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Application of the Circuit Training Method to Improve Physical Fitness Learning Outcomes Among Phase E Students at SMK Negeri 4 Semarang

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Abstract
This study was motivated by the low learning outcomes in physical fitness among students of class X TM 1 at SMK Negeri 4 Semarang, as indicated by limited participation, low learning motivation, and unsatisfactory achievement in cognitive, affective, and psychomotor domains. The study aimed to improve students' physical fitness learning outcomes through the implementation of the circuit training method. The research employed a Classroom Action Research (CAR) design based on the Kemmis and McTaggart model, consisting of two cycles involving planning, action, observation, and reflection stages. The participants were 36 students of class X TM 1 at SMK Negeri 4 Semarang during the second semester of the 2025/2026 academic year. Data were collected through observation, tests, and documentation, and analyzed using descriptive quantitative techniques. The findings revealed improvements in all learning domains. The average cognitive score increased from 71.2 in the pre-cycle to 84.1 in Cycle II. The affective score improved from 70.1 to 86.2, while the psychomotor score increased from 67.0 to 85.4. Classical learning mastery also improved and exceeded 75% in all assessed domains. Therefore, the implementation of the circuit training method was proven effective in improving the physical fitness learning outcomes of students in cognitive, affective, and psychomotor aspects.

Keywords: circuit training; learning outcomes; physical fitness; classroom action research; students.

1. Introduction

Sports are one of the most effective ways to maintain physical fitness and are widely practiced because they can be performed almost anywhere. According to Law Number 3 of 2005, Article 1, Paragraph 4, sport is defined as any systematic activity aimed at encouraging, fostering, and developing physical, mental, and social potential. Consequently, sports have become an integral part of Indonesian society, both in urban and rural communities (Utomo & Sudarmono, 2021)

In the context of school education, physical fitness is an essential component of Physical Education, Sports, and Health (PJOK) because it contributes not only to students' physical development but also to their cognitive, affective, and social competencies. The ideal physical fitness learning process should be active, enjoyable, student-centered, and capable of engaging all students in meaningful physical activities to achieve the expected learning objectives (Risyanto et al., 2021). Meaningful and varied learning experiences are expected to increase students' motivation, participation, and learning achievement in the cognitive, affective, and psychomotor domains (Hardiansyah et al., 2025).

Recent studies have emphasized that high-quality physical education should not only focus on improving students' physical performance but also facilitate their cognitive, affective, and

psychomotor development through meaningful learning experiences. Well-designed learning interventions that actively engage students in physical activities have been shown to enhance learning motivation, participation, and overall educational outcomes. Therefore, the implementation of active and student-centered instructional approaches is essential to achieve comprehensive learning objectives in physical education (Dudley et al., 2022).

However, the actual learning conditions in Class X TM 1 at SMK Negeri 4 Semarang were inconsistent with these expectations. Preliminary classroom observations indicated several problems during physical fitness learning. Students showed low motivation and limited participation in learning activities. Many students tended to be passive, easily lost concentration, and lacked confidence when performing physical fitness movements. Furthermore, the learning process was still dominated by conventional teacher-centered instruction with limited variations in learning activities, resulting in students becoming bored and less enthusiastic during lessons (Haetami & Triansyah, 2021). Such conditions reduced students' engagement in the learning process and negatively affected their learning achievement (Farel & Candra, 2024).

The preliminary observation conducted before implementing the classroom action research involved 36 students of Class X TM 1. The results revealed that the average cognitive score was 71.2, with only 21 students (58.33%) achieving the minimum learning mastery criterion. Similarly, the average affective score reached only 70.1, with 20 students (55.56%) achieving mastery, while the average psychomotor score was 67.0, with only 18 students (50.00%) meeting the expected learning outcomes. These findings indicate that students' physical fitness learning outcomes in all assessed domains were still below the expected standard. Therefore, improvements in instructional strategies were necessary to enhance students' motivation, participation, and learning outcomes comprehensively.

To address these problems, physical fitness learning should be implemented through active, engaging, and student-centered instructional methods that accommodate students' characteristics and learning needs while promoting meaningful learning experiences (Bayu et al., 2022). Active instructional strategies have consistently demonstrated positive effects on students' participation and learning engagement in physical education. Learning environments that encourage active involvement and interaction enable students to develop better movement competence while simultaneously improving their motivation and confidence. Consequently, selecting appropriate instructional methods is an important factor in maximizing students' learning experiences during physical education classes (Wang et al., n.d.). One instructional approach that has considerable potential is the circuit training method, which combines various physical activities into structured exercise stations that actively involve students throughout the learning process.

