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THE EFFECT OF SLED-PULLING TRAINING METHOD ON SPRINTING ABILITY OF SEVENTH GRADE STUDENTS OF JUNIOR HIGH SCHOOL OF NW HUSNUL ABROR

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Abstract

This study aims to determine the effect of the sled pulling training method on sprinting ability among seventh-grade students at MTs NW Husnul Abror. This experimental study used two groups: an experimental group that received the sled pulling training method and a control group that did not receive this training. The subjects consisted of 10 male students divided into two groups of 5 students each. The data collected included pretest and posttest sprinting ability results. The Shapiro-Wilk normality test was used to ensure that the data were normally distributed. The normality test results showed that the data were normally distributed with p-values > 0.05 for all data. The Levene's test of homogeneity was used to ensure that the variances of the two groups were homogeneous. The homogeneity test results showed that the variances of the two groups were homogeneous with p-values > 0.05 . The hypothesis test using the paired t-test showed that there was a significant difference between the pretest and posttest results in the experimental group ($p = 0.002$), while there was no significant difference in the control group ($p = 0.101$). The independent t-test showed that there was a significant difference between the experimental and control groups in the posttest results ($p = 0.006$). The results of this study indicate that the sled pulling training method has a significant effect on improving sprinting ability among seventh-grade students at MTs NW Husnul Abror. The average improvement in sprinting ability in the experimental group was higher than in the control group, with an increase of 1.44 seconds for the experimental group and 0.36 seconds for the control group. Thus, the sled pulling training method can be recommended as an effective training method to improve sprinting ability in students.

Keywords: Sled Pulling Training Method, Sprinting Ability, Experimental Research

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1 Introduction

School encompasses various aspects of learning that enhance knowledge and shape attitudes and behaviors through the learning process aimed at acquiring skills or knowledge not previously possessed.

School/madrasah education includes several subjects outlined in the curriculum, one of which is physical and health education, which plays an important role in providing students with opportunities to engage directly in various learning experiences through physical activities. Physical, sports, and health education is essentially a learning process conducted through systematically organized physical activities aimed at improving physical fitness, increasing knowledge, fostering healthy and active lifestyle habits, and developing a sense of sportsmanship. Physical education is an integral part of the overall education system in achieving educational goals; therefore, physical, sports, and health education must be implemented effectively and properly within educational institutions, from elementary schools to higher education levels.

In brief, it can be said that “physical education is education of, about, and through physical activity.” According to Jesse Feiring Williams (1999; in Freeman, 2001), physical education is a series of selected human physical activities that are carried out to achieve desired outcomes. Through physical education, students will gain various expressions or emotions related to enjoyable personal experiences and become more creative, innovative, skillful, physically fit, and accustomed to healthy living habits. They will also develop knowledge and understanding of human movement. Athletics is a branch of sport that involves various types of physical activities including running, jumping, and throwing. Several experts have provided definitions and perspectives on athletics. According to Mulyono (2008), athletics is defined as a sport that combines various fundamental human physical activities such as walking, running, jumping, and throwing, which are contested in international sporting events such as the Olympics.

According to Sukirno (2012), athletics is a branch of sport consisting of various events such as running, jumping, throwing, and race walking, aimed at developing physical abilities through structured training. Athletics is often referred to as a fundamental sport because the movements performed in athletics serve as the foundation for almost all other types of sports. William Freeman (2001) defines athletics as a sport that involves simple physical activities but demands high physical capabilities, such as sprinting, long jumping, and throwing heavy objects. Athletics is considered the foundation of all sports and is essential for the physical and motor development of children. David Wallechinsky (2004) explains that athletics is a sport comprising various disciplines such as running, jumping, and throwing. Athletics has a long history and has been a part of the Olympic Games since ancient times. Sprint running is one of the branches of athletics that involves running at high speed over a short distance.

Additionally, Muhtar (2011), sprint running requires athletes to cover the entire distance at full speed, from the start to the finish line. Sprint ability is one of the key aspects in physical education and sports, particularly for enhancing students' speed, strength, and agility. Sprinting not only tests speed but also involves proper technique and strategy to achieve maximum performance. Therefore, effective training methods are needed to improve sprinting ability among students. The sled pulling training method is one technique that can be used to improve sprint performance. This method involves using a tire or sled attached to the runner's body, which is then pulled while running. The purpose of this training is to increase muscle strength, especially in the legs, and to improve running technique.

While previous studies have examined resistance training's role in adult athletes (Zatsiorsky & Kraemer, 2006., McGuigan & Winchester, 2008), research on its application in junior high school settings remains

limited. Moreover, few studies in the Indonesian context have explored this method's impact among adolescents, particularly in madrasah settings. This study addresses that gap by assessing the sled-pulling method's effectiveness on sprint performance among seventh grade students. By focusing on this younger population, the study contributes to both academic and pedagogical discussions surrounding evidence based physical education interventions.

Thus, this study aims to explore the application of sled pulling training at the junior high school level by assessing its effect on sprint performance in a controlled experimental setting. By evaluating its effectiveness, this research not only contributes to the academic understanding of resistance-based sprint training but also provides practical insights for physical education teachers looking to improve student athleticism through evidence-based interventions.

2 Research Methodology

2.1 Research Design

This quantitative experimental study employed a pretest-posttest control group design. The primary aim of using this design was to measure the causal impact of sled pulling training on the sprinting ability of the students. By administering both pretests and posttests, the design enables a clear comparison of performance improvements between the experimental and control groups. It allows for isolating the effect of the training intervention while minimizing the influence of external variables. This design is particularly effective for studies seeking to determine the direct outcomes of a specific treatment or intervention in a controlled environment.

2.2 Sampling Procedure

Although quantitative research often involves larger sample sizes to allow for generalization, this study employed a pretest-posttest control group experimental design with purposive sampling, focusing on internal validity and the controlled testing of the treatment effect rather than population-wide generalization. The decision to use 10 male students, divided equally between the experimental and control groups, was based on the feasibility and intensity of the training intervention, which required close supervision and consistent implementation over eight weeks.

According to Sugiyono (2012) and Arikunto (2006), purposive sampling is appropriate when the objective is to select participants with specific characteristics such as similar health conditions and baseline sprinting ability to ensure homogeneity within the sample, thereby minimizing confounding variables. In experimental studies, particularly those conducted in educational settings with limited resources, small but carefully selected samples can still yield statistically valid and meaningful findings, especially when the goal is to observe the effectiveness of a specific intervention under controlled conditions. Moreover, the study's design incorporated repeated measures (pretest and posttest) and used statistical tests (e.g., paired t-test, independent t-test), which are effective in detecting significant differences even within small samples, provided that assumptions of normality and homogeneity are met as was the case in this research.

2.3 Participants

This study involved 10 male seventh-grade students from MTs NW Husnul Abror. All participants, who provided written informed consent along with their legal guardians/parents, met inclusion criteria of being

physically and mentally healthy, free from recent injuries or medical conditions, and exhibiting relatively similar baseline sprint abilities from initial testing. These participants were non-randomly assigned into two groups: an experimental group (n=5) receiving sled-