріальна класифікація.

Результати. Висновки показали, що більшість студентів були віднесені до початкових і прогресуючих рівнів у всіх областях. Хлопчики набрали дещо більше балів за фізичною компетентністю, тоді як дівчатка значно перевершили хлопчиків за знаннями та розумінням (p = 0,017). У сфері мотивації та впевненості суттєвих

гендерних відмінностей не спостерігалося.

Висновки. Загальний рівень фізичної грамотності індонезійських учнів початкової школи залишається нижчим за оптимальні стандарти, зі значними прогалинами у знаннях і розумінні. Необхідні комплексні втручання, включаючи покращення розробки навчальної програми, підготовку вчителів, рівний доступ до об'єктів та залучення спільноти для покращення результатів фізичної грамотності в Індонезії.

Ключові слова: фізична грамотність, канадська оцінка фізичної грамотності (CAPL-2), фізична компетентність, мотивація та впевненість, знання та розуміння.

Introduction

Physical literacy refers to a combination of motivation, confidence, physical competence, knowledge, and understanding necessary for an individual to remain physically active throughout their lifetime [1]. This concept has been widely recognized in global scientific research and serves as a critical foundation for formulating policies related to physical education, sports, and public health [2]. Beyond the mastery of motor skills, physical literacy emphasizes the importance of intrinsic motivation and adequate knowledge to ensure individuals remain engaged and capable of actively participating in physical activities across all stages of life.

Whitehead [1] emphasizes that physical literacy should be understood as a lifelong journey involving the development of motor skills, confidence, and knowledge about the importance of physical activity for health. This perspective represents a significant shift in the paradigm of physical education, where the focus extends beyond technical sports skills to include the development of individuals capable of understanding, enjoying, and sustaining an active lifestyle throughout their lives.

Globally, awareness of the importance of physical literacy has grown rapidly and become a central focus in public policies across developed countries. For example, the *Healthy China 2030 Planning Outline* emphasizes the integration of physical literacy into national education and health policies as a strategic step to improve the population's quality of life [3]. In Singapore, physical literacy has been incorporated into the national curriculum to ensure children acquire the necessary skills and motivation to remain physically active throughout their lives [4]. These countries have demonstrated that physical literacy is not merely an educational issue but also an integral component of public health and overall social development.

Research also indicates that physical literacy developed from an early age has positive impacts not only on physical health but also on cognitive function, emotional well-being, and academic achievement [5,6]. Physically active children tend to have better concentration, stronger memory, and higher academic performance compared to their less active peers [7]. Furthermore, social and emotional skills such as resilience, cooperation, and self-confidence are also nurtured through consistent and well-guided physical activity [8,9].

Although physical literacy has gained global attention, its implementation in Indonesia still faces several challenges. Physical education in Indonesia often remains focused on competitive sports skills rather than the comprehensive development of physical literacy. Furthermore, the absence of consistent and nationally recognized assessment standards for measuring physical literacy complicates efforts to improve the quality of physical education in schools [4].

Existing research on physical literacy in Indonesia tends to be fragmented and focused on specific aspects. For example, several studies have explored the conceptual overview of physical literacy [10], the integration of physical literacy into physical education curricula [11,12], and the effectiveness of active games and traditional sports in enhancing students' physical literacy [13,14]. However, these studies have yet to provide a comprehensive picture of how physical literacy can be systematically measured, monitored, and sustainably improved in Indonesia. Additionally, the lack of awareness and understanding among physical education teachers about physical literacy remains a significant barrier. Many teachers still perceive physical education merely as routine sports activities, without recognizing the importance of developing students' motor skills, motivation, and holistic knowledge [15]. Consequently, the goal of physical education to foster individuals equipped with the skills and motivation for a healthy and active lifestyle is often not optimally achieved.

One of the most commonly used instruments for measuring physical literacy is the *Canadian Assessment of Physical Literacy (CAPL-2)* [16]. This instrument has been proven to have high reliability and validity in assessing four key domains of physical literacy: *Physical Competence*, *Motivation & Confidence*, *Knowledge & Understanding*, and *Daily Behaviour* [17]. However, the implementation of CAPL-2 in Indonesia still faces sev-

eral significant challenges.

