



Sociocognitive rhythmic physical activity to improve basic movement skills in primary learners

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ABSTRACT

Rhythmic physical activity has the potential to enhance fundamental movement skills in children aged 8–9 years; however, research on this topic remains limited. The objective of this study was to examine the effectiveness of socio-cognitive-based rhythmic physical activity in improving the fundamental movement skills of elementary school students aged 8–9 years. A total of 40 students (20 boys and 20 girls) were randomly assigned to either an experimental group or a control group. Both groups participated in a four-week intervention program conducted three times per week. Fundamental movement skills were assessed using the Test of Gross Motor Development-3 Short Form (TGMD-3 Short Form) one day before and after the intervention. After the four-week intervention, the experimental group demonstrated a significant improvement in fundamental movement skills. All seven items of the TGMD-3 Short Form showed statistically significant enhancements: hop with one leg ($p < 0.05$), Gallop ($p < 0.05$), long jump from place ($p < 0.05$), overhand throw ($p < 0.05$), two-handed catch ($p < 0.05$), stationary dribble ($p < 0.05$), and two-handed strike ($p < 0.05$). This study provides empirical evidence that an eight-week socio-cognitive-based rhythmic physical activity program significantly improves the fundamental movement skills of children aged 8–9 years. The improvement in movement skills was greater in children who participated in the socio-cognitive rhythmic physical activity program compared to those who engaged in general physical activities. This rhythmic activity model can serve as an effective alternative learning material for rhythmic activity instruction in elementary schools.

Keywords: effectiveness, rhythmic physical activity, basic movement skills

Article history

Received:

04 June 2025

Revised:

15 July 2025

Accepted:

12 September 2025

Published:

06 October 2025

Citation (APA Style): Dwihandaka, R., Nurkamto, J., Hidayatullah, M. F., Fauzi, F., & Ihsan, F. (2025). Sociocognitive rhythmic physical activity to improve basic movement skills in primary learners. *Cakrawala Pendidikan: Jurnal Ilmiah Pendidikan*, 44(3), pp. 568-578. DOI: <https://doi.org/10.21831/cp.v44i3.86211>

INTRODUCTION

Fundamental movement skills (FMS) form the foundational basis of children's motor development and serve as prerequisites for more advanced physical competencies, such as engaging in sports and performing daily physical activities. FMS consists of three primary components: locomotor skills (e.g., running, jumping, sliding), manipulative skills (e.g., throwing, catching, kicking), and stability skills (e.g., balancing, turning, body rotation) (Gallahue et al., 2012). Children who develop strong FMS are more likely to participate in complex physical activities and maintain an active lifestyle throughout their lives (Lubans et al., 2010). Conversely, limited mastery of FMS during childhood can lead to reduced participation in physical activity and increase the risk of long-term health issues such as obesity and psychosocial problems (Ma & Luo, 2023).

Unfortunately, the decline in FMS quality among primary school-aged children has become a growing concern in many countries, including Indonesia. Children today are more inclined to engage in sedentary activities such as watching television or playing with gadgets rather than participating in physical activities that stimulate motor skills. A study by Hardy et al. (2010) found

that many children aged 6–10 fail to attain age-appropriate levels of FMS proficiency. This presents a significant challenge for educators, particularly in designing physical education curricula that effectively stimulate motor skill development.

In this context, rhythmic physical activity has emerged as a promising alternative teaching method. Rhythmic physical activity refers to motor activities integrated with music and rhythm, encompassing rhythmic gymnastics, creative dance, and rhythmic games tailored to children's developmental stages. According to Gallahue et al. (2012), rhythmic activities are well-suited for children aged 6–10 as they stimulate motor, cognitive, and affective aspects in an integrated manner. Children are more engaged and motivated to participate in lessons that involve music and rhythmic movement because they are enjoyable and developmentally appropriate.

Furthermore, empirical studies have shown that rhythmic physical activities enhance coordination, balance, movement rhythm, and motor creativity in children. Research by Marinšek and Denac (2020) confirmed that integrating music and movement in physical education programs significantly improves gross motor skills and rhythmic abilities in primary school-aged children. These activities not only foster motor development but also strengthen the connections between cognitive and emotional domains.

