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Review Article

EFFECTIVENESS OF INTEGRATED LEARNING FOR PROMOTING HOLISTIC DEVELOPMENT ELEMENTARY STUDENTS: SYSTEMATIC REVIEW AND META-ANALYSIS

EFICÁCIA DA APRENDIZAGEM INTEGRADA NA PROMOÇÃO DO DESENVOLVIMENTO HOLÍSTICO DOS ALUNOS DO ENSINO BÁSICO: REVISÃO SISTEMÁTICA E META-ANÁLISE

I Bagus Endrawan[1], Winara[2], Ahmad Yani[3], Alficandra[3], Martinus[1], Kamarudin[3], Balkis Ratu NL Esser[4], Jujur Gunawan Manullang[5]

[1]Bina Darma University, Palembang City, Indonesia.
[2]State University of Medan, Medan, Indonesia.
[3]Islamic University of Riau, Pekanbaru, Indonesia.
[4]Mandalika University of Education, Mataram, Indonesia
[5]PGRI University of Palembang, Palembang City, Indonesia.

RESUMO

Este estudo teve como objetivo identificar estratégias de implementação e avaliar sua eficácia para melhorar a participação estudantil e a aquisição de habilidades. Foram selecionados cinco estudos por meio de uma revisão sistemática da literatura e de uma meta-análise a partir das bases de dados Scopus e Web of Science, aplicando critérios de inclusão rigorosos. Esses estudos empregaram diferentes abordagens de aprendizagem integradora na Educação Física (EF), incluindo programas de atividade física (AF) integrados ao currículo, aprendizagem baseada em jogos e programas estruturados de alfabetização física. O tamanho de efeito agregado favoreceu os grupos experimentais, indicando uma diferença média padronizada (DMP) de 0,91 (IC 95%: -0,45 a 2,28; p = 0,19). Contudo, a análise revelou um alto nível de heterogeneidade (I^2 = 99%), o que indica que variações nas características da população, na fidelidade da implementação e no tipo de intervenção influenciam substancialmente os resultados. A generalização dos achados é limitada pelo número reduzido de estudos e pela variabilidade considerável, embora a maioria das intervenções tenha mostrado tendências positivas. Esta revisão enfatiza que a aprendizagem integradora em EF tem o potencial de melhorar o engajamento físico, a aquisição de conhecimentos e o desenvolvimento psicossocial no ensino fundamental. No entanto, são necessárias pesquisas adicionais. Investigações futuras devem avaliar a sustentabilidade e a viabilidade em longo prazo da aprendizagem integradora em EF em diferentes contextos educacionais, investigar moderadores como o contexto cultural, a duração do programa e a diversidade do alunado, além de adotar desenhos padronizados.

Palavras-chave: aprendizagem integradora; educação física; desenvolvimento holístico; alunos do ensino básico;

ABSTRACT

This study aimed to identify implementation strategies and evaluate their effectiveness in enhancing student engagement and skill acquisition. Five studies were selected through a systematic literature review and meta-analysis from Scopus and Web of Science databases, applying strict inclusion criteria. These studies employed diverse integrative learning approaches to Physical Education (PE), including curriculum-embedded physical activity (PA), game-based learning, and structured physical literacy programs. The aggregated effect size favored the experimental groups, which indicated a standardized mean difference (SMD) of 0.91 (95% CI: -0.45 to 2.28; p = 0.19). Nevertheless, the analysis demonstrated a high level of heterogeneity (I^2 = 99%), indicating that variations substantially influence outcomes in population characteristics, implementation fidelity, and intervention type. The generalizability of the findings is limited by several studies and substantial variability, even though most interventions yielded positive trends. Integrative learning in PE has the potential to enhance physical engagement, knowledge acquisition, and psychosocial development in primary education, as this review emphasizes. However, additional investigations are required. Future research should evaluate integrative PE's long-term sustainability and viability across diverse educational settings, investigate moderators such as cultural context, program duration, and learner diversity, and embrace standardized designs.

Keywords: integrative learning; physical education; holistic development; elementary school students;

Introduction

Physical Education (PE) is a part of educational sports that is generally carried out in the form of lessons in schools[1]. PE lessons are conducted by focusing on the body and responding to students' movement needs[2,3]. Physical education is considered important for fostering a lifelong attitude towards physical activity, where engagement, enjoyment, and long-term commitment to physical activity are influenced by perceived competence and relatedness[4]. High-quality PE is central to the explicit planning and coordination of meaningful, coherent, relevant, and sustainable physical activity opportunities for youth in schools[5]. The learning materials provided to students are related to the skills, knowledge, and attitudes needed to remain active throughout their lives[6]. This makes PE a subject that must be taken seriously and provided at every level of education[7].