Previous studies have demonstrated that circuit training effectively improves students' physical fitness, motor performance, and exercise capacity through structured and progressive training activities (Invernizzi et al., 2020). Furthermore, circuit training has been reported to increase students' motivation and participation because it provides varied and enjoyable learning experiences (Jatra et al., 2023). Nevertheless, previous studies have mainly emphasized improvements in physical performance and fitness components, whereas studies investigating the effectiveness of circuit training in improving learning outcomes comprehensively across the cognitive, affective, and psychomotor domains remain limited, particularly among vocational high school students.

Recent systematic reviews have also highlighted that innovative instructional models in physical education contribute not only to students' physical competence but also to their cognitive engagement, motivation, and social interaction during the learning process. However, empirical evidence examining the implementation of these instructional approaches through classroom action research in vocational high schools remains limited. Therefore, further studies are needed to investigate how active learning strategies can comprehensively improve students' cognitive, affective, and psychomotor learning outcomes in authentic classroom settings (Casey et al., 2018).

Therefore, this study was conducted to improve students' physical fitness learning outcomes through the implementation of the circuit training method in Class X TM 1 at SMK Negeri 4 Semarang. Unlike previous studies that primarily focused on physical performance, this research evaluates the effectiveness of circuit training in improving learning outcomes comprehensively across the cognitive, affective, and psychomotor domains through a Classroom Action Research approach. The findings are expected to provide practical evidence and serve as a reference for Physical Education, Sports, and Health (PJOK) teachers in implementing innovative and effective instructional strategies to improve students' physical fitness learning outcomes (Susanto et al., 2021).

2. Method

This study employed a Classroom Action Research (CAR) approach to improve students' physical fitness learning outcomes through the implementation of the circuit training method among Class X TM 1 students at SMK Negeri 4 Semarang. The study was conducted during the second semester of the 2025/2026 academic year and involved 36 students as research participants. The research design followed the Classroom Action Research framework developed by Kemmis and McTaggart, which consists of four cyclical stages: planning, action, observation, and reflection. This model allows researchers to systematically identify problems, implement interventions, evaluate outcomes, and make continuous improvements throughout the research process (Abdul Razak et al., 2024). The research design consisted of four main stages, namely planning, action, observation, and reflection. These stages were implemented systematically and cyclically throughout the study. The research was conducted in three phases: the pre-cycle, Cycle I, and Cycle II. Each cycle was carried out repeatedly until the predetermined success indicators were achieved.

The study was implemented through a series of cyclical stages comprising a pre-cycle, Cycle I, and Cycle II. The intervention was repeated and refined in each cycle until the established success criteria were attained. The pre-cycle stage was designed to examine students' initial physical fitness learning outcomes by conducting preliminary observations, identifying instructional challenges, and measuring students' baseline competencies. The results obtained during this stage were utilized as the foundation for planning the subsequent actions. Each cycle was carried out during a learning session with a duration of 3 × 45 minutes, following the standard instructional schedule applied at the school.

Table 1. The research procedures were implemented through the following stages

Pre-Cycle	Cycle I	Cycle II
Preliminary Observation	1 × 45 minutes: Introduction to the circuit training method and implementation of the initial training session.	2 × 45 minutes: Follow-up actions based on the reflection results obtained from Cycle I.
Pre-Cycle Activities	2× 45 minutes: Implementation of circuit training activities and evaluation of students' learning outcomes.	1× 45 minutes: Final evaluation of students' learning outcomes.

During the planning stage, the researcher prepared the instructional materials, teaching modules, research instruments, and learning scenarios incorporating the circuit training method. The action stage involved the implementation of the circuit training method in physical fitness learning activities (Ramirez-Campillo et al., 2023). The circuit training program consisted of six exercise stations specifically designed to develop various components of physical fitness, including muscular strength, endurance, agility, flexibility, and motor coordination. Each station was systematically organized to provide students with opportunities to engage in diverse physical activities and to enhance their overall physical fitness. The six exercise stations included a 10-meter sprint, plank push-up, shuttle run, cobra stretch, knee-touch stretch, and stair-stepping exercise (Hasanah et al., 2020).