However, many of the current approaches to implementing rhythmic physical activity remain traditional and are not yet grounded in comprehensive learning theories. In this regard, the socio-cognitive approach developed by Albert Bandura can be employed to enhance the effectiveness of interventions. This theory emphasizes the role of social environment, modeling, observation, self-regulation, and self-efficacy in the learning process (Bandura, 1986). In physical education settings, this approach views learners as active agents who learn through observation, direct experience, and reflection on their own and others' behaviors.

The socio-cognitive approach is particularly relevant for children aged 8–9, who are in Piaget's concrete operational stage of development. At this stage, children begin to understand cause-effect relationships, imitate behaviors observed by teachers or peers, and develop a sense of self through the feedback they receive. Therefore, rhythmic physical activities designed with socio-cognitive principles will support learning not only through physical practice but also through structured cognitive and social processes. For instance, children may imitate movements demonstrated by a teacher or peer, assess their performance by observing outcomes, and be motivated by the success of their peers (Zhou et al., 2021).

Nonetheless, empirical studies that integrate rhythmic physical activity with a socio-cognitive perspective in primary school physical education are still scarce, particularly in Indonesia. Most existing research focuses solely on physical aspects, without accounting for the social and cognitive factors that support movement learning. A study by Hu et al. (2020) demonstrated that theory-based approaches are more effective than conventional methods in enhancing FMS. They compared Novel Rhythmic Physical Activities (NRPA) with Traditional Rhythmic Physical Activities (TRPA) and found that NRPA, which employs a theory-based pedagogical approach, led to significant improvements in children's motor skills.

Based on this background, it is important to conduct a study that examines the effectiveness of socio-cognitively-based rhythmic physical activity in improving fundamental movement skills among primary school children. Such an intervention is expected to contribute to the development of enjoyable, structured, and effective physical education learning models grounded in sound learning theories. In addition, the findings of this study are expected to provide practical alternatives for physical education teachers in implementing rhythmic activities that focus not only on physical achievements but also on students' social and cognitive development.

Therefore, this study aims to investigate the effectiveness of socio-cognitively-based rhythmic physical activities in enhancing fundamental movement skills among 8–9-year-old primary school students. The study tests the hypothesis that rhythmic physical activities designed using a socio-cognitive approach are more effective than conventional physical activities in improving locomotor, manipulative, and stability movement aspects in primary school-aged children. Through a structured scientific approach, the results of this study are expected to enrich the literature on physical education curriculum development and serve as a foundation for future interventions in early childhood movement education.

METHOD

This study employed a quantitative approach using a quasi-experimental design, involving an experimental group and a control group. The research subjects consisted of 40 students aged 8–9 years from two elementary schools in Kulon Progo Regency. The experimental group comprised 20 students from Karang Sari 2 Public Elementary School, while the control group consisted of 20 students from Widoro Public Elementary School.

The inclusion criteria for participants were as follows: (1) second-grade elementary students aged 8–9 years, (2) willingness to participate in the entire research program, (3) not enrolled in any extracurricular or other motor training programs outside school, and (4) having obtained written parental or guardian consent. All participants signed an informed consent form after receiving an explanation of the study's objectives and procedures.

The experimental group received an intervention in the form of rhythm-based physical activity grounded in the socio-cognitive approach for four weeks, with a frequency of three sessions per week and a duration of 8 minutes and 30 seconds per session. Each session was divided into three parts warm-up, main activity, and cool-down structured according to rhythmic activity principles from stages B1 to B5. The intervention was administered by the Physical Education, Sports, and Health (PJOK) teachers at each respective school. Meanwhile, the control group did not receive any intervention and only participated in their regular school activities.

The instrument used to measure fundamental motor skills was the Test of Gross Motor Development 3 Short Form (TGMD-3 Short Form). Measurements were conducted one day before (pretest) and one day after (post test) the intervention.