First, CAPL-2 was developed within a Western educational context and may not fully align with Indonesia's cultural and educational settings [4,18]. Differences in teaching methods, preferences for physical activities, and students' understanding of the importance of physical activity can influence assessment outcomes using this instrument. Second, there are limitations in teacher training for properly understanding and applying CAPL-2. Without adequate training, physical education teachers may struggle to administer assessments consistently and accurately [15]. This can undermine the reliability of the collected data and hinder evidence-based improvement efforts. Third, the lack of support from national education policies for integrating physical literacy into the physical education curriculum further complicates this issue in Indonesia [4]. Existing policies often fail to provide clear guidelines on how physical literacy should be taught, assessed, and monitored within the formal education system.

Internationally, efforts to adapt *CAPL-2* in various countries have shown positive results. In Denmark and Greece, *CAPL-2* was successfully adapted and validated to ensure alignment with local cultural and educational contexts [19,20]. These studies demonstrate that, with a careful adaptation process, *CAPL-2* can serve as an effective tool for assessing children's physical literacy across countries with diverse cultural backgrounds. Furthermore, research from countries such as China and Singapore highlights that culturally and contextually grounded approaches are essential to ensure the effectiveness of physical literacy assessment tools [21,22]. This adaptation process involves not only translating the instrument but also adjusting the context of physical activities and assessment scenarios to better reflect students' daily lives and experiences.

This study aims to analyze and classify the levels of physical literacy among elementary school students using the *CAPL-2* instrument, which has been culturally and pedagogically adapted. The research is expected to provide a more comprehensive understanding of the state of physical literacy among elementary school students in Lombok, West Nusa Tenggara, Indonesia, as well as offer clear recommendations for developing physical education curricula and teacher training programs. Thus, the findings of this study can serve as a solid foundation for formulating more effective policies to enhance children's physical literacy in Indonesia.

Materials and Methods

Participants

The participants in this study were public elementary school students aged 8 to 12 years from ten different elementary schools on Lombok Island, West Nusa Tenggara, Indonesia. A total of 169 students participated, consisting of 85 boys and 84 girls, with an average age of 10.14 years and a standard deviation of 0.75. Participants were selected using a *stratified random sampling* method to ensure that the sample represented various age groups, genders, and other demographic characteristics [23].

Before the study commenced, parents or guardians of the students were provided with a thorough explanation of the study's objectives, procedures, and potential risks. The *informed consent* process was conducted transparently, ensuring that each participant and their guardians fully understood their rights, including the right to withdraw from the study at any time without any consequences [24]. Additionally, throughout the research process, participants' physical and psychological well-being was safeguarded by maintaining a friendly, safe, and pressure-free research environment. In recruiting participants, researchers also considered the local social and cultural context, including educational norms and students' preferences for physical activities in Lombok. This approach is expected to ensure more accurate and contextually relevant data representation while minimizing biases in the study's results.

Research Design

This study employs a cross-sectional design, aiming to understand the relationship between risk factors and their impacts through data collection at a specific point in time [25]. This approach was chosen for its ability to provide a representative snapshot of the relationships between the studied variables in a relatively short and efficient timeframe. In the context of this research, the cross-sectional design enables the simultaneous measurement of elementary school students' motivation, confidence, physical competence, as well as knowledge and understanding using the *Canadian Assessment of Physical Literacy (CAPL-2)* instrument.

Cross-sectional design have been widely used in physical literacy research due to their ability to identify patterns and trends within larger populations. This study examines the dynamics of these variables in a sample of students of varying ages, genders, and backgrounds at a single point in time, thereby providing a clear snapshot of the relationships between the measured variables [22,26]. Although this design has limitations, such as its inability to establish causal relationships [27], its application remains relevant and significant in this research context.

Through this design, the data obtained are expected to provide a strong foundation for de-

veloping practical recommendations to enhance the quality of physical education in Indonesia. Additionally, this approach allows researchers to analyze various factors influencing students' physical literacy levels, such as differences in age, gender, and learning environments. Therefore, this study not only aims to describe the current state of physical literacy but also to identify areas requiring further intervention within the context of physical education in Indonesia.

