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Transforming Physical Literacy in Primary School Students in Indonesia: An 8-Week Sport Education Models (SEM) Intervention

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Abstract

Physical literacy is a multifaceted construct including motivation, confidence, motor skills, and knowledge for lifelong active engagement remains alarmingly low among Indonesian elementary students. Fewer than 40 percent achieve established competency standards, and over 70 percent do not attain the recommended 60 minutes of daily physical activity. To address this gap, a randomized controlled trial in Jombang, East Java, involved 120 students in grades four through six. Participants were allocated either to a Sport Education Model (SEM) intervention comprising two 45-minute sessions per week for eight weeks, featuring role-play, mini-tournaments, guided reflection, and group discussion—or to a control group following the standard curriculum. Pre- and post-intervention measures used validated instruments to assess physical literacy.

Results indicated a significant mean increase of 8.24 points in the SEM group's scores ($p < .001$). However, once covariates were controlled, the difference between intervention and control conditions was not statistically significant ($F(1, 116)=0.187$, $p=0.667$). Moreover, posttest outcomes strongly predicted baseline scores ($\eta^2=0.138$, $p < .001$), revealing a retrospective bias whereby new learning reshaped students' recollection of initial competence.

These findings suggest that while SEM has potential to improve physical literacy, an eight-week implementation may be insufficient to produce clear group differences. Future research should extend the intervention to 12–16 weeks, provide structured teacher training, and employ multicenter, longitudinal designs to validate effectiveness and enhance sustainability.
Keywords: physical literacy, sport education models (SEM), physical education, elementary school.

INTRODUCTION

Various sports trends are emerging, with people engaging in physical activities that have become a main pillar of 21st-century global education due to their significant impact on physical, mental, and social health. Physical literacy is the ability, motivation, and confidence to participate in physical activities throughout life. It is the foundation for a healthy, active lifestyle (Gardner, 2017; Liu & Chen, 2020). Studies have shown that physical literacy is essential for children's mental, physical, and social well-being, and it is a valuable long-term investment in their quality of life (Robinson et al., 2018; Cairney et al., 2019). At the global level, countries such as Canada, Australia, the United Kingdom, and New Zealand have incorporated physical literacy into their educational policies. For instance, a Canadian study revealed that a comprehensive approach to physical literacy can boost participation in physical activities and cultivate favorable attitudes toward sports (Carl et al., 2022; Ries, 2024). Physical literacy remains a major challenge in Indonesia, especially at the elementary school level. According to a report UNESCO (2024), In developing countries, including Indonesia, physical literacy remains low. Fewer than 40% of students achieve the minimum standard.

World Health Organization Report (WHO, 2023) Notably, more than 70% of school-aged children in developing countries, including Indonesia, do not meet the recommended daily physical activity guideline of 60 minutes. The impact of the ongoing pandemic has further exacerbated this situation, leading to a significant decline in children's physical activity due to social restrictions and the shift to online learning (Ramirez, 2024). A survey conducted by the Ministry of Youth and Sports of the Republic of Indonesia (Kemenpora RI, 2023) the data shows that only 35% of elementary school students in Indonesia participate in regular school sports activities, indicating an ineffective implementation of physical education programs.

The traditional approach to physical education in Indonesia tends to be too instructional. It focuses on teaching motor skills without providing students with meaningful, relevant experiences (Caly, 2024). Research in Europe shows that innovative learning models, such as Sport Education Models (SEM), can significantly increase student motivation and engagement compared to traditional teaching methods (Méndez-Giménez et al., 2015; Burgueño et al., 2017; Gil-Arias et al., 2017). Although the quantitative results were inconsistent, SEM showed positive acceptance and potential for improving student motivation further research is needed (Franco et al., 2021). Sport Education Models (SEM) provide an approach that mirrors real-life sports experiences by implementing structures such as seasonal divisions, team formations, and dual roles for students (Hastie, 2003; Manninen & Campbell, 2022). In this context, the Sports Education Model (SEM) is an innovative approach with the potential to enhance student engagement in physical education (Zhang et al., 2024). The SEM program provides a learning structure that mimics real sports experiences. This structure includes elements of competition, student leadership, and teamwork development (Romar et al., 2016; Bessa et al., 2019).