Data analysis was carried out using SPSS version 27.0. The analysis procedure began with assumption tests, namely the normality test using the Kolmogorov–Smirnov test and the homogeneity test using Levene's Test. Since the results indicated that the data were not normally distributed and not homogeneous, non-parametric tests were employed. The Wilcoxon Signed Rank Test was used to examine the differences between pretest and posttest within each group, while the Kruskal–Wallis test was applied to determine differences between the experimental and control groups. All analyses were conducted at a significant level of 0.05.

FINDINGS AND DISCUSSION

Findings

Normality test

To ensure that the research data met the requirements for further statistical analysis, a normality test was conducted on the measurement results of fundamental motor skills in both the experimental and control groups, at both the pretest and posttest stages. The normality test was performed using the Kolmogorov-Smirnov method, and the results are presented in Table 1.

Based on the results presented in Table 1, it is evident that all variables of fundamental motor skills, both in the experimental group and the control group, show significance values (p-value) less than 0.05. This indicates that the data are not normally distributed, for both pretest and posttest measurements across all fundamental motor skill items. Therefore, the assumption of normality is not met. Consequently, non-parametric tests, such as the Wilcoxon Test and the Kruskal-Wallis Test, were used for subsequent data analysis, as they are more appropriate under these conditions.

Homogeneity test

After conducting a normality test on the fundamental motor skills data and finding that the data were not normally distributed, the next step was to perform a homogeneity test to determine whether the variances between groups were equal. The results of the homogeneity test for each component of fundamental motor skills are presented in Table 2. Based on the results of the homogeneity test presented in Table 2, several components of fundamental motor skills showed significance values (Sig.) less than 0.05, namely Hop With 1 Leg, Gallop, Long Jump from Place, Catch (Two-Handed), and Strike.

Table 1. Kolmogorov-Smirnov normality test of basic movement skills of experimental and control groups

Group	Variable	Group	Statistic	p-value	Description
Experiment (N = 20)	Hop With 1 Leg	Pretest	0.226	0.009	Not Normal
		Posttest	0.387	0.000	Not Normal
	Gallop	Pretest	0.398	0.000	Not Normal
		Posttest	0.350	0.000	Not Normal
	Long Jump from Place	Pretest	0.330	0.000	Not Normal
		Posttest	0.376	0.000	Not Normal
	Throw Overhead	Pretest	0.280	0.000	Not Normal
		Posttest	0.449	0.000	Not Normal
	Catch (Two-Handed)	Pretest	0.538	0.000	Not Normal
		Posttest	0.261	0.000	Not Normal
	Dribble Stationary	Pretest	0.284	0.000	Not Normal
		Posttest	0.361	0.000	Not Normal
	Strike	Pretest	0.399	0.000	Not Normal
		Posttest	0.389	0.000	Not Normal
Control (N = 20)	Hop With 1 Leg	Pretest	0.263	0.001	Not Normal
		Posttest	0.333	0.000	Not Normal
	Gallop	Pretest	0.424	0.000	Not Normal
		Posttest	0.499	0.000	Not Normal
	Long Jump from Place	Pretest	0.400	0.000	Not Normal
		Posttest	0.438	0.000	Not Normal
	Throw Overhead	Pretest	0.300	0.000	Not Normal
		Posttest	0.247	0.002	Not Normal
	Catch (Two-Handed)	Pretest	0.538	0.000	Not Normal
		Posttest	0.527	0.000	Not Normal
	Dribble Stationary	Pretest	0.276	0.000	Not Normal
		Posttest	0.288	0.000	Not Normal
	Strike	Pretest	0.238	0.000	Not Normal
		Posttest	0.288	0.000	Not Normal

Table 2. Homogeneity test of basic movement skills

Basic movement skills	Levene Statistic			Description
	Statistic	df	Sig.	
Hop with 1 Leg	5.784	1;38	0.021	Not Homogeneous
Gallop	5.384	1;38	0.026	Not Homogeneous
Long Jump from Place	7.728	1;38	0.008	Not Homogeneous
Throw Overhead	2.463	1;38	0.125	Homogeneous
Catch (Two-Handed)	81.000	1;38	0.000	Not Homogeneous
Dribble Stationary	2.449	1;38	0.126	Homogeneous
Strike	4.711	1;38	0.036	Not Homogeneous

This indicates that the data for these components are not homogeneous across groups. Meanwhile, two components, Throw Overhead and Dribble Stationary, had significant values greater than 0.05, suggesting that their variances are homogeneous. Since the majority of the data do not meet the assumptions of normality and homogeneity, subsequent data analyses employed non-parametric tests to obtain more valid results.