PE involves high levels of behavioral interaction, teaching students about morality, and facilitating specific prosocial behaviors, which are considered crucial goals of physical education[8]. The implementation of PE occurs in various educational environments, including during school hours, after-school programs, and alternative settings, emphasizing character development through physical activity[9]. Moreover, sports instruction provides opportunities for student success, sets expectations, and fosters respectful relationships, enhancing life skills[10]. PE instruction should be harmoniously carried out, offering positive sports experiences, stimulating interest, and encouraging goal achievement[11]. This illustrates that PE not only focuses on physical skills and fitness but also essential life skills to support holistic student development. Thus, strategic pedagogies in PE teaching are needed to accommodate efforts toward achieving holistic student development.

Intensive research on the effectiveness of teaching methods and instructional strategies has been conducted by researchers and scholars[12]. However, PE teaching and learning still face significant challenges[13]. Additionally, teaching that emphasizes proficiency in sports and covers educational goals itself has become a common issue in PE[14]. One reason for this is the traditional PE paradigm, which focuses on multi-activity and sports techniques, leading to less skilled students, suboptimal learning sessions, and unmet student needs[15,16]. Furthermore, this traditional PE paradigm employs a command style of teaching based on sports content and technical practices[17]. This approach results in students struggling to learn and play during games[18].

Regarding the focus on achieving outcomes and addressing challenges in teaching, efforts are undoubtedly needed to overcome these issues. One of the significant influencing factors is the pedagogical approach chosen by the teacher, which has the greatest impact on learning[19]. However, the evidence shows that teachers still struggle to translate the concept of the play-based approach[20]. Teachers have limited pedagogical understanding, leading to deviations from the teaching practices recommended by the curriculum[21]. Additionally, teachers find it difficult to change their habitual teaching methods[22] and are less adept at keeping up with technological advancements and collaborating with colleagues[23].

Currently, PE instruction is recommended to integrate different teaching styles that can improve fitness, motor competence, enjoyment, and the amount of physical activity[24]. Integrated learning is An approach incorporating multiple pedagogical models provides potential solutions to enduring limitations in the scope of learning outcomes, subject matter, and instructional strategies associated with each pedagogical model, enabling their use to attain educational value[25]. Futhermore, pedagogical practices and programs should focus on an integrative approach designed to meet national physical education standards[26]. Specifically, integration in elementary schools supports enjoyment in physical activities, specific self-confidence, and perceptions of quality of life, contributing to children's subjective well-being[27]. A holistic integrative approach can be effectively implemented by applying a physical

education curriculum in elementary schools, considering curriculum flexibility, local needs, and individual student requirements[28]. Integrated teaching and its impact on the development of elementary school students provide guidance for future implementation and evaluation of research-based physical activity interventions[29].

Experts have extensively investigated the implementation of integrated teaching through various studies summarized primarily through reviews. Suyato et al.,[30] reviewed 122 articles related to the implementation of social values in physical education and sports to shape the character of adolescent students. Bao et al.,[31] analyzed 20 studies using a thematic meta-analysis approach to identify descriptive themes regarding the impact of metacognition on academic achievement in physical education and activity settings. Furthermore, Kreijkes & Greatorex[32] reported a review of nine studies comparing student learning outcomes between a subject-based curriculum approach and a more integrated curriculum. Lastly, Jackson and Ettekal[33] reviewed five studies to describe educational programs that promote social-emotional learning (SEL) and physical activity (PA) for adolescent development.

The reviews conducted have certain weaknesses, such as being too general and not fully addressing the implementation of integrated teaching in elementary school physical education. Furthermore, to the best of the authors' knowledge, there are no studies that have discussed this topic through a systematic review and meta-analysis. Therefore, this systematic review needs to be synthesized to provide clearer insights into the effectiveness of integrated teaching implementation in elementary school physical education. The main objective of this article is to report the findings of a systematic review and meta-analysis on the effectiveness of integrated teaching implementation in stimulating the development of elementary school students. Specifically, this investigation aims to answer questions related to the application and effectiveness of integrative learning in physical education at the elementary school level.