Research Instrument

This study employs the *Canadian Assessment of Physical Literacy (CAPL-2)* as the primary instrument to measure students' physical literacy levels. *CAPL-2* is a validated and reliable assessment protocol designed to evaluate the physical skills, motivation, knowledge, and physical activity behaviors of children aged 8–12 years [28]. This tool is specifically designed to provide a comprehensive assessment of the interconnected aspects of physical literacy, which collectively influence children's lifelong participation in physical activities.

In this study, the assessment focuses on three main domains of *CAPL-2*: *Physical Competence*, *Motivation & Confidence*, and *Knowledge & Understanding*. The *Physical Competence* domain is measured using the *Canadian Agility and Movement Skill Assessment (CAMSA)*, which evaluates children's fundamental movement skills through a series of complex and integrated movements [29]. This assessment includes 14 movement criteria, evaluated based on the accuracy and speed of movement execution.

The *Motivation & Confidence* domain is evaluated using a *self-report questionnaire* consisting of 12 items that assess intrinsic motivation, self-confidence, and students' preferences for physical activities [30]. This domain is crucial as it provides insights into how motivation and self-confidence influence students' engagement in physical activities. Meanwhile, the *Knowledge & Understanding* domain is measured through a series of questions designed to assess students' understanding of fundamental physical activity concepts, such as daily activity guidelines, cardiorespiratory fitness, muscle strength, and skill development [28].

CAPL-2 has undergone a validation and reliability process tailored to the context of elementary schools in Lombok, West Nusa Tenggara, Indonesia, with results indicating high internal consistency and reliability in measuring students' physical literacy [31]. This validation process involved a series of pilot tests and statistical analyses to ensure that each component of *CAPL-2* is reliable and produces consistent results across different groups of students. The construct validity of *CAPL-2* in the Indonesian context demonstrated that the instrument effectively captures key aspects of physical literacy relevant to students' characteristics. Furthermore, reliability testing showed a good level of internal consistency, ensuring that measurements conducted using this instrument can be repeated with similar outcomes.

The adaptation process of *CAPL-2* was not limited to translating the instrument into Indonesian but also involved adjustments to align with local cultural and pedagogical contexts. This adaptation considered various factors, including social norms, physical activity habits, and teaching methods in physical education in Indonesia. These adjustments were made to ensure that students could easily understand the instructions and questions in the assessment, resulting in more accurate outcomes that genuinely reflect their actual conditions. This cultural adaptation also included input from physical education experts, school teachers, and direct participation from students during the initial pilot testing of the instrument [31].

Data Collection Procedures

The data collection process in this study followed the guidelines for the translation and adaptation of the *Canadian Assessment of Physical Literacy (CAPL-2)* Indonesian version [31]. This procedure aimed to ensure consistency, accuracy, and reliability at every stage of assessment, so the results could accurately reflect the actual physical literacy levels of the students. Prior to data collection, the researchers conducted intensive training sessions for all involved parties, including physical education teachers and research assistants peneliti [32].

Data collection was conducted in a school environment to ensure student comfort and minimize external distractions. Schools were selected based on considerations of accessibility, availability of supporting facilities, and willingness to collaborate in this research. The data collection process was divided into two main sessions held on different days to reduce student fatigue and maintain the quality of the data obtained. In the first session, students were asked to complete the *Motivation & Confidence* and *Knowledge & Understanding* questionnaires, which were administered in a classroom setting under the direct supervision of researchers and physical education teachers.

In the second session, students participated in the *Physical Competence* assessment using the *Canadian Agility and Movement Skill Assessment (CAMSA)*. Before starting the assessment, students were given two simulation sessions of the CAMSA movements to ensure they fully understood the assessment procedures. The first simu-

lation was conducted at a slow pace to emphasize proper movement techniques and ensure students felt confident performing each stage of the movement. The second simulation was performed at optimal speed to provide an experience closer to actual assessment conditions. After completing the simulations, each student performed two official trials, with the best result recorded and analyzed according to *CAPL-2* guidelines [20,29].

Statistical Analysis

Data analysis in this study was systematically conducted using *IBM SPSS 23.0* software, aiming to accurately process, analyze, and interpret data from the *Canadian Assessment of Physical Literacy (CAPL-2)* assessment. The analysis process included normality testing, descriptive statistical analysis, categorization of physical literacy levels, and group difference testing using the *Independent Sample Test*. This approach was designed to provide a comprehensive overview of the distribution, relationships, and differences between variables in the physical literacy levels of elementary school students.