T-test results

After it is known that the data is not normally distributed and not homogeneous, an analysis is carried out using the Wilcoxon nonparametric test to determine the difference in basic movement skills between the pretest and posttest in each group. The Wilcoxon test results for the experimental and control groups are shown in Table 3.

Table 3. Wilcoxon test results pretest - posttest basic movement skills of experimental and control groups

Group	Variable	Group	Mean	Std. Deviation	p-value	Description
Experiment (N = 20)	Hop With 1 Leg	Pretest	1.95	0.759	0.002	There is a difference
		Posttest	2.60	0.503		
	Gallop	Pretest	2.40	0.598	0.014	There is a difference
		Posttest	2.70	0.571		
	Long Jump from Place	Pretest	2.15	0.745	0,008	There is a difference
		Posttest	2.70	0.657		
	Throw Overhead	Pretest	1.70	0.737	0,001	There is a difference
		Posttest	2.65	0.671		
	Catch (Two-Handed)	Pretest	2.05	0.224	0.002	There is a difference
		Posttest	2.55	0.510		
	Dribble Stationary	Pretest	1.65	0.671	0.001	There is a difference
		Posttest	2.55	0.510		
	Strike	Pretest	2.20	0.523	0.001	There is a difference
		Posttest	2.95	0.510		
Control (N = 20)	Hop With 1 Leg	Pretest	1.80	0.696	0.180	No Difference
		Posttest	1.95	0.605		
	Gallop	Pretest	2.35	0.587	0.083	No Difference
		Posttest	2.20	0.523		
	Long Jump from Place	Pretest	2.	0.459	0.414	No Difference
		Posttest	2.10	0.447		
	Throw Overhead	Pretest	1.90	0.788	0.157	No Difference
		Posttest	2.10	0.852		
	Catch (Two-Handed)	Pretest	2.05	0.224	0.317	No Difference
		Posttest	2.10	0.308		
	Dribble Stationary	Pretest	1.70	0.657	0.180	No Difference
		Posttest	1.85	0.671		
	Strike	Pretest	2.65	0.813	0.046	There is a difference
		Posttest	2.85	0.671		

Based on the results of the Wilcoxon test presented in Table 3, it was found that there was a significant difference between the pretest and posttest results in the experimental group for all fundamental motor skill variables. This is indicated by p-values less than 0.05 across all items, suggesting an improvement in fundamental motor skills following participation in the rhythm-based physical activity program grounded in sociocognitive theory. In contrast, in the control group, most items did not show significant differences between the pretest and posttest (p-values > 0.05), except for the Strike variable, which showed a significant difference. These findings indicate that improvements in fundamental motor skills occurred more significantly in the group that received the sociocognitive-based rhythmic physical activity intervention compared to the group that did not receive any specific treatment.

T-test results

To see the difference in the improvement of basic movement skills between the experimental group and the control group after treatment, the Kruskal-Wallis test was used. This test was chosen because the data did not meet the assumptions of normality and homogeneity. The results of the Kruskal-Wallis test are presented in Table 4.

Based on the results of the Kruskal Wallis test presented in Table 4, it was found that all aspects of fundamental motor skills showed significant differences between the experimental group and the control group ($p < 0.05$). The average improvement in scores in the experimental group was higher compared to the control group, with the most significant differences observed in the Strike component ($p = 0.001$), Dribble Stationary ($p = 0.002$), and Throw Overhead ($p = 0.003$). These findings indicate that the socio-cognitive-based rhythmic physical activity intervention has a greater impact on improving fundamental motor skills in children aged 8–9

years than regular physical activity. Therefore, the socio-cognitive-based approach can be considered an effective alternative for developing basic motor abilities in elementary schools.