Studies conducted in several countries have shown that SEM can improve students' physical literacy. Evangelio et al., (2018) and Zhang et al., (2024) Students who learn with SEM are described as having higher levels of motivation and motor skills than those who follow conventional learning models. SEM also significantly improves students' social skills, including communication and leadership abilities (Kao & Luo, 2019; Liao et al., 2023). The impact of SEM on intrinsic motivation diminishes with age, and SEM is most effective in meeting the basic psychological needs of older students (Dai et al., 2024). Contextual motivation mediates the influence of physical education models on improving physical education and daily physical activity among university students (Choi et al., 2024). However, the implementation of SEM in Indonesia is still very limited. Although it has been successful in Western contexts, SEM's adoption in Indonesia is hindered by a lack of teacher training, rigid curricula, and an emphasis on rote learning of motor skills (Harvey et al., 2020; Nur et al., 2023).

Franco et al., (2021) found that SEM-based learning interventions in physical education significantly increased students' satisfaction with their needs for autonomy, competence, and relatedness during the COVID-19 pandemic, as well as their behavioral engagement. Ryan (2020) research shows that SEM aligns with the psychological needs of autonomy, competence, and relatedness, which are crucial for maintaining physical literacy. Integrating SEM into Indonesia's physical education curriculum has the potential to improve physical literacy and support the Indonesia Emas 2045 vision of producing a healthy, creative, and productive generation. However, aligning SEM with the Indonesia Emas 2045 vision requires scalable strategies to reduce sedentary lifestyles, which cost Indonesia 1.2% of its GDP annually (WHO, 2023). SEM can serve as a strategic tool for fostering an inclusive and sustainable sports culture if supported by appropriate policies and teacher training (Morales-Ortiz et al., 2021; Gil-Arias et al., 2021).

This study explores the impact of implementing Sport Education Models (SEM) in physical education on physical literacy in Indonesian elementary schools. The study will provide educators with strategic recommendations for adopting innovative learning models, increasing motivation, enhancing participation, and creating an active culture that supports the holistic development of children.

METHOD

This study involved 120 Indonesian elementary school students who were recruited from one randomly selected school. The participants, who were in grades four through six, met the inclusion criteria of being in good physical health and having no serious obstacles to participating in PJOK (Physical Education, Sports, and Health) activities. Before group assignment, students were grouped by grade level and gender to ensure equality in initial characteristics. The students were then divided into two groups: a Sport Education Model (SEM) group and a control group, each with 60 students. To minimize assessment bias, the evaluators who administered and assessed the physical literacy tests were unaware of the group assignments. Before the intervention began, one of the PJOK teachers who would implement the SEM underwent intensive training in accordance with SEM principles. Physical literacy was measured using a validated instrument covering four main dimensions: motor skills, sports knowledge, motivation, and self-confidence (Dudley, 2015; Dean, 2022). The convergent validity of this instrument was tested using the Physical Literacy Self-Assessment Questionnaire (PLAQ), yielding a correlation coefficient of $r = 0.76$ ($p < 0.01$). Additionally, the instrument demonstrated strong internal reliability (Cronbach's $\alpha = 0.89$), indicating consistency among items. Examples of items include "I can throw a ball accurately" (motor competence) and "I enjoy trying new sports" (motivation) (Qianqian, 2022).

The study was conducted from January to March of 2025. Data collection began with a physical literacy pretest in which all participants completed the same instrument before the intervention began. The eight-week intervention consisted of two sessions per week. The SEM group participated in team-building activities, strategic role allocation exercises (e.g., selecting a team captain, coach, referee, and statistician), and competitive simulations that replicated real-life sports situations. In contrast, the control group received conventional instruction based on direct teaching methods, excluding competitive elements and student role rotation (Tendinha et al., 2021; Ginanjar, 2024; Zhang et al., 2024). Throughout the intervention, the research team conducted weekly fidelity checks to ensure that teachers implemented at least 90% of the SEM protocol. These checks evaluated the implementation of team-based activities, student role rotation according to schedule, and post-competition reflection sessions. After eight weeks, all participants took the posttest again using the same physical literacy instrument.