In the initial stage, a normality test was conducted using the *Kolmogorov-Smirnov* and *Shapiro-Wilk* methods to determine whether the collected data followed a normal distribution. This test is crucial because its results dictate the most appropriate statistical analysis method to be applied in subsequent stages [33,34]. A normal distribution is a prerequisite for applying parametric statistical tests, while a non-normal distribution requires the use of non-parametric statistical tests [27]. By performing this normality test, the analysis can be conducted using the appropriate method, minimizing interpretive bias and enhancing the validity of the results.

After confirming the data distribution, a *descriptive statistical analysis* was performed to summarize the data in terms of mean, standard deviation, minimum, and maximum values for each *CAPL-2* assessment domain: *Physical Competence*, *Motivation & Confidence*, and *Knowledge & Understanding*. This descriptive analysis provides an overview of how students' physical literacy scores are distributed across the research sample. Additionally, the analysis allows researchers to identify score distribution patterns

based on demographic variables such as age and gender. The results of this analysis are presented in tables and graphs to facilitate interpretation [23,35].

Subsequently, the assessment results were categorized into four levels of physical literacy: *Beginning*, *Progressing*, *Achieving*, and *Excelling*, based on the *CAPL-2* manual guidelines [36]. These categories provide a more specific context regarding each student's position in their physical literacy development. The *Beginning* level represents students requiring significant support to develop their physical literacy, while the *Excelling* level indicates students who exceed expectations and demonstrate strong potential for sustained engagement in physical activities. This categorization aids in understanding the distribution of results across the sample and supports the design of more targeted and effective intervention strategies.

To examine differences in physical literacy levels between groups based on gender, an *Independent Sample Test* was conducted. This test aims to identify whether there are significant differences in scores for *Physical Competence*, *Motivation & Confidence*, and *Knowledge & Understanding* between male and female students. The *Independent Sample Test* was performed while considering the assumption of equal variances using *Levene's Test for Equality of Variances*. If the assumption of equal variances was met, the *t-test* results were used to interpret differences between groups [33,37]. If the assumption was violated, the interpretation was based on adjusted *t-test* results (*unequal variances assumed*).
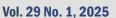
Results

Before proceeding with further analysis, a normality test was conducted using the *Kolmogorov-Smirnov* and *Shapiro-Wilk* methods to ensure that the data followed a normal distribution or met the assumptions for parametric statistical analysis.

The results of the normality test, presented in *Table 1*, indicate that for the *Fundamental Movement Skills (FMS)* and *Motivation & Confidence (MC)* components, both male and female students showed a tendency toward normal data distribution, with significance values above 0.05. For ex-

Table 1. Test of Normality

Component	Gender	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Fundamental Movement Skills	Boys	.096	85	.052	.972	85	.063
	Girls	.090	84	.087	.984	84	.371
Motivation & Confidence	Boys	.060	85	.200*	.971	85	.056
	Girls	.095	84	.057	.942	84	.001
Knowledge and Understanding	Boys	.109	85	.014	.973	85	.076
	Girls	.109	84	.015	.970	84	.050

ample, the *p*-value for *FMS* in male students was 0.063 (*Shapiro-Wilk*), and in female students, it was 0.371 (*Shapiro-Wilk*). However, for the *Knowledge & Understanding (KU)* component, the data distribution showed greater variability. The significance value for male students was 0.076 (*Shapiro-Wilk*), while for female students, it was 0.050 (*Shapiro-Wilk*), indicating a potential deviation from a perfectly normal distribution. Therefore, while most of the data met the assumptions of normality, further analysis of the *Knowledge & Understanding* component requires caution in selecting and applying appropriate statistical methods.

The results of the *descriptive statistical analysis*, presented in *Table 2*, show the average scores across the three main *CAPL-2* domains: *Fundamental Movement Skills (FMS)*, *Motivation & Confidence (MC)*, and *Knowledge & Understanding (KU)*. In general, male students tended to have slightly higher *FMS* scores compared to female students across all age groups. For example, 11-year-old male students had an average score of *21.34 ± 3.41*, while female students of the same age scored *20.69 ± 2.96*.