Table 4. Kruskal-Wallis test results of basic movement skills of experimental and control groups

Measurement test Basic movement skills	Experiment Mean $\pm$ (SD)	Control Mean $\pm$ (SD)	p-value	Description
Hop With 1 Leg	0.65 $\pm$ (0.67)	0.15 $\pm$ (0.49)	0.014	There is a difference
Gallop	0.30 $\pm$ (0.47)	0.15 $\pm$ (0.37)	0.003	There is a difference
Long Jump from Place	0.55 $\pm$ (0.76)	0.10 $\pm$ (0.55)	0.019	There is a difference
Throw Overhead	0.95 $\pm$ (0.89)	0.20 $\pm$ (0.62)	0.003	There is a difference
Catch (Two-Handed)	0.50 $\pm$ (0.51)	0.05 $\pm$ (0.22)	0.018	There is a difference
Dribble Stationary	0.90 $\pm$ (0.72)	0.15 $\pm$ (0.49)	0.002	There is a difference
Strike	0.75 $\pm$ (0.64)	0.20 $\pm$ (0.41)	0.001	There is a difference

Discussion

Interpretation of research results

The results of this study indicate that socio-cognitive-based rhythmic physical activity significantly improves fundamental motor skills (FMS) in children aged 8–9 years. Wilcoxon test data showed a significant increase in all aspects of FMS in the experimental group ($p < 0.05$), which included locomotor skills (hop on one leg, gallop, standing long jump), manipulative skills (overhand throw, catch, stationary dribble, strike), whereas the control group did not exhibit significant changes, except in the strike skill. This demonstrates that participation in a systematically designed rhythmic physical activity program using a socio-cognitive approach can comprehensively develop children's motor abilities.

The socio-cognitive approach is based on Bandura's theory, which emphasizes that learning occurs through observation, imitation, and modeling, aligning well with the characteristics of primary school-aged children. In this study, children not only moved rhythmically but also imitated movements demonstrated directly by physical education instructors or teachers. This supports the internalization process of motor skills through social interaction and positive reinforcement within the context of music and rhythmic movement (Han et al., 2022; Lanang, et al., 2023; Laure & Habe, 2023).

These findings further reinforce that fundamental motor skills, which serve as a critical foundation for motor development and readiness for further sports activities, can be effectively enhanced through age-appropriate and enjoyable media. Socio-cognitive-based rhythmic physical activity provides a learning environment that supports children's social, emotional, and cognitive needs, contributing to the effectiveness of motor skill learning (Marinšek, & Denac, 2020; Yang et al., 2025; Zhao et al., 2024). Thus, this intervention model not only impacts physical performance improvements but also fosters positive attitudes and behaviors toward physical activity from an early age. Consistent with these findings, Hidayat (2013) demonstrated that self-monitoring and goal-setting strategies significantly enhance elementary students' mastery of motor skills and intrinsic motivation, underscoring the importance of self-regulation in physical education contexts.

The most effective method to promote the development of fundamental motor skills (FMS) and rhythmic abilities (RA) in early childhood is a program combining music with movement (Marinšek & Denac, 2020).

Comparison with previous studies

The results of this study are consistent with several previous studies that emphasize the importance of rhythmic physical activity in enhancing fundamental movement skills (FMS) in early childhood. Gallahue et al. (2012) explain that rhythmic activities are highly suitable for children aged 6–10 years because they develop basic motor skills while simultaneously introducing children to concepts of rhythm and music. In the context of this study, systematically

and structurally conducted rhythmic physical activities provided varied and enjoyable movement experiences, which are key to effective motor learning in children.

Further research by Hu et al. (2020) demonstrated that Novel Rhythmic Physical Activities (NRPA) are more effective than Traditional Rhythmic Physical Activities (TRPA) in improving Fundamental Movement Skills (FMS). This appears to align with the approach used in this study, where the sociocognitive element adds an additional dimension of social learning and motivation reinforcement, making the activity more than just ordinary physical movement. In line with this, Sucipto et al. (2023) found that applying tactical and gender-responsive learning approaches in physical education increases students' enjoyment levels, confirming that motivational and social dimensions are essential factors in sustaining engagement during movement-based activities.