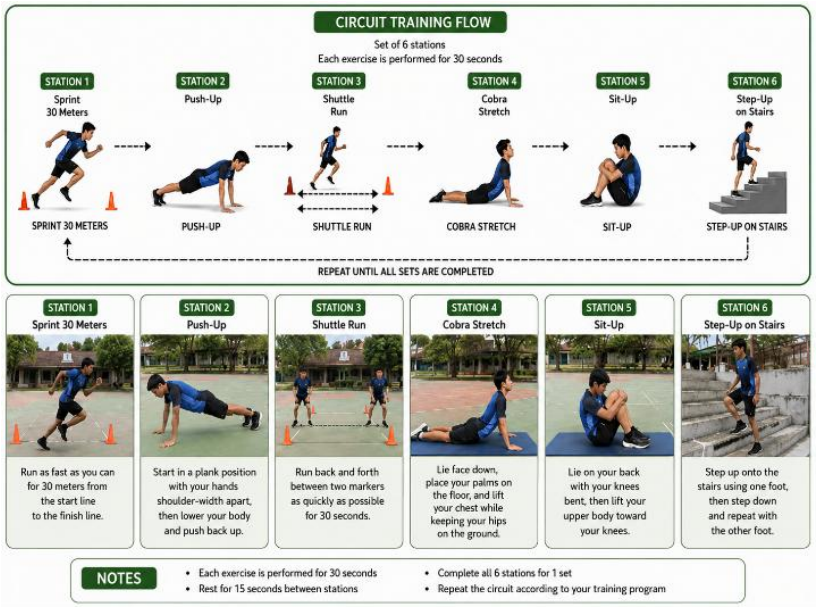

Figure 1. The circuit training exercise stations used in the study

The research instruments employed in this study consisted of student activity observation sheets, as well as cognitive, affective, and psychomotor assessment instruments. These instruments were designed to collect comprehensive data regarding students' learning outcomes and participation throughout the implementation of the circuit training method. The detailed description of the research instruments is presented in:

Table 2. Research instruments

Instrument	Aspect assessed	Indicators	Asessment technique
Student Activity Observation Sheet	Learning Activities	Participation, cooperation, discipline, enthusiasm, and engagement	Observation scale 1-4
Cognitive Assessment	Knowledge	Understanding of physical fitness concepts, benefits of exercise, circuit training techniques, and fitness component	Written Test
Affective Assessment	Attitude	Discipline, responsibility, cooperation, sportsmanship, and self-confidence	Observation
Psychomotor Assessment	Skills	Movement accuracy, coordination, movement fluency, endurance, and completion of exercise sequences	Performance Test

The validity of the research instruments was established through expert judgment. Prior to data collection, the instruments were reviewed and validated by academic supervisors and Physical Education, Sports, and Health (PJOK) teachers to ensure their relevance to the research objectives and their ability to accurately measure the variables under investigation.

Data were collected through observation, tests, and documentation. Observation was employed to obtain information regarding students' activities during the learning process and to assess their level of participation in physical fitness learning implemented through the circuit training method (Iswanto et al., 2024) The testing technique was utilized to measure students' learning outcomes in the cognitive, affective, and psychomotor domains across each research cycle. Meanwhile, documentation served as supporting evidence in the form of photographs of learning activities, students' score records, and other documents related to the implementation of the research actions.

The collected data were analyzed using descriptive quantitative analysis to determine the improvement in students' learning outcomes throughout the research cycles. Data analysis was conducted by calculating the mean scores of students' learning outcomes and the percentage of classical learning mastery in the cognitive, affective, and psychomotor domains. The mean score was calculated to determine the level of students' achievement in each cycle using the following formula:

$$\bar{X} = \frac{\sum X}{N}$$

$\bar{X}$: mean score
$\sum X$: total score obtained by all students
N : total number of students

Furthermore, the percentage of classical learning mastery was calculated to determine the overall effectiveness of the learning process. The percentage was obtained using the following formula:

$$P = \frac{f}{N} \times 100\%$$

P : percentage of classical learning mastery
f : number of students who achieved the predetermined mastery criteria
N : total number of students

The results of the data analysis were subsequently compared across the pre-cycle, Cycle I, and Cycle II to determine the extent of improvement in students' physical fitness learning outcomes following the implementation of the circuit training method. Comparisons were made based on the mean scores and the percentage of classical learning mastery achieved in each cycle. The study was considered successful when at least 75% of the students attained the Learning Objective Achievement Criteria (KKTP) established by the school.