In the *Motivation & Confidence* component, average scores for male and female students were relatively balanced across all age groups. The average score for 11-year-old male students was *25.11 ± 2.84*, while female students scored *24.51 ± 4.33*. This small difference suggests that both male and female students exhibit relatively stable levels of motivation and confidence in physical activities.

Unlike the previous two components, the *Knowledge & Understanding* scores showed a different trend. Female students consistently scored higher than their male counterparts across all age groups. For instance, 11-year-old female students had an average score of *5.27 ± 1.34*, while male students scored *4.57 ± 1.82*. This trend highlights a gender gap in knowledge and understanding related to physical activity, suggesting potential areas for targeted intervention and improvement.

Based on the *score categorization results* presented in *Table 3*, most students fall into the *Beginning* and *Progressing* categories. In the *Fundamental Movement Skills (FMS)* component, *62.35%* of male students and *57.14%* of female students were classified as *Progressing*. This indicates that students' fundamental movement skills still require further reinforcement and development.

In the *Motivation & Confidence (MC)* component, the score distribution showed a more positive trend compared to the other components. Approximately *25.88%* of male students and *40.48%* of female students were categorized as *Excelling*.

Table 2. Descriptive statistics for participants by component, gender, and age (N = 169)

Component	Gender	Age	Mean	Var	SD	Min	Max
Fundamental Movement Skills (*CAMSA Score*)	Boys	9	19.7143	8.114	2.84856	16.00	25.00
		10	19.9655	9.034	3.00574	12.00	26.00
		11	21.3429	11.644	3.41229	14.00	26.00
	Girls	9	18.6471	10.493	3.23924	12.00	25.00
		10	19.0732	12.320	3.50992	13.00	27.00
		11	20.6923	8.782	2.96337	15.00	26.00
Total Component FMS			**19.9822**	**10.922**	**3.30489**	**12.00**	**27.00**
Motivation & Confidence (*CAPL–2 Questionnaire*)	Boys	9	22.3857	12.239	3.49847	15.90	29.00
		10	23.3586	11.256	3.35501	15.70	30.00
		11	25.1114	8.109	2.84768	18.20	29.50
	Girls	9	21.9941	24.579	4.95776	14.70	29.50
		10	22.8268	22.982	4.79390	13.10	30.00
		11	24.5135	18.750	4.33007	13.10	29.50
Total Component MC			**23.5121**	**16.776**	**4.09579**	**13.10**	**30.00**
Knowledge and Understanding (*CAPL–2 Questionnaire*)	Boys	9	4.2381	4.990	2.23394	0.00	8.00
		10	4.2759	5.564	2.35882	0.00	9.00
		11	4.5714	3.311	1.81959	1.00	9.00
	Girls	9	4.9412	3.184	1.78433	1.00	8.00
		10	5.0976	4.440	2.10719	1.00	9.00
		11	5.2692	1.805	1.34336	3.00	8.00
Total Component KU			**4.7515**	**3.974**	**1.99339**	**0.00**	**9.00**

FMS = Fundamental Movement Skills; MC = Motivation & Confidence; KU = Knowledge and Understanding; Mean = Average Score; Var = Variance; SD = Standard Deviation; Min = Minimum Score; Max = Maximum

Table 3. Interpretation categories for component scores of physical literacy

Component	Gender	N	Interpretation Categories			
			Beginning	*Progressing*	*Achieving*	*Excelling*
Fundamental Movement Skills	Boys	85	13 (15.29%)	53 (62.35%)	13 (15.29%)	6 (7.07%)
	Girls	84	17 (20.24%)	48 (57.14%)	12 (14.29%)	7 (8.33%)
Motivation & Confidence	Boys	85	5 (5.88%)	34 (40%)	24 (28.24%)	22 (25.88%)
	Girls	84	8 (9.52%)	23 (27.38%)	19 (22.62%)	34 (40.48%)
Knowledge and Understanding	Boys	85	53 (62.35%)	24 (28.24%)	5 (5.88%)	3 (3.53%)
	Girls	84	45 (53.57%)	29 (34.52%)	6 (7.15%)	4 (4.76%)
Total CAPL		**169**	**47 (27.81%)**	**70.33 (41.62%)**	**26.33 (15.58%)**	**25.34 (14.99%)**

