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The Effect of Interval Training on 30 Meters Sprint Running Speed in Elementary School Students

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Abstract

This study aimed to examine the impact of interval training on 30-meters sprint speed in elementary school children. This study emphasized the importance of appropriate training methodology to improve students' physical fitness, particularly in speed ability. This study used a quantitative methodology with a quasi-experimental design featuring a pretest-posttest control group. The study sample consisted of 54 sixth-grade students divided into an experimental group and a control group. The experimental group underwent interval training for four weeks, while the control group followed traditional physical education instruction. Data collection was conducted by assessing the 30-meters sprint. Data analysis used descriptive statistics and non-parametric testing, specifically the Wilcoxon and Mann–Whitney tests. The results showed a significant increase in the experimental group from pretest to posttest. However, there was no significant difference between the experimental and control groups in the posttest results. These findings indicate that interval training can improve sprint speed, but has not shown significant benefits compared to traditional techniques. The uniqueness of this study lies in the implementation of interval training in the elementary school physical education curriculum, using a controlled experimental methodology. Although interval training improved sprint performance within the experimental group, it did not produce significantly greater improvements compared to traditional physical education methods

Keywords: interval training, running speed, physical education, elementary school

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A. Introduction

Speed is a crucial element of physical fitness that significantly impacts sports, especially those requiring explosive movements such as sprinting. (Carvajal-Espinoza et al., 2023) state that speed is a crucial determinant of sports performance, as it relates to an individual's ability to move in the shortest possible time. In elementary school physical education, increasing speed is crucial for developing children's fundamental movement skills and improving physical fitness (Marsigliante et al., 2024). Consequently, successful training methodologies must be tailored to align with students' developmental characteristics.

Physiological capacity for speed is determined by neuromuscular coordination, muscle strength, and the contractile potential of fast-acting muscle fibers (Trowell et al., 2022). This ability can be improved through systematic and repeated training at a defined intensity. In this context, exercises that activate the anaerobic energy system and increase muscle contraction efficiency are crucial, starting from elementary school age.

Interval training is an effective way to increase speed. Interval training is a methodology that alternates between periods of high-intensity exertion and rest periods (Wang, 2023). This approach has been shown to be effective in increasing anaerobic energy system capacity, muscle strength, and explosive power, which directly enhance sprint performance (Drwal& Maciejczyk, 2025). Furthermore, interval training improves cardiovascular efficiency and the body's ability to utilize oxygen effectively (Ridwan et al., 2024).

Previous studies have shown that scheduled interval training can significantly improve the sprinting ability of elementary school students (Paria et al., 2024). Additional research indicates that interval training can increase speed by up to 15% compared to traditional training methods (Thron et al., 2026). Research conducted by Koci et al., (2025) showed that a consistent school-based interval training program improved motor coordination and sprinting performance in children aged 10 to 12.

During the elementary school years, particularly between the ages of 10 and 12, children reach peak motor development. Arias Macias & Vargas Vera (2024) stated that at this age, coordination, strength, and motor control improve, making children more receptive to organized physical activity. Furthermore, children at this age often prefer diverse and enjoyable activities, making repetitive training approaches less effective in increasing student engagement.

In physical education, the use of diverse training techniques, such as interval training, improves physical ability while increasing student enthusiasm and engagement. Wahyuniati et al., (2025) stated that interval-based activities are generally more engaging and increase student engagement compared to boring exercises. This conclusion is supported by (da Silva Bento et al., 2022), who stated that high-intensity interval training programs in educational settings are safe, effective, and well-received by young people.

Although numerous studies have demonstrated the effectiveness of interval training, most of these studies have focused on adolescent athletes or been conducted outside the framework of elementary school education (Burford et al., 2022). Furthermore, studies examining the direct implementation of interval training within the physical education (PJOK) curriculum in Indonesian elementary schools are still limited and sometimes lack experimental designs with control groups (Lohonathan et al., 2022). Consequently, there remains a research gap regarding the effectiveness of interval training within the formal educational framework of elementary schools.

Given this, further research is needed to evaluate the effectiveness of interval training and to investigate its direct

implementation within PJOK education using a more rigorous research framework. This study aimed to examine the impact of interval training on 30-meters sprint speed in sixth-grade elementary school students using a quasi-experimental design with pretest and posttest control groups.