3. Result

Research Findings

This classroom action research was conducted in two cycles with the aim of improving students' physical fitness learning outcomes through the implementation of the circuit training method. The participants consisted of 36 students from Class X TM 1 at SMK Negeri 4 Semarang. Each cycle comprised four stages: planning, action, observation, and reflection. Research data were collected through observations, learning outcome assessments, and documentation throughout the instructional process.

Prior to the implementation of the intervention, a preliminary observation was conducted to identify the initial condition of students' learning outcomes in physical fitness education. The results indicated that the learning process had not yet been implemented optimally. A number of students demonstrated low levels of participation during learning activities, limited learning motivation, and learning outcomes that had not yet met the expected mastery criteria.
The initial evaluation further revealed that most students experienced difficulties in understanding physical fitness concepts, exhibited limited engagement during the learning process, and were unable to perform physical fitness activities effectively. Based on the results of the pre-cycle evaluation, the data presented in Table 3 were obtained.

Table 3. Students' physical fitness learning outcomes in the Pre-Cycle stage

Learning domain	Mean score	Students achieving mastery	Students not achieving mastery	Mastery percentage (%)
Cognitive	71,2	21	15	58,33%
Affective	70,1	20	16	55,56%
Psychomotor	67,0	18	18	50,00%

Based on these findings, it can be observed that students' learning outcomes in the cognitive, affective, and psychomotor domains were still below the predetermined success criteria. Therefore, the circuit training method was implemented as an intervention to improve the learning process and enhance students' physical fitness learning outcomes.

The intervention in Cycle I was carried out through the implementation of a circuit training program consisting of six exercise stations: a 10-meter sprint, plank push-up, shuttle run, cobra stretch, knee-touch stretch, and stair-stepping exercise. Each activity was performed for 30 seconds in a rotational system, allowing students to move systematically from one station to another. During the implementation of Cycle I, students began to demonstrate increased participation and engagement in the learning process. The more varied learning activities also appeared to enhance students' enthusiasm and motivation in completing each exercise sequence.

The results of the Cycle I evaluation demonstrated an improvement in students' learning outcomes across all assessed domains, as presented in Table 4.

Table 4. Students learning outcomes in Cycle I

Learning domain	Mean score	Students achieving mastery	Students not achieving mastery	Mastery percentage (%)
Cognitive	77,5	27	9	75,00%
Affective	78,4	28	8	77,78%
Psychomotor	76,8	26	10	72,22%

The data presented in Table 4 indicate that the implementation of the circuit training method had a positive impact on students' learning outcomes across the cognitive, affective, and psychomotor domains. The cognitive and affective domains achieved the predetermined classical mastery criterion, with mastery percentages of 75.00% and 77.78%, respectively. However, the psychomotor domain reached only 72.22%, indicating that the overall success criteria had not yet been fully achieved. Therefore, further intervention was required in Cycle II to optimize students' learning outcomes.

The reflection conducted after Cycle I identified several challenges that limited the effectiveness of the learning process. Some students were still adapting to the circuit training activities and experienced difficulties in performing several movement techniques correctly. In addition, the transition time between exercise stations was not managed efficiently, reducing the amount of effective practice time. Several students also required clearer demonstrations and more intensive feedback to perform the exercises accurately. Based on these findings, several improvements were implemented during Cycle II, including providing clearer movement demonstrations, improving group organization and transition time management, offering continuous motivation and constructive feedback, and increasing the number of circuit training rotations to optimize students' physical engagement and learning experiences.

The implementation of these improvements resulted in a more effective learning process than that observed in Cycle I. Students demonstrated higher levels of participation, enthusiasm, confidence,

and cooperation during the circuit training activities. They were also able to perform the movement techniques more accurately and complete each exercise station with greater fluency. These positive changes were reflected in the evaluation results, which showed further improvements in students' learning outcomes across the cognitive, affective, and psychomotor domains, as presented in Table 5.

Table 5. Students' learning outcomes in Cycle II

learning domain	mean score	students achieving mastery	students not achieving mastery	mastery percentage (%)
Cognitive	84,1	32	4	88,89%
Affective	86,2	33	3	91,67%
Psychomotor	85,4	32	4	88,89%

The evaluation results obtained after the implementation of Cycle II are presented in Table 5. As shown in Table 5, students' learning outcomes improved substantially across all assessed domains following the implementation of the improvements identified during the reflection of Cycle I. The cognitive domain achieved a mean score of 84.1, with 32 out of 36 students (88.89%) meeting the minimum mastery criterion. Similarly, the affective domain recorded the highest achievement, with a mean score of 86.2 and 33 students (91.67%) achieving mastery. The psychomotor domain also showed considerable improvement, reaching a mean score of 85.4, with 32 students (88.89%) achieving mastery. These results indicate that all learning domains exceeded the predetermined success criterion of 75% classical mastery.