Table 4. Independent test by gender and physical literacy components

Component	Levene's Test for Equality of Variances		t-test for Equality of Means				
	F	**Sig.**	**t**	**df**	**Sig. (2-tailed)**	**Mean Difference**	**Std. Error Difference**
Fundamental Movement Skills	.298	.586	1.948	167	.053	.982	.504
			1.948	166.353	.053	.982	.504
Motivation & Confidence	13.857	.000	1.047	167	.297	.65964	.62995
			1.045	149.446	.298	.65964	.63120
Knowledge & Understanding	1.769	.185	-2.417	167	.017	-.731	.302
			-2.419	164.215	.017	-.731	.302

These results suggest that students' motivation and confidence in physical activities are relatively strong compared to their physical skills and knowledge.

Conversely, in the *Knowledge & Understanding (KU)* component, the majority of students were classified as *Beginning*, with *62.35%* of male students and *53.57%* of female students falling into this category. This finding highlights an urgent need to enhance students' understanding of the importance of physical activity and its health benefits.

The results of the *Independent Sample Test*, presented in *Table 4*, indicate no significant differences between male and female students in the *Fundamental Movement Skills (FMS)* and *Motivation & Confidence (MC)* components, with significance values of *0.053* and *0.297*, respectively. However, in the *Knowledge & Understanding (KU)* component, a significant difference was observed, with a *p*-value of *0.017*. This finding suggests that female students have a better understanding of physical activity concepts compared to their male counterparts

Discussion

The findings of this study reveal that the level of physical literacy among elementary school students in Lombok remains low, with the majority of students concentrated in the *Beginning* and *Progressing* levels, particularly in the *Knowledge & Understanding* domain. These results reflect broader challenges also faced by developing countries in Southeast Asia, where limitations in resources, a lack of systematic physical education programs, and socio-cultural barriers contribute to low physical literacy levels among students [33,37]. This discussion will explore the study's findings within a broader context, considering the three main *CAPL-2* domains—*Physical Competence*, *Motivation & Confidence*, and *Knowledge & Understanding*—while also addressing influencing factors such as gender differences and cultural contexts.

Fundamental Movement Skills (FMS)

The *Fundamental Movement Skills (FMS)* domain assesses students' basic motor skills, such as balance, agility, and movement coordination. The study results indicate that male students tend to have slightly higher scores than female students across all age groups, although the difference is not statistically significant ($p = 0.053$, *Table 4*). The average score for 11-year-old male students was *21.34 ± 3.41*, while female students of the same age scored *20.69 ± 2.96* (*Table 2*). These findings suggest a slight advantage in motor skill performance among male students, potentially influenced by differences in physical activity preferences, opportunities for practice, and participation in structured physical activities.

This difference aligns with previous research, which found that boys are generally more engaged in motor skill-based physical activities outside school, such as playing soccer, running, or participating in game-based physical activities

[38,39]. These activities contribute positively to the development of boys' motor skills compared to girls, who often have more limited access to similar physical activity opportunities. This disparity may stem from social and cultural norms, differing activity preferences, or unequal encouragement and opportunities for girls to participate in structured or informal physical activities.

Another factor influencing these results is the difference in participation patterns in physical activities within family and school environments. Research indicates that in many Southeast Asian communities, boys are often encouraged to be more physically active, while girls are frequently subjected to social stereotypes that limit their participation in more challenging physical activities [40,41]. Additionally, access to sports facilities and extracurricular programs focusing on fundamental movement skills is often unevenly distributed, further exacerbating this gap [37]. These disparities highlight the need for more inclusive and equitable physical education policies and practices to ensure that both boys and girls have equal opportunities to develop their motor skills effectively.

To address these limitations, the physical education curriculum in schools needs to place greater emphasis on developing fundamental movement skills for all students, regardless of gender. An inclusive approach that incorporates enjoyable, activity-based methods—such as traditional games adapted for physical education purposes—can enhance girls' engagement and support them in developing better motor skills [14]. These strategies not only make physical activities more appealing but also help break down social stereotypes, creating an environment where both boys and girls have equal opportunities to participate, learn, and thrive in physical education programs.