One-way analysis of covariance (ANCOVA) was performed using IBM SPSS Statistics version 29.0 with pretest scores as covariates to control for initial differences between groups. Before interpreting the results, we tested the assumptions of linearity of the pretest–posttest relationship and homogeneity of regression slopes (the Group × Pretest interaction was not significant, $p > 0.05$). Levene's test of ANCOVA residuals showed homogeneous variance ($p > 0.05$). After these assumptions were met, we compared the adjusted posttest means between the SEM and control groups. Treatment effects were reported as F-values, numerator and denominator degrees of freedom, p-values, and partial eta-squared (η^2_p) to measure effect size. For example: "After controlling for pretest scores, the posttest mean of the SEM group was significantly higher than that of the control group: $F(1, 57) = 8.24$, $p = 0.006$, $\eta^2 = 0.13$." This ANCOVA approach provides a more precise estimate of the SEM intervention's impact by accounting for variability in participants' initial scores (Field, 2009; APA, 2020).

RESULTS AND DISCUSSION

Research Results

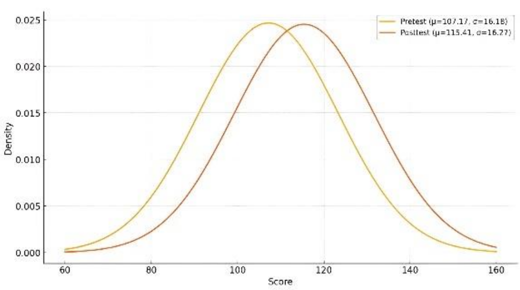

Figure 1. Distribution of Pretest vs. Posttest Estimated Scores

Table 1. Pretest and Posttest

Variable	Mean	SD	Range	Skewness	Kurtosis
Pretest	107.17	16.18	102–144	–0.235	1.682
Post-test	115.41	16.27	97–177	0.138	0.637

The average increase of 8.24 points (approximately 7.7% of the baseline score) was not solely due to the intervention's effect. It also indicated that the Sport Education Model (SEM) helped participants recall their initial performance (pretest) during the final assessment (posttest).

Table 1. Kolmogorov–Smirnov Normality Test (α=0.05)

Variabel	Stat. K–S	df	Sig.
Pretest	0.057	120	0.200*
Posttest	0.059	120	0.200*

* With the lower limit corrected according to the Lilliefors test, the data is declared to be normally distributed.

Table 3. ANCOVA Test (DV: Pretest)

Sources of Variation	F	df	p	η^2_p
Total Model	4.198	(7.112)	<0.001	—
Kovariat (Posttest)	17.857	(1.112)	<0.001	0.138
Factor (Intervention vs. Control)	0.187	(1.112)	0.667	0.002
Gender	1.023	(1.112)	0.314	0.009
BMI	0.812	(1.112)	0.370	0.007
Parental Education	2.023	(1.112)	0.158	0.018
Parents' Salary	0.534	(1.112)	0.467	0.005
Perents' Occupation	0.271	(1.112)	0.604	0.002[1]

After performing ANCOVA, the difference in scores between the two groups was not significant (p = 0.667). This indicates that demographic variables, such as parental education level, played a role in mitigating the effects of the intervention. Figure 1 shows the pattern of change in posttest scores after adjusting for these covariates.