Compared with Cycle I, the implementation of the improvements in Cycle II resulted in higher student participation, greater confidence in performing movement techniques, and more effective learning activities. Students demonstrated better cooperation during the circuit training sessions and were able to complete each exercise station more accurately and efficiently. These findings suggest that the circuit training method not only enhanced students' physical performance but also improved their cognitive understanding and positive learning attitudes throughout the learning process.

Overall, the progression of students' learning outcomes from the pre-cycle stage to Cycle II demonstrates a consistent and substantial improvement across the cognitive, affective, and psychomotor domains. The findings indicate that the implementation of the circuit training method was effective in improving students' physical fitness learning outcomes and successfully achieved the predetermined research success criteria. The progression of students' learning outcomes across the research cycles is illustrated in Figure 2.

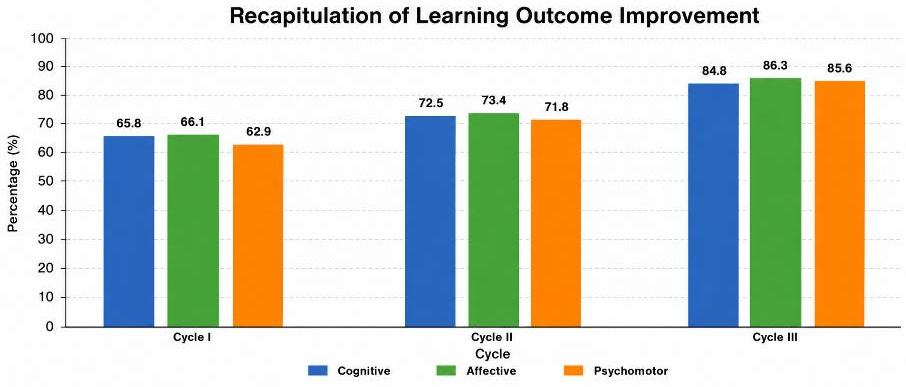

Figure 2. Recapitulation of student's learning

Based on the recapitulation of the learning outcome data, it can be concluded that the implementation of the circuit training method progressively improved students' physical fitness learning outcomes across the cognitive, affective, and psychomotor domains from the pre-cycle stage to Cycle II.

4. Discussion

The findings of this study indicate that the implementation of the circuit training method effectively improved the physical fitness learning outcomes of Class X TM 1 students at SMK Negeri 4 Semarang. The improvement was evident in the cognitive, affective, and psychomotor domains throughout the research cycles.

At the initial stage, students' learning outcomes were still below the predetermined success criteria. This condition was influenced by several factors, including limited student engagement during the learning process, the use of less varied instructional methods, and low student motivation to participate in physical fitness activities. Following the implementation of the circuit training method, students' learning outcomes improved progressively across all domains. These findings are consistent with previous evidence indicating that instructional approaches emphasizing active participation and structured physical activities create more meaningful learning experiences for students. When students are actively engaged throughout the learning process, they demonstrate higher levels of motivation, concentration, and learning persistence, which subsequently contribute to better academic achievement and physical competence in physical education settings (Ladwig, 2025).

The improvement in the cognitive domain indicates that the circuit training method helped students develop a better understanding of physical fitness concepts. Learning through direct experience enabled students to gain a more concrete understanding of the benefits of exercise, components of physical fitness, and movement techniques practiced during the learning activities. The findings revealed that the mean cognitive score increased from 71.2 in the pre-cycle to 84.1 in Cycle II. This improvement suggests that active student involvement in the learning process contributed significantly to the enhancement of students' understanding. These findings are consistent with constructivist learning theory, which emphasizes that knowledge is constructed through direct learning experiences. In circuit training activities, students not only received information from the teacher but also actively experienced and practiced physical fitness activities,

making the learning process more meaningful. Similar findings were reported by (Aulia, 2025), who concluded that active instructional models in physical education significantly enhance students' cognitive engagement by encouraging them to solve movement-related problems, reflect on their learning experiences, and actively construct knowledge through participation. This confirms that learning activities requiring direct involvement are more effective than passive instructional approaches in improving conceptual understanding (Shan et al., 2021).