Methods

Search Strategy

A Systematic Literature Review emphasizes the systematic search process supported by three main steps: identification, screening, and eligibility, which aid researchers in conducting comprehensive article searches[34]. A systematic review was conducted to search for studies discussing the effectiveness of integrated teaching implementation in elementary school physical education. In the systematic review, the study search process was carried out using the Scopus and Web of Science (WoS) databases. These databases were chosen because they have several important similarities in the extent to which tracked citations can provide further information and assess existing research[35]. Additionally, these databases are primary citation databases used to rank journals within a discipline in terms of productivity and the total citations received, indicating the journal's impact, influence, or prestige[36]. Thus, the investigators consider these databases reliable and the articles published in them to be of high quality.

The search strategy included a combination of the keywords ((integrative OR integrated) AND (model OR approach) AND (learning OR teaching) AND (physical education OR movement education) AND (elementary school OR primary school)) with a search scope of article titles, abstracts, and keywords conducted on October, 24 2024. The reference lists of the included articles were searched to identify additional studies to find relevant articles.

Criteria for Inclusion of Studies

The systematic review included articles that: (a) involved subjects or participants using control groups, and (b) explicitly discussed the implementation of integrative learning in elementary school physical education. Articles were excluded if they: (a) were not published

between 2015 and October 25, 2024; (b) were not in the final processing stage; (c) were not in English; or (d) were not from peer-reviewed journals.

Study Selection

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines were used as a guide for article searches. PRISMA is a protocol that does not require ethical review and is reliable due to its foundation in high-quality, reputable journals[37]. A total of 54 articles were identified based on searches using keywords from both databases. Then, 4 articles were excluded after duplicate checks. Additionally, 45 articles were excluded after full-text screening for not meeting one or more of the inclusion criteria. Ultimately, 5 articles met the criteria and were included in the systematic review and meta-analysis. The process of identifying, screening, and determining the eligibility of articles is illustrated in Figure 1.

Data Synthesis and Effectiveness Calculation

The studies included in this investigation will be synthesized both qualitatively and quantitatively. The qualitative analysis is assisted by using mnemonics like PICO (Population, Intervention, Comparator, and Outcome) to systematically develop research questions.[37,38] Quantitatively, it will be conducted using meta-analysis techniques to determine the size, direction, and statistical significance[39,40]. The data synthesis for the meta-analysis will be performed using Review Manager software by Cochrane version 5.4. The data analysis in this study was conducted using a quantitative meta-analytic approach to calculate the effect size and test its statistical significance. The effect size was computed as the Standardized Mean Difference (SMD) to facilitate comparisons between studies that implemented distinct measurement instruments[41]. The overall effect size (pooled SMD) was obtained by aggregating these SMD values using a pooling method. The Chi-Square test (Q test) was employed to evaluate the variability between studies, degrees of freedom, and the I^2 statistic, indicating the proportion of variation due to true heterogeneity rather than sampling error. Three leading indicators were employed for the heterogeneity analysis: the I^2 statistic, degrees of freedom, and the Chi-Square test (Q test).