Moreover, Marinšek and Denac (2020) assert that the combination of music and movement is the best strategy to promote the development of FMS and Rhythmic Ability (RA) in children. Therefore, when music is used as an enjoyable external enhancer that guides children's movement rhythm, it positively impacts coordination, response speed, and mastery of motor skills.

Thus, the findings of this study are consistent with existing literature and reinforce the evidence that approaches involving music, rhythm, and social learning principles can be highly effective methods for developing children's fundamental movement skills.

Strengths of research design

This study possesses several design strengths that support the validity and reliability of the obtained findings. First, the use of a quasi-experimental design with both experimental and control groups provides a robust basis for directly comparing the effects of the intervention. With a balanced sample size (20 children in each group) and random participant selection, selection bias can be minimized (Berger et al 2021; Miller et al, 2020; Sella et al. 2021).

Second, the employment of an internationally standardized instrument for measuring fundamental motor skills, namely the Test of Gross Motor Development-3 Short Form (TGMD-3 SF), ensures strong content and construct validity. The TGMD-3 has been demonstrated to objectively and reliably assess locomotor and manipulative skills in children, including within the Indonesian cultural context.

Third, the comprehensive data testing procedures, including normality and homogeneity tests, indicate the researchers' attention to data characteristics before selecting appropriate statistical tests. When the data were non-normal and heterogeneous, the researchers appropriately applied nonparametric tests such as the Wilcoxon and Kruskal-Wallis tests, thereby maintaining the statistical validity of the analysis results (Bongbeebina & Rahman, 2025).

Additionally, the intervention activities were conducted over four weeks with a frequency of three sessions per week, reflecting an adequate training intensity to observe motor skill improvements. The activities were directly supervised by physical education teachers at each school, reinforcing genuine involvement within the educational context rather than merely laboratory simulation.

The combination of experimental design, the use of valid measurement tools, and control over implementation establishes a strong methodological foundation for the findings, making this study a valuable reference for the implementation of rhythm-based physical activity programs in elementary schools.

Explanation of the effectiveness of rhythmic activities

The effectiveness of rhythmic physical activity in enhancing fundamental motor skills can be explained through a combination of physiological, psychological, and socio-cognitive principles. Physiologically, repetitive movements performed in a specific rhythm stimulate the motor nervous system, strengthen the coordination of large muscle groups, and improve control over balance and agility. The accompanying music also activates the limbic system, which plays a role in emotion and motivation, thereby increasing children's enthusiasm and engagement in the activity. Similarly, Nugraha et al. (2022) highlighted structured and reflective physical education practices, such as circuit learning involving peer observation and self-assessment,

effectively improving students' critical thinking and physical fitness, reinforcing the value of interactive and feedback-based motor learning.

From a psychological perspective, the structured and predictable rhythm helps children prepare their bodies for subsequent movements. This fosters anticipatory motor planning, which is crucial for motor skill development. Music and rhythm provide auditory cues that regulate movement timing, enhance synchronization, and accelerate the understanding of movement patterns (Janzen et al., 2022).

From a socio-cognitive standpoint, such activities offer learning opportunities through observation and imitation. Children mimic movements from teachers or peers, reinforcing learning through vicarious experiences. Additionally, within Bandura's theoretical framework, positive reinforcement (such as praise, encouragement, or enjoyable movements) enhances children's self-efficacy in physical activity. When children feel capable of following the rhythm and mastering movements, their confidence in engaging in physical activity increases (Libertus & Hauf, 2017).

Rhythmic activities also facilitate meaningful social interactions with instructors and fellow participants. This social element acts as a key motivational factor that accelerates the internalization of skills. Therefore, the effectiveness of the intervention lies not only in the movements themselves but also in the accompanying emotional, social, and cognitive contexts (Tunçgenç & Cohen, 2018; Vazou et al., 2020; William & Berthelsen, 2019).