Motivation & Confidence (MC)

The *Motivation & Confidence* domain shows relatively better results compared to the other two domains, with a more balanced distribution of scores between male and female students. The average score for 11-year-old male students was *25.11 ± 2.84*, while female students scored an average of *24.51 ± 4.33* (*Table 2*). Additionally, the score distribution across categories reveals that most students have reached the *Achieving* and *Excelling* levels, with *25.88%* of male students and *40.48%* of female students classified in the *Excelling* category (*Table 3*). These findings suggest that both male and female students demonstrate relatively high levels of motivation and confidence in participating in physical activities, reflecting a positive psychological foundation for further physical literacy development.

These results reflect that although motor skills and knowledge about physical activity remain low, students exhibit relatively high levels of *motivation* and *confidence*. *Intrinsic motivation*, such as the enjoyment and satisfaction derived from movement, plays a crucial role in encouraging children's engagement in physical activities [38,39]. Previous studies have also found that high *self-confidence* is positively correlated with sustained participation in physical activities and the development of better motor skills [42,43]. These findings emphasize the importance of fostering intrinsic motivation and self-confidence in physical education programs as key drivers for improving overall physical literacy among students.

Environmental factors, including support from physical education teachers and inclusive teaching approaches, also play a significant role in enhancing student motivation. Teachers who can create a positive classroom atmosphere and encourage participation without fear of failure are more likely to boost students' confidence levels [25,44]. Therefore, training physical education teachers in teaching methods that foster motivation and self-confidence is essential for improving outcomes in this domain. Such training should focus on creating supportive environments, using positive reinforcement, and incorporating engaging activities that accommodate varying skill levels, ensuring that all students feel capable and motivated to participate actively.

Additionally, research indicates that a supportive family environment—where parents are physically active and provide positive encouragement for movement—contributes significantly to enhancing children's motivation [45]. Parental involvement in school physical education programs can, therefore, serve as a key supporting factor in boosting students' motivation. Collaborative initiatives, such as family-oriented physical activity events or workshops on the importance of physical literacy, can help bridge the gap between school and home environments, fostering a consistent message about the value of active lifestyles.

Knowledge & Understanding (KU)

The *Knowledge & Understanding* domain shows the lowest results compared to the other two domains, with the majority of students falling into the *Beginning* category, particularly male students (*62.35%*) (*Table 3*). Furthermore, analysis using the *Independent Sample Test* revealed a significant difference between male and female students, with female students achieving statistically higher scores (*p = 0.017*, *Table 4*). This finding suggests that female students have a better understanding of the importance of physical activity, its health benefits, and related concepts compared to their male peers. It highlights

a critical area requiring targeted intervention to improve students' knowledge and comprehension of physical activity principles, particularly among boys.

The low level of students' understanding of physical activity can be attributed to inconsistencies in the quality of physical education, a lack of emphasis on cognitive aspects in the curriculum, and limitations in content delivery by teachers [46,47]. Studies show that many students lack adequate knowledge about daily physical activity guidelines, the health benefits of exercise, and the risks associated with sedentary lifestyles [41]. The difference in scores between male and female students in this domain may stem from the teaching methods, which might be more effectively received by female students. Previous research suggests that female students are generally more responsive to discussion- and reflection-based teaching approaches [47]. These findings highlight the need for a more balanced and structured approach in teaching the cognitive aspects of physical education, ensuring that both male and female students gain a solid understanding of the principles and benefits of physical activity.

To improve outcomes in this domain, enhancements to the physical education curriculum must prioritize *knowledge* and *understanding* aspects. Educational content about the *benefits of physical activity*, *fitness guidelines*, and *risks of a sedentary lifestyle* should be delivered using engaging and student-friendly teaching methods. Additionally, integrating *educational technology*, such as *interactive learning applications*, can effectively enhance students' understanding of physical literacy concepts [48,49]. These tools can present information in visually appealing and interactive formats, making complex concepts easier to grasp while maintaining students' interest and motivation.