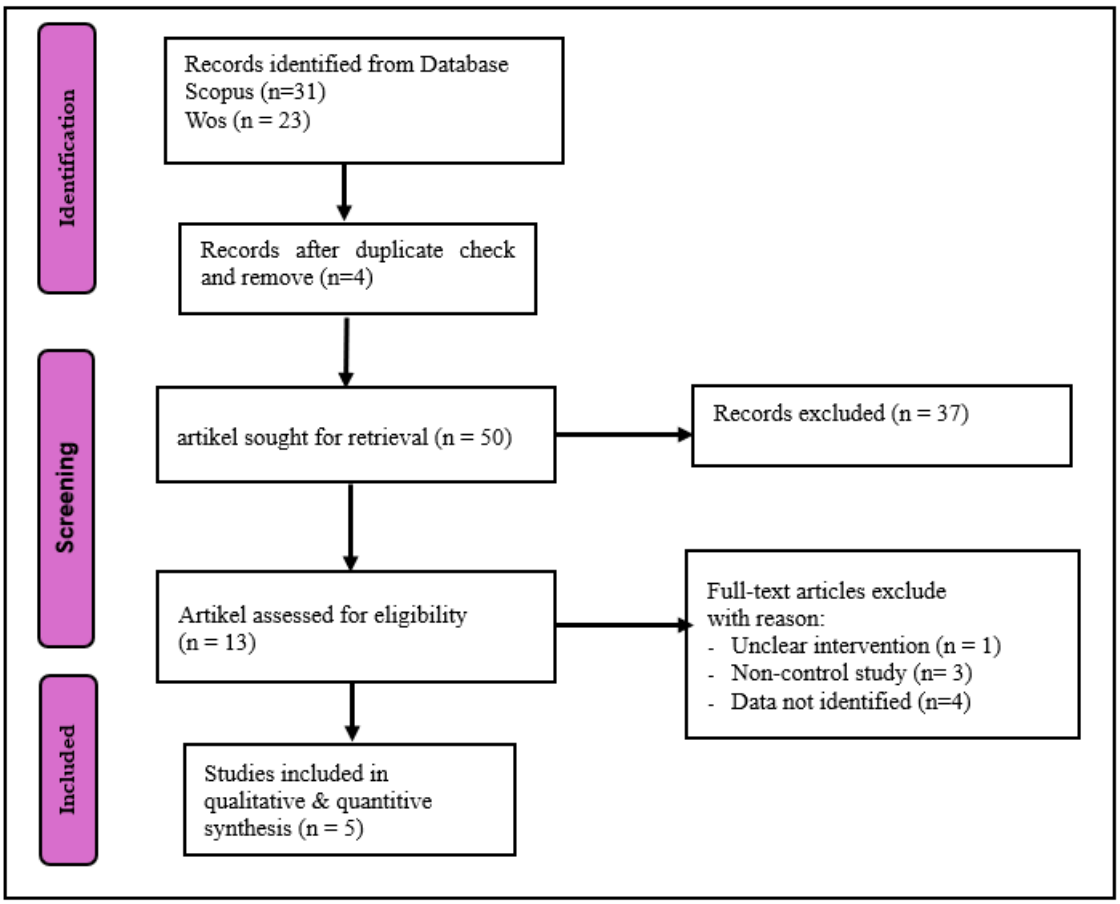

Figure 1. Study selection flow diagram
Source: The authors.

Results

Qualitative analysis result

This systematic review synthesizes findings from five studies investigating the integration of holistic achievement in elementary school settings (See Table 1). The focus is on understanding the diverse effects of PA-based interventions on student outcomes, specifically in cognitive, physical, social, and affective domains. Based on the investigation results, the population and context collectively target elementary school students, primarily in upper grades (ages 9-11), indicating a focus on critical developmental stages for cognitive and motor skill acquisition. These interventions were conducted in various educational settings, providing a broader context for comparing outcomes across diverse education systems.

Furthermore, based on the analysis of intervention strategies and modalities used, it is evident that researchers employed a variety of integrative approaches. The study by van den Berg used juggling to make math practice more dynamic, reflecting a trend toward kinesthetic learning as a method to reinforce memorization and cognitive engagement[42]. Additionally, The study conducting by Lee with used an educational app in PE classes, showing slight increases in student autonomy and social support but mixed results in physical activity levels[43]. Larsson et al.[44] demonstrated the feasibility of integrating regular physical activity into academic schedules, improving students' overall activity levels using The FALK program. Zheng et. al.[45] illustrated the potential of digital, game-based systems to enhance learning outcomes in health education. Lastly, the PLitPE intervention underscored a comprehensive approach to physical literacy, yielding significant improvements in motor skills, affective responses, and a reduction

in gender disparities[46]. Each study employed a unique physical activity-based intervention, ranging from video-led juggling exercises to technology-integrated PE classes, curriculum-embedded physical activity sessions, game-based learning, and structured physical literacy programs.

The outcomes across studies reveal several patterns despite diverse approaches. Cognitive gains were modest, with only the game-based anatomy learning showing significant improvements in academic effectiveness. This suggests that while PA integration can support cognitive engagement, further refinement may be necessary to translate enjoyment and engagement into tangible academic gains. Furthermore, programs like FALK and PLitPE effectively boosted PA levels, with FALK achieving recommended activity benchmarks and PLitPE enhancing motor skills. This aligns with the broader objective of PE to promote lifelong physical fitness. Additionally, enjoyment, autonomy, and social support emerged as frequent affective outcomes, highlighting PA's role in fostering a positive school experience. Notably, the PLitPE program also reduced gender disparities in physical competence, suggesting that structured interventions can foster equity in physical literacy. Lastly, the findings underscore the potential of PA-based interventions to enrich traditional learning environments and contribute to holistic child development.