Research limitations

Although this study yielded significant findings, several limitations should be considered for a more cautious interpretation of the results. First, the intervention duration was limited to only four weeks. While this period was sufficient to demonstrate initial changes, it may not have been optimal for assessing long-term effects, such as skill retention or the formation of active habits.

Second, the sample size was relatively small and confined to two elementary schools in Kulon Progo Regency. This limits the generalizability of the findings to a broader population with different geographic, social, or economic backgrounds.

Third, although the physical education teachers conducted activities following the prepared guidelines, variations in teaching methods and facilitation styles may have influenced the final outcomes. The absence of strict control over the implementation process in the field could have led to differences in the quality of execution between schools.

Furthermore, this study did not include additional variables such as the impact of the activities on children's non-motor aspects, including self-confidence, musical intelligence, or motivation toward sports. Follow-up measurements after the intervention were also not conducted, leaving it unclear whether the observed skill improvements were maintained over time.

Taking these limitations into account, the study's results remain relevant and significant; however, further research with a broader design and longer duration is necessary to strengthen the evidence regarding the effectiveness of socio-cognitive-based rhythmic physical activity interventions.

Practical implications

The findings of this study have important practical implications in the field of physical education and motor learning in elementary schools. First, the socio-cognitive based rhythmic physical activity model can serve as an alternative learning approach in rhythmic activities, which have traditionally been conducted using conventional methods. By integrating elements of music, rhythm, and social learning, teachers can create a more engaging, enjoyable, and meaningful learning experience for students.

Second, this rhythmic physical activity can provide an inclusive learning solution. The movements involved are simple, progressive, and accessible to all children, including those with mild motor impairments. This enables all students to actively participate in physical education without feeling left behind.

Third, the involvement of physical education teachers as direct implementers of the intervention demonstrates that this program is easy to integrate into the school curriculum. Without requiring complex facilities or equipment, the activities can be conducted in classrooms, fields, or school halls with minimal resources. These findings align with Sunardianta et al. (2024), who emphasized that child-friendly and well-managed learning environments in physical education encourage students' engagement and support the holistic development of motor and health competencies.

Fourth, the program can strengthen the synergy between motor development and children's socio-emotional growth. When children successfully imitate movements, receive positive reinforcement, and interact in an enjoyable environment, this contributes to building their self-confidence and a positive attitude toward physical activity.

Therefore, this program not only benefits the enhancement of fundamental motor skills but also supports holistic child development in terms of character education and health. Consequently, it is recommended that this approach be systematically integrated into teacher training, physical education curricula, and elementary school education policies.

Suggestions for further research

Based on the results and limitations of this study, several recommendations can be made for future research. First, studies with longer intervention durations, for example, 8 to 12 weeks, are needed to evaluate whether improvements in fundamental motor skills can be maintained or even further developed over an extended period. A longer duration also allows for the emergence of more permanent changes in physical behavior. Second, the scope of research should be expanded to include various regions with diverse social, cultural, and economic backgrounds. By broadening the geographical sample, the generalizability of the results will be strengthened, enabling the findings to serve as a basis for national educational policy. Third, future studies should incorporate additional variables, such as exercise motivation, interest in physical activity, and children's self-perception of their motor abilities. These variables are essential to understanding the psychosocial impact of the given intervention. Fourth, a mixed-methods approach combining quantitative and qualitative data can provide a deeper understanding. Interviews with teachers and students, as well as direct observations during activities, can reveal aspects of the learning process that are not captured solely by statistical data.

Finally, it is important to develop evidence-based modules or guides that can be widely utilized by physical education teachers or child coaches. These modules should include sociocognitive principles, rhythmic activity structures, and strategies to enhance motivation in motor learning. With this development strategy, the impact of sociocognitive-based rhythmic physical activities can be optimized as part of active, enjoyable, and adaptive learning for elementary school children.

CONCLUSION

The findings of this study indicate that engaging in socio-cognitive-based rhythmic physical activity for four weeks effectively improves fundamental motor skills in children aged 8 to 9 years. The fundamental motor skills of children in the treatment group showed greater improvement compared to those in the group participating in regular or general physical activities. This rhythmic physical activity model can serve as an alternative learning material for rhythmic activities in elementary schools.

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