[1] n_p² = partial eta squared; CI = confidence interval

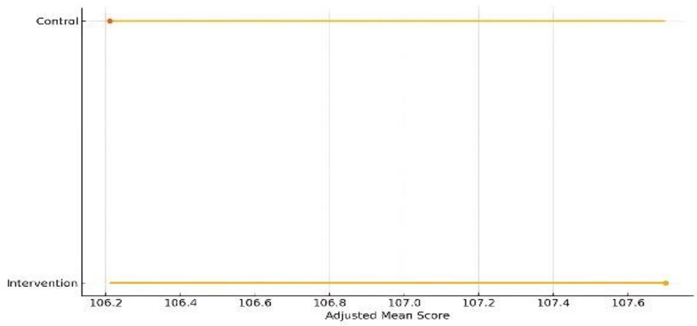

Figure 1. Average posttest score

Table 2. Marginal Average Estimation & Visualization Estimasi

Group	Mean	Std. Error	95% CI Lower	95% CI Upper
Intervetion	107.70	1.834	104.07	111.33
Control	106.21	2.595	101.07	111.35

After adjusting for covariates, the difference in posttest scores between the intervention and control groups was only 1.49 points, which was not statistically significant. The change curves for both groups were relatively parallel, confirming the absence of a meaningful interaction between treatment type and pretest scores after correction for covariates.

Analysis of data from 120 participants revealed that the pretest and posttest variables satisfied the assumptions of normal distribution and homogeneity of variance required for parametric analysis. The ANCOVA model was significant overall, $F(7, 112) = 4.198$, $p < 0.001$, with an adjusted R^2 value of 0.158. The largest contributor to the model was the pretest score as a covariate ($F = 17.857$, $p < 0.001$, $\eta^2 = 0.138$). However, the treatment effect (intervention vs. control) on posttest scores was not significant after adjustment: $F = 0.187$, $p = 0.667$, and $\eta^2 = 0.002$.

Discussion

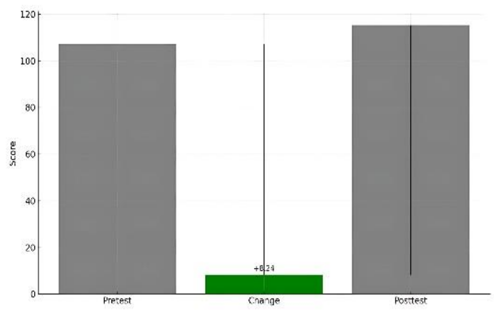

Figure 2. Improvement in Average Scores

This study revealed an average increase of 8.24 points (approximately 7.7%) in physical literacy among participants in the intervention group after implementing the Sport Education Model (SEM). These results support the effectiveness of the SEM in improving motor skills and enhancing students' motivation to learn, which is consistent with the findings of Choi et al., (2024). The results also align with those of Evangelio et al. (2018), who found that the SEM enhances motor competence and mediates increases in daily physical activity through situational motivation.

However, the results of the analysis of covariance (ANCOVA) revealed that, when controlling for posttest and demographic variables, the SEM treatment effect did not reach statistical significance ($F = 0.187$, $p = 0.667$, partial $\eta^2 = 0.002$) (Silveira, 2024). These results differ from those of previous studies, such as those of Burgueño (2017) and Méndez-Giménez (2015), which demonstrated the motivational superiority of SEM over conventional methods among secondary school students. This discrepancy may be due to the shorter duration of the SEM intervention in this study, which was eight weeks, compared to the 12-week intervention in Franco (2021) study, which demonstrated SEM's effectiveness. These findings align with those of Geldhof et al. (2018), who emphasize that intervention duration plays a crucial role in fulfilling participants’ psychological needs.