Quatitative analysis result

The quantitative findings from studies that implemented PA and educational interventions in elementary school settings are presented in Table 1. The goal is to evaluate the effect of these interventions on various student outcomes, including academic performance, affective responses, physical activity, and psychological development. The study by van den Berg et al.[42] highlighted a significant increase in enjoyment among students in the experimental group (Mean = 50.64) compared to the control group (Mean = 32.79). In the study by Lee the physical activity intensity levels were almost identical between the experimental and control groups, indicating that technology-based PA interventions (such as using an app in PE classes) did not significantly change students' activity intensities[43]. In contrast, Larsson et, al. observed a slight increase in physical activity levels in the experimental group (Mean = 13.06) compared to the control (Mean = 11.4), suggesting that curriculum-based PA programs like the FALK program may be more effective at promoting daily activity levels[44].

Zheng et al. focused on knowledge acquisition in health education, specifically understanding human internal organs[45]. The experimental group, which utilized a game-based learning system, scored higher (Mean = 54.29) compared to the control group (Mean = 50.58). The study by Stoddart et al. examined the psychological outcomes of students participating in the Physical Literacy in PE (PLitPE) program[46]. The experimental group showed a modest increase in psychological measures (Mean = 51.96) compared to the control (Mean = 49.83). In Lee study, children’s beliefs related to physical activity and PE were measured, showing minimal differences between the experimental and control groups (Mean = 33.98 and Mean = 36.87, respectively)[43].

Chart 1 Summary of included study

Reference	Population	Intervention	Comparator	Outcome
[42]	369 fifth-grade students	5-week program where experienced physical education (PE) teachers used 20 instructional videos combining juggling exercises with multiplication practice	traditional memorization techniques	no significant impact on multiplication retention and reported higher enjoyment levels, with 70% expressing a desire for more frequent juggling-math lessons, compared to 20% in the control group.
[43]	157 fourth and fifth graders	PE classes incorporated an app displayed via iPad and projected in the gym)	similar PE classes without technological integration,	In the intervention group, students exhibited increased sedentary behavior but also showed slight improvements in autonomy, social support, and enjoyment, albeit not significant.
[44]	164 primary students	A curriculum-based program called FALK added three 30-minute physical activity (PA) sessions weekly, on top of regular PE classes.	Regular PE classes occurred twice weekly for 40 minutes, with additional voluntary physical activities.	The FALK program effectively increased students' physical activity levels and reduced the number of students
[45]	131 elementary students	The Physical Literacy in PE (PLitPE) program included circuit stations focused on motor skills, with additional days for locomotor exercises aligned with curricular goals.	A usual PE practice routine was followed by the control group.	The PLitPE intervention significantly improved students' physical competence, motor skills, and movement vocabulary, the psychological domain and appeared to reduce gender differences in physical literacy development.
[46]	131 elementary school stu-dents	PLitPE consisted of two sets of circuit stations on two separate days (Circuit 1: 8 skills, Circuit 2: 6skills) with a third day specifically focused on locomotor patterns (e.g. skip, gallop, crossovers).	Usual practice condition	PLitPE was successful in developing physical competence and movement vocabulary.

Source: The authors.

Table 1 Meta-Analysis of Integrative Learning by Outcome Measure Type

Reference	Outcome measure	Experiment			Control		
		Mean	SD	Total	Mean	SD	Total
[42]	aMultiplication performance	25.9	4.8	163	23.3	7.1	136
	bEnjoyment	50.64*	2.5	163	32.79*	2.3	136
[43]	aPhysical activity intensities	33.37	13.7	77	33.37	15.07	80
	bChildren's beliefs	33.98*	1.28	77	36.87*	1.22	80
[44]	Physical activity (SPD)	13.06	3.04	83	11.4	3.18	81
[45]	Human Internal Organ	54.29	13.12	38	50.58	12.52	36
[46]	Psychological domain	51.96	11.9	81	49.83	10.42	48

Note:*The data was processed using the average post-test scores and standardized with z-scores.
Source: The authors.

The meta-analysis results in table 3 provide a comparative evaluation of the efficacy of integrative learning in seven analyzed studies, specifically between experimental and control groups. The forest diagram visually illustrates each study's standardized mean difference (SMD) and corresponding 95% confidence interval (CI). Although the statistical significance of the effects varied, the experimental groups were favored in most studies, which demonstrated positive effects.