Conclusions

This study reveals that the level of *physical literacy* among elementary school students in Lombok remains low, with the majority of students categorized as *Beginning* and *Progressing* across the three main domains assessed using the *Canadian Assessment of Physical Literacy (CAPL-2)*: *Physical Competence*, *Motivation & Confidence*, and *Knowledge & Understanding*. In the *Physical Competence* domain, male students demonstrated slightly higher average scores compared to female students, although the difference was not statistically significant. This finding reflects differences in physical activity patterns between genders, as well as barriers to providing equal opportunities for female students to develop fundamental movement skills. Addressing these disparities requires targeted interventions, including

inclusive teaching approaches and the creation of equitable opportunities for all students to participate in structured physical activities.

In the *Motivation & Confidence* domain, both male and female students demonstrated relatively balanced levels of motivation and self-confidence. *Intrinsic motivation*, such as enjoyment and personal satisfaction, serves as a crucial foundation for increasing engagement in physical activities both within and outside the school environment. Meanwhile, the *Knowledge & Understanding* domain revealed a significant gap between male and female students, with female students showing a better understanding of the benefits of physical activity. Overall, these findings emphasize the need for greater focus on the *cognitive aspects* of physical education, which have often been overlooked in existing curricula. Integrating structured and engaging educational content on the importance of physical activity into physical education programs is essential to address this gap and enhance students' overall physical literacy.

The low level of students' *physical literacy* is influenced by various interconnected factors, including the *quality of physical education instruction*, *limited access to adequate facilities*, and the *lack of integration of cognitive aspects* into the curriculum. These challenges highlight the need for a *holistic and systematic approach* that addresses not only physical skills but also *motivation* and *knowledge* to ensure comprehensive development. Effective interventions should include *improved teacher training* to equip physical education instructors with strategies for fostering engagement across all domains of physical literacy, *curriculum enhancements* that integrate balanced content covering physical, motivational, and cognitive elements, and *facility and resource development* to provide adequate infrastructure and tools for diverse physical activities. Additionally, *community and parental involvement* should be encouraged to create a supportive ecosystem where physical literacy is reinforced both at school and at home. By addressing these factors collectively, a more inclusive and sustainable improvement in students' physical literacy can be achieved.

Recommendation

The development of *physical literacy* among elementary school students in Lombok requires a *comprehensive approach*, starting with the refinement of the *physical education curriculum* to balance the three core domains of *CAPL-2*: *Physical Competence*, *Motivation & Confidence*, and *Knowledge & Understanding*. Learning materials should be designed to be *interactive* and integrate both *practical and theoretical knowledge* about the benefits of physical activity and physical fitness. Additionally, *teacher training* in physical education must be prioritized to ensure educators

possess adequate skills and knowledge for delivering *inclusive and effective learning experiences*. Teachers should be trained to properly utilize assessment tools such as *CAPL-2* and adopt teaching methods that actively engage both male and female students. Through these improvements, physical education can better address the diverse needs of students, fostering an environment where physical literacy can flourish sustainably.

Furthermore, improving *sports facilities* and *school infrastructure* is essential for creating a learning environment that supports the development of students' *physical literacy*. Equal access to these facilities, especially in resource-limited areas, must be a priority for the *government* and *policymakers*. In addition to infrastructure development, *family and community involvement* is crucial to ensure that children receive consistent support beyond the school environment. Awareness campaigns about the *importance of physical activity* should be intensified at the family and community levels, encouraging children to remain physically active across various settings. Collaborative efforts among schools, families, and communities can create a sustainable ecosystem where physical literacy becomes an integral part of children's daily lives, fostering long-term engagement in physical activities and healthier lifestyles.

Finally, the use of *educational technology*, such as *interactive applications*, can serve as an effective tool to enhance students' understanding of physical activity. These technologies can present physical literacy concepts in an engaging and accessible manner, making learning both enjoyable and impactful. Additionally, further research with a *longitudinal study design* is needed to evaluate the effectiveness of implemented interventions over time. Longitudinal data can provide deeper insights into the long-term impacts of curriculum improvements, teacher training, and community engagement on students' physical literacy. Through a *collaborative* and *sustainable approach*—involving schools, teachers, families, communities, and policymakers—the enhancement of physical literacy among elementary school students can be achieved more effectively, fostering healthier and more active future generations.

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Supplementary Information

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