In addition to the cognitive domain, improvements were also observed in the affective domain. The mean affective score increased from 70.1 in the pre-cycle to 86.2 in Cycle II. This improvement was reflected in enhanced discipline, cooperation, responsibility, participation, and enthusiasm among students during the learning process. The improvement in affective outcomes occurred because circuit training provided opportunities for students to interact and collaborate throughout the training sessions. Group-based learning activities encouraged students to support one another, provide motivation, and maintain discipline during the exercises. These findings indicate that physical fitness learning contributes not only to the development of physical abilities but also to the cultivation of positive attitudes and character traits. The improvement in students' affective outcomes is also supported by previous studies demonstrating that collaborative physical education activities promote interpersonal communication, mutual responsibility, self-confidence, and social interaction among students. These learning experiences strengthen students' positive attitudes while increasing their willingness to participate actively in future physical education lessons (Casey & Goodyear, 2015)

Furthermore, the study revealed a substantial improvement in the psychomotor domain. The mean psychomotor score increased from 67.0 in the pre-cycle to 85.4 in Cycle II. This improvement indicates that students became increasingly capable of performing various physical fitness activities with greater accuracy and consistency. The enhancement of psychomotor skills can be attributed to the repetitive nature of circuit training exercises conducted through multiple stations. Repeated practice enabled students to improve movement coordination, increase endurance, strengthen muscles, and perform physical fitness activities more effectively. The six exercise stations employed in this study provided stimuli for various components of physical fitness, thereby promoting comprehensive motor skill development (Azhari et al., 2024). Likewise, systematic evidence has demonstrated that circuit-based physical training effectively improves motor competence, muscular endurance, movement efficiency, and overall physical fitness among school-aged students. The repetitive practice involved in circuit training enables students to refine movement techniques while developing greater physical confidence and exercise proficiency, supporting the psychomotor improvements observed in the present study (Bull et al., 2020).

The implementation of circuit training also had a positive impact on the learning process itself. Learning activities became more active, varied, and engaging, thereby reducing students' boredom during Physical Education, Sports, and Health (PJOK) classes. The variety of activities at each training station increased students' enthusiasm and motivation to participate in learning activities until completion. Overall, the improvement in learning outcomes demonstrates that circuit training is an effective instructional method for physical fitness education. This method not only enhances students' knowledge but also improves their attitudes and motor skills simultaneously.

Therefore, the findings of this study suggest that the circuit training method can serve as an effective alternative approach in physical fitness education to improve students' learning outcomes comprehensively across the cognitive, affective, and psychomotor domains.

5. Conclusion and Recommendation

Based on the findings of this classroom action research conducted over two cycles, it can be concluded that the implementation of the circuit training method successfully improved the physical fitness learning outcomes of Class X TM 1 students at SMK Negeri 4 Semarang. Improvements were observed across all learning domains, including cognitive, affective, and psychomotor aspects.

In the cognitive domain, the mean score increased from 71.2 in the pre-cycle to 77.5 in Cycle I and further increased to 84.1 in Cycle II. In the affective domain, the mean score improved from 70.1 in the pre-cycle to 78.4 in Cycle I and reached 86.2 in Cycle II. Similarly, in the psychomotor domain, the mean score increased from 67.0 in the pre-cycle to 76.8 in Cycle I and further improved to 85.4 in Cycle II.

These findings indicate that the circuit training method was capable of creating a more active and varied learning environment while increasing student engagement in physical fitness learning activities. Therefore, the circuit training method can be considered an effective instructional strategy for improving students' physical fitness learning outcomes.

Based on the findings of this study, Physical Education, Sports, and Health (PJOK) teachers are encouraged to implement the circuit training method as an alternative approach to physical fitness instruction, as it has been proven effective in improving students' learning outcomes in the cognitive, affective, and psychomotor domains. The use of varied instructional methods is expected to enhance students' participation and motivation throughout the learning process.

Students are encouraged to actively engage and participate optimally in physical fitness learning activities to further develop their physical abilities, conceptual understanding, and positive learning. attitudes. In addition, schools are expected to support the implementation of physical fitness education by providing adequate facilities and infrastructure to ensure effective and optimal learning experiences.

Future researchers are encouraged to further develop the application of the circuit training method by incorporating more diverse exercise variations or integrating it with other instructional models to generate broader and more comprehensive research findings.

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