Generally, the pooled standardized mean difference across all studies was 0.91, with a 95% confidence interval from -0.45 to 2.28. This suggests that integrative learning interventions are generally more effective than conventional approaches. Nevertheless, the combined effect was not statistically significant, as indicated by the p-value of 0.19. This implies that the observed differences between the experimental and control groups are insufficiently robust to be considered conclusive. Consequently, the integrative approach is favored by the aggregated direction of the effect; however, the statistical evidence is insufficient to verify its overall efficacy. The heterogeneity analysis revealed a remarkable degree of variability among the studies, with $Chi^2 = 639.07$, degrees of freedom (df) = 6, and $I^2 = 99\%$, suggesting significant differences. Diverse intervention characteristics, implementation contexts, population profiles, and measurement instruments will likely influence these variations, as indicated by an I^2 value approaching 100%.

Effect sizes exhibited substantial fluctuations at the individual study level (figure 2). Van den Berg et al. reported the most significant and largest effect (SMD = 7.38; CI: 6.75 to 8.01) in enhancing pupil enjoyment through a physically active learning approach that combined mathematics with juggling and a neutral effect (SMD = 0.00; CI: -0.31 to 0.31), suggesting no significant difference between the experimental and control groups (42). This discovery emphasizes the potential of integrating physical and game-like elements into academic instruction to elicit highly positive affective responses from students. In contrast, Lee discovered a substantial negative impact (SMD = -2.30; CI: -2.71 to -1.90) on students' perceptions of physical education due to using an iPad-based application (43). This finding may be indicative of digital fatigue or limitations in physical engagement. Although their statistical significance varied, other studies demonstrated moderate and positive effects on daily physical activity levels and anatomical knowledge (45; 47). This may indicate limitations regarding the duration of the intervention or the extent to which the intervention strategy is based on the learning requirements of the students.

The meta-analysis indicates integrative learning in elementary physical education can improve students' cognitive, affective, and motor development. Nevertheless, the exceptionally high degree of heterogeneity suggests that the efficacy of these interventions is significantly influenced by the context, including the learner's characteristics, implementation fidelity, and intervention design. Consequently, it is imperative to exercise caution when interpreting these aggregated findings, and additional research is required to identify potential moderating variables that may either facilitate or impede the success of integrative learning in physical education settings.

Table 2 Metaanalysis Result

Studies	Experiment			Comparison			Weight	Std Mean Difference IC Random 95%		
	Mean	SD	Total	Mean	SD	Total		SMD	CI_Lower	CI_Upper
42	25.9	4.8	163	23.3	7.1	131	14.4	0.44	0.21	0.67
42	50.64	2.5	163	32.79	2.36	136	14	7.38	6.75	8.02
43	33.37	13.7	77	33.37	15.7	85	14.4	0	-0.31	0.31
43	33.98	1.28	37	37.28	2.07	47	14.3	-2.3	-2.71	-1.9
44	13.06	3.04	83	11.4	3.18	81	14.4	0.53	0.22	0.84
45	54.29	13.12	68	50.58	12.52	122	14.2	0.29	-0.17	0.74
46	51.96	11.91	91	49.83	10.42	84	14.3	0.19	-0.17	0.54
Total (95% CI)			682			579	100%	0.91	-0.17	0.74

Note: Heterogenety Tau²= 3.36, Chi²= 639.07, df=6 (P<0.00001). I² = 99%; Test for everall effect Z = 1.31 (P=0.19).
Source: The authors.