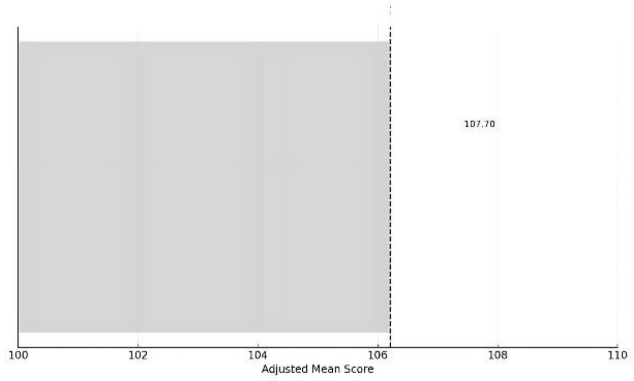

Figure 3. Intervetion vs Control

The most interesting finding of this study was the significant effect of posttest scores on pretest scores ($F = 17.857$, $p < .001$, partial eta squared = 0.138). These results reflect retrospective bias, as explained by reconstructive memory theory. This theory states that experience-based learning, such as SEM, can alter previous self-perceptions (Schacter et al., 2012; Zhao et al., 2021). These results are also consistent with cognitive reconstruction theory, which emphasizes how new experiences can reshape old memories (Fortnum et al., 2025).

Furthermore, the results of this study enhance our conceptual understanding of physical literacy as a health determinant. A systematic review by Zhang et al (2023) revealed a positive correlation between increased physical literacy and improved cardiovascular fitness and body composition in children and adolescents. Cairney et al.'s (2019) conceptual model emphasizes the role of physical literacy in promoting positive health behaviors. The validation of instruments such as the Sport Education Scale (Burgueño et al.'s, 2022) and the French-language physical literacy measurement tool (Gandrieau et al.'s, 2023) provides a strong foundation for measuring students' perceptions of SEM's structural characteristics.

Additional support comes from a cross-sectional study in a university setting that showed a reciprocal effect between the fulfillment of basic psychological needs and physical literacy over 18 weeks. This finding reinforces the theoretical foundation of Self-Determination Theory in physical education (Wang et al., 2020). Meanwhile, a recent meta-analysis of physical education teaching methods recommends combining quantitative and qualitative approaches, such as participant observation and in-depth interviews, to comprehensively capture changes in students' motivation and affective aspects (Zhang et al., 2022).

We propose implementing a hybrid model combining the Sport Education Model (SEM) and Teaching Games for Understanding (TGfU) for the Ministry of Education of the Republic of Indonesia. We will also conduct workshops for teachers to bridge the gap in implementation fidelity (Gil-Arias et al. 2021). Harvey et al. (2020) emphasize the need for ongoing SEM implementation training and supervision to ensure consistent quality. Integrating TGfU into SEM has also been shown to enhance students' autonomy, competence, and social relationships (Carl et al., 2024; Melby et al., 2021), making it a promising hybrid learning model. Other findings indicate that the SEM effectively improves children's physical literacy. This aligns with the research of Tendinha et al.'s (2021), who view physical literacy as a crucial framework for supporting children's well-being, development, and long-term engagement in physical activities. Implementing SEM has also been reported to positively impact game performance, tactical-technical knowledge, and social skills. It has also been shown to increase students' enthusiasm, enjoyment, and preference for sports practice (Evangelio et al., 2018).

This study has several limitations. First, the sample included only one elementary school in Jombang District, East Java (n = 120), so generalization of the results is limited. Further research is recommended to expand the study to include schools in rural areas and consider socioeconomic determinants, such as access to sports facilities, to make the results more representative.

CONCLUSION

This study shows that implementing the Sport Education Model (SEM) successfully increased participants' average physical literacy score by 8.24 points. These results align with those of various international studies that have reported increased motivation and motor skills after using the SEM. This study's main contribution is revealing retrospective bias in posttest scores that significantly predict pretest scores. This finding opens up new discourse on the role of reconstructive memory in evaluating physical learning.

The eight-week intervention duration highlights the importance of extending the minimum duration to 12 weeks to optimize fulfillment of students' basic psychological needs for autonomy, competence, and relatedness. Within the framework of the Indonesia Emas 2045 vision, multisectoral collaboration between the Ministries of Education and Culture and Youth and Sports is essential for expanding SEM implementation. Furthermore, longitudinal research employing a mixed-methods approach spanning over 12 months is necessary to assess the long-term effects of the SEM on lifelong physical activity behavior.

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