The uniqueness of this study lies in the implementation of a planned interval training program within the framework of physical education in elementary schools, using two different schools as the experimental and control groups. This research combines physical training methodology with direct PJOK (Physical and Occupational Knowledge) learning in the school environment, aiming to offer practical and theoretical contributions to the development of an effective and applicable speed training model, which is adapted to the characteristics of elementary school students.

However, previous studies investigating interval training in children and adolescents have reported inconsistent findings regarding its effectiveness in improving sprint performance. While several studies demonstrated significant improvements in speed and anaerobic capacity, others found that the benefits were not substantially different from those achieved through regular physical education activities. Moreover, existing studies rarely compare the effectiveness of interval training with standard physical education practices within controlled school settings, leaving uncertainty about its relative pedagogical advantage. Therefore, further investigation is needed to determine whether interval training provides superior benefits compared to conventional physical education methods among elementary school students.

B. Methods

This study used a quantitative methodology with a quasi-experimental design to examine the impact of interval training on 30-meters sprint speed in elementary school children. This study employed a pretest-posttest control group design, combining an experimental group and a control group to systematically evaluate treatment outcomes (Nayeri et al., 2023). The research flow is depicted in Figure 1.

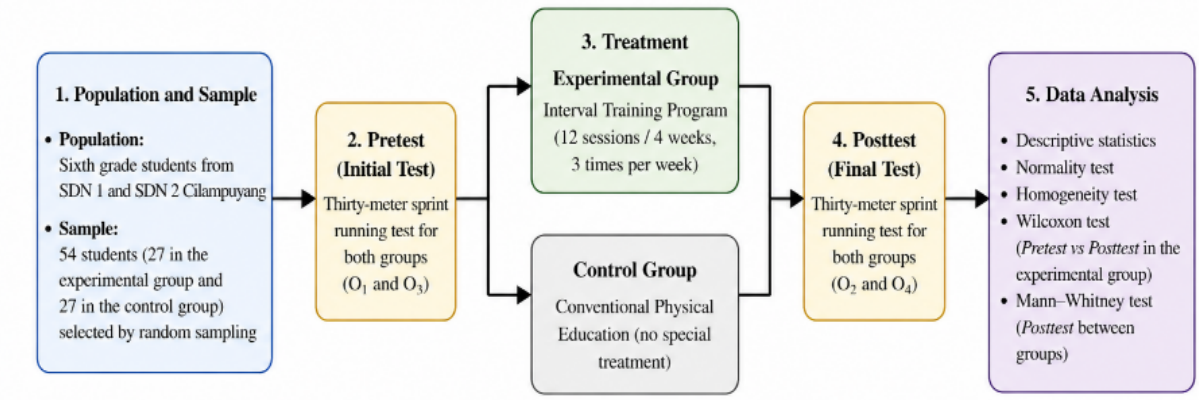

Figure 1. Research Flow

The study was conducted at SDN 1 Cilampuyang and SDN 2 Cilampuyang in Garut Regency. The initial sample consisted of 54 sixth-grade students, with 27 students assigned to the experimental group and 27 students assigned to the control group. Only participants who completed the full intervention program and both pretest and posttest assessments were included in the final analysis. Any discrepancies in sample size were due to participant absence during testing sessions and incomplete data records.

The research approach began with sample selection, followed by a pretest to assess the initial 30-meters sprint speed capabilities of both groups. The next phase involved implementing a four-week interval training program, conducted three times a week, for the experimental group. The control group received no specific intervention and attended standard Physical Education (PJOK) classes. The training program was designed according to the concepts of work-rest ratio, gradual intensity, and progressive overload to systematically improve speed capabilities (Hammert et al., 2024). After completing the comprehensive training program, both groups underwent a posttest using the same methodology as the pretest to obtain conclusive data.

The testing protocol used the 30-meters sprint assessment, as referenced by (Santander et al., 2022). Each student performed two attempts, and the best result was recorded in seconds using a digital stopwatch. The results obtained from the pretest and posttest were then compiled and reported as research data.

Data analysis was performed using SPSS software version 26.0. The analytical step began with descriptive statistics to determine the mean, standard deviation, and minimum and maximum values. Normality was assessed using the Kolmogorov-Smirnov test to ensure data distribution, followed by an evaluation of homogeneity using Levene's test to verify equality of variance between groups. The test results indicated that the data were not normally distributed ($p < 0.05$), so the study continued with non-parametric testing. The Wilcoxon test was used for hypothesis testing to assess differences between pre-test and post-test results in the experimental group, while the Mann-Whitney test was used to evaluate differences in post-test results between the experimental and control groups. All tests were conducted at a significance level of $\alpha = 0.05$, with the decision-making criterion determined by the p-value.

C. Result and Discussion

This part delineates the findings from the examination of study data, encompassing descriptive statistics, normality assessments, homogeneity evaluations, and hypothesis testing via the Wilcoxon and Mann–Whitney tests. The data is organized in a tabular format to enhance the interpretation of the research findings.

Table 1. Descriptive Statistics of Pretest and Posttest

Group	Test	N	Mean	Std. Deviation
Experimental	Pretest	33	12.03	1.53
Experimental	Posttest	33	8.21	1.05
Control	Pretest	29	12.38	2.08
Control	Posttest	29	7.97	1.99

Source: Data Processing Results (2026)

According to Table 2, the experimental group (Elementary School 1) showed a decrease in average sprint time from 12.03 seconds to 8.21 seconds after

the interval training intervention. This decrease indicates an increase in sprint speed. Furthermore, the decrease in standard deviation indicates increasingly homogeneous data.

In the control group (Elementary School 2), the average also decreased from 12.38 seconds to 7.97 seconds. This indicates improved performance, even without any specific intervention.

Table 2. Normality Test (Shapiro-Wilk)

Variable	Sig.	Conclusion
Pretest Experimental	0.009	Not Normal
Posttest Experimental	0.008	Not Normal
Pretest Control	0.343	Normal
Posttest Control	0.048	Not Normal

Source: Data Processing Results (2026)

The significance value of less than 0.05 suggests that the majority of the data are not normally distributed, as suggested by the results of the normality test in Table 2. The experimental group's pretest and posttest, as well as the control group's posttest, contained non-normal data. The pretest in the control group was the sole instance of a normal distribution.

This result suggests that the assumption of normality was not met uniformly, rendering parametric tests unfeasible for data analysis. Consequently, the analysis was resumed with non-parametric tests, which are more suitable for the research data's characteristics.

Table 3. Homogeneity Test (Levene Test)

Test	Sig.	Conclusion
Based on Mean	0.002	Not Homogeneous

Source: Data Processing Results (2026)

The data variance between the experimental and control groups is not homogeneous, as indicated by the homogeneity test results in Table 3. Table 3 indicates a significance value of less than 0.05. This suggests there are discrepancies in the variability of data among the categories.

The decision to employ non-parametric tests for hypothesis testing is further reinforced by the data inhomogeneity, as parametric tests necessitate homogeneity of variance, whereas non-parametric tests do not.

Table 4. Wilcoxon Test Results

Group	Z	Sig. (2-tailed)	Conclusion
Experimental	-5.012	0.000	Significant
Control	-4.704	0.000	Significant

Source: Data Processing Results (2026)

The Wilcoxon test results, as presented in Table 4, show a substantial difference between the pretest and posttest scores in the experimental and control groups, as evidenced by a significance value below 0.05. This indicates that both groups showed improvements in sprint speed following therapy and instruction.

The observed improvements in the experimental group may be attributed to the methodical implementation of interval training. In the control group, the improvements may have been influenced by general physical education activities and factors related to students' physical development.

Table 5. Mann-Whitney Test

Variable	**Mann-Whitney U**	**Wilcoxon W**	**Z**	**Asymp. Sig. (2-tailed)**	**Conclusion**
GainEksKon	340.500	901.500	-	0.052	Not

	1.947	Significant

Based on Table 5, the Asymp. Sig. (2-tailed) value obtained from the Mann–Whitney test was 0.052, which is greater than the significance level of 0.05. This indicates that there was no statistically significant difference between the experimental group and the control group in improving 30-meter sprint speed. Although both groups showed improvements after the treatment, interval training did not demonstrate significantly superior results compared to conventional physical education activities. These findings suggest that both interval training and regular physical education programs can positively contribute to the development of sprint speed among elementary school students. The absence of significant differences may be influenced by several factors, including the relatively short duration of the intervention, similarities in physical activity exposure between groups, and the natural physical development of students during late childhood.

This indicates that although both groups showed improvements in sprinting ability, the difference in improvement between the interval training group and the regular learning group was not statistically significant. Consequently, interval training did not demonstrate substantial benefits compared to traditional learning approaches within the scope of this study.

Although interval training improved sprint performance within the experimental group, the absence of significant differences between groups indicates a non-superiority finding. In other words, interval training was not statistically superior to conventional physical education activities in improving 30-meter sprint performance among elementary school students.

This finding suggests that regular physical education activities may already provide sufficient stimulus for speed development during late childhood, particularly because students are in a rapid phase of neuromuscular and motor development. Several factors may explain the absence of superior effects, including the relatively short intervention duration, similarities in physical activity exposure between groups, and natural developmental adaptations among children aged 10–12 years. Therefore, the contribution of this study lies not only in demonstrating the effectiveness of interval training, but also in providing comparative evidence that its benefits may not substantially exceed those of standard school-based physical education within short-term interventions.

Discussion

The results showed that interval training significantly increased 30-meters sprint speed in elementary school children. A Wilcoxon test found a significant difference between pre-test and post-test results in the experimental group. The reduction in sprint time indicates an improvement in speed performance, an important measure of sprinting ability (Thibault et al., 2025).

This increase in speed can be attributed to changes in the neuromuscular system and increased anaerobic energy capacity due to consistent high-intensity training. Interval training facilitates the body's adaptation to workload by modulating the work-rest ratio, thereby increasing muscle contraction efficiency and accelerating motor responses (Carvajal-Espinoza et al., 2023). This training improves motor coordination and explosive muscle strength, both of which are crucial for sprinting (Wang, 2023).

The Mann–Whitney test results showed no significant difference between the experimental and control groups. This finding suggests that speed increases are influenced not only by interval training but also by additional factors, including consistent physical activity during Physical Education (PJOK) classes, students' biological developmental stages, and natural adaptations due to growth

(Wahyuniati et al., 2025). This significance lies in the fact that physical development occurs rapidly during elementary school, which could potentially influence the study results.

This finding aligns with research conducted by (Thron et al., 2026), which showed that interval training effectively increases students' running speed. Furthermore, several studies have shown that interval-based training has a positive effect on speed and endurance in children and adolescents (Li et al., 2023). Unlike previous research, the improvements observed in this study did not show significant differences between groups.

The discrepancies in outcomes may stem from various reasons, including the limited length of the treatment, insufficient training intensity, and inadequate oversight of students' physical activity after the treatment. Moreover, motivation, daily physical condition, and student engagement in learning can impact sprint performance (Arias Macias & Vargas Vera, 2024).

The findings of this study suggest that interval training may serve as an alternate training approach in Physical Education (PJOK) curricula, since it has demonstrated an enhancement in students' running speed. Educators can include this approach into their curricula to enhance the quality of students' physical exercise in a more organised and methodical fashion (Ridwan et al., 2024).

This study's weaknesses stem from its limited sample size and very short treatment duration. This study did not adequately consider students' physical activity outside of the intervention, which could have influenced the results. Therefore, it is recommended that future research use a larger sample size, extend the training duration, and implement stricter variable controls to achieve more comprehensive results.

The absence of significant differences suggests that traditional physical education activities may already provide sufficient stimulus for speed development in elementary school children.

D. Conclusion

This study investigated the effect of interval training on 30-meter sprint performance among elementary school students. The findings demonstrated that interval training significantly improved sprint performance within the experimental group, indicating that structured high-intensity activities can positively contribute to speed development in children.

However, the comparative analysis revealed no significant differences between the experimental group and the control group in the posttest results. This indicates that interval training did not significantly outperform conventional physical education activities. Therefore, the present study represents a neutral or non-superiority finding, suggesting that both interval training and standard physical education methods may be similarly effective for improving sprint speed in elementary school settings.

These findings provide practical implications for physical education teachers and schools. Teachers may use interval training as an alternative instructional strategy to increase exercise variation, student engagement, and training intensity during physical education lessons. At the same time, conventional physical education activities remain valuable for supporting students' motor and speed development.

The contribution of this study lies in providing comparative evidence regarding the effectiveness of interval training within a controlled school-based context. Rather than merely demonstrating improvement, this study highlights that the relative advantage of interval training over standard physical education may be limited during short-term interventions among elementary school students.

Future research is recommended to involve larger sample sizes, longer intervention durations, and stricter control

of external physical activity variables to better understand the long-term effectiveness of interval training in school-aged children.

E. Akcnowledgment

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F. Conflict of Interest

The author declares that there is no conflict of interest related to this research. This study was conducted solely for academic purposes, specifically to fulfill the requirements of a thesis defense.

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