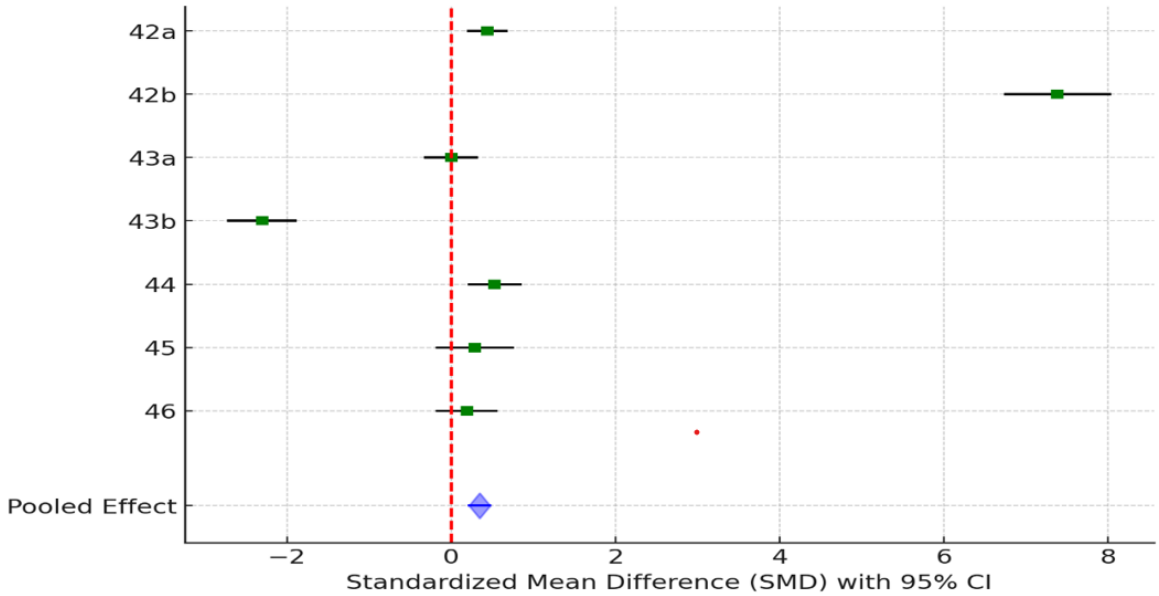

Figure 2. Forest plot of integrative learning effect sizes
Source: The authors.

Discussion

This systematic review synthesizes findings from five studies investigating the integration of holistic achievement in elementary school environments. These results illustrate the implementation forms of integrated learning in PE. The integrative approaches used in these studies include video-led juggling exercises, technology-integrated PE classes, curriculum-embedded PA sessions, game-based learning, and structured physical literacy programs. These results indicate that the integration approach in PE can be implemented using technology, focusing on approaches that embed PA directly into the curriculum, using interactive and engaging game-based learning methods, and promoting comprehensive skill-building through structured physical literacy programs.

These findings are supported by previous research stating that the integration of modern information technology enables students to engage in sports practice and gain a thorough understanding of the dual education value in physical education[47]. Furthermore, this technological integration becomes essential as it explores the potential of these tools to enhance teaching methods, tailor training programs, and optimize performance in educational and athletic contexts, thereby facilitating the implementation of new educational approaches[48]. Thus, efforts to maximize the potential of physical education in the digital era necessitate not only adopting technological advancements but also addressing challenges related to educational management, cooperative and blended learning, and curriculum innovation[49].

Utilizing physical activity as an approach to implementing integrated learning can positively affect students' engagement, physical activity levels, and psychological development. This statement is supported by studies indicating that the physical activity and quality of life of students have a direct impact on their academic success[50] and foster a robust psychological foundation among student populations[51]. Additionally, engaging in physical activity significantly enhances university students' nonacademic skills, including social connectedness, life satisfaction, mental health, as well as boosts academic achievements such as graduation rates, GPA, academic motivation, and overall engagement[52].

Utilizing interactive and engaging game-based learning methods is an excellent choice for implementing integrated physical education teaching. This is because game-based learning positively impacts comprehensive learning outcomes and changes in teaching practices[53]. Additionally, this approach is believed to enhance results in tactical skills, skill performance, affective and procedural knowledge, physical activity, health, and technical methods[54]. Furthermore, applying physical literacy programs in early childhood offers comprehensive advantages for children[55]. The physical literacy construct, which applies physical literacy elements to various health and educational contexts, provides overviews and assessments of curricula and program interventions, or delineates between definitions and understandings of physical literacy[56].

Furthermore, the effects of implementing integrated learning interventions on stimulating students' holistic development are evident. The results of the meta-analysis of five selected studies suggest that experimental groups that received integrative learning interventions tended to achieve better outcomes than control groups. However, not all of the differences attained statistical significance. These findings substantiate the idea that integrative learning strategies in physical education can effectively promote the holistic development of elementary school students. Nevertheless, to guarantee the consistency of outcomes and the long-term efficacy of interventions, it is necessary to conduct additional research and adopt a more standardized approach to investigate potential moderating factors, including age, cultural background, and intervention type. Future studies are encouraged to consider contextual implementation aspects and employ more robust experimental designs to expand the practical relevance and scope of integrative pedagogy in physical education.

The findings of this review indicate that integrated educational interventions can positively affect students' engagement, physical activity levels, and psychological development. These results align with several previous studies, such as those revealing an increase in language competence as a result of integrated learning[56; 57]. Additionally, a study found that integration strategies in content and language-integrated learning (PE-in-CLIL) can enhance oral communication[57]. Another study demonstrated that integrated teaching positively contributes to the development of cognitive skills[58,59]. Moreover, it can enhance students' game performance and critical thinking dispositions[60]. Therefore, the use of integrated learning interventions can effectively stimulate holistic student development. The results indicate that integrative approaches have the potential to improve cognitive, affective, motor, and social domains; however, the variability in the results underscores that the effectiveness of the

intervention is contingent upon its implementation. This emphasizes the significance of considering the specific requirements of students, teacher preparedness, and the local context when developing integrative learning programs.

Conclusion

This study explores the implementation and effectiveness of integrative learning approaches within elementary PE, focusing on curriculum-embedded PA sessions, game-based learning, and structured physical literacy programs. The efficacy of integrative learning approaches in elementary PE was the primary focus of this systematic review and meta-analysis, examining their impact on students' cognitive, affective, motor, and psychological development. The results corroborate the assertion that integrative PE, which incorporates curriculum-embedded physical activity, game-based learning, and structured physical literacy programs, can benefit students' holistic development. Although not all results attained statistical significance, the experimental group was favored in most studies.

The findings indicate that integrative learning in PE fosters a more engaging and dynamic learning environment that combines physical and cognitive development. The application of these methods demonstrates that curriculum-embedded PA sessions effectively enhance students' physical engagement, while game-based learning encourages knowledge retention and a positive affective response. Structured physical literacy programs support comprehensive skill-building and psychological growth, further enriching students' overall educational experience.

In terms of effectiveness, integrative PE learning approaches not only improve PA levels but also positively impact students' motivation, enjoyment, and self-confidence. This suggests that integrative learning can play a vital role in holistic child development within elementary education. Nevertheless, the review uncovered a significant degree of heterogeneity among the studies, suggesting that contextual factors, including the specific design of each program, learner characteristics, and implementation strategies, influence the efficacy of interventions. One limitation of this review is the limited number of eligible studies, which restricts the generalizability of the findings. Furthermore, the diversity of outcomes and measurement instruments complicates the direct comparison of studies.

Future studies are also recommended to continue exploring the long-term impacts and scalability of these approaches, especially in diverse school settings. This study has limitations in terms of the relatively small number of included studies, indicating the need for further research. Future research should adopt more rigorous and standardized experimental designs, explore moderating variables such as age, socio-cultural background, and duration of intervention, and examine long-term outcomes. These directions are essential to deepen our understanding of how integrative learning in PE can be optimized to meet diverse educational goals across varied contexts.

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CRediT author statement

I Bagus Endrawan: Conceptualization, Methodology, Formal analysis, Writing –original draft
Winara: Conceptualization, Methodology, Formal analysis, Writing –original draft
Ahmad Yani: Conceptualization, Methodology, Formal analysis, Writing –original draft
Alficandra: Methodology, Formal analysis, Writing –original draft, Writing–review & editing
Martinus: Methodology, Formal analysis, Writing –original draft
Kamarudin: Methodology, Formal analysis, Writing –original draft
Balkis Ratu NL Esser: Visualization, Writing–original draft, Writing–review & editing
Jujur Gunawan Manullang: Visualization, Writing–original draft, Writing–review & editing

ORCID
I Bagus Endrawan: https://orcid.org/0000-0003-2625-4730
Winara : https://orcid.org/0000-0002-5167-1555
Ahmad Yani: https://orcid.org/0000-0003-2975-1812
Alficandra: https://orcid.org/0000-0001-8495-0262
Martinus: https://orcid.org/0000-0002-7757-1528
Kamarudin: https://orcid.org/0009-0006-5755-4735
Balkis Ratu NL Esser: https://orcid.org/0000-0002-2846-0733
Jujur Gunawan Manullang : https://orcid.org/0000-0001-7796-1158

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Corresponding author: I Bagus Endrawan. Email: bagus.endrawan@binadarma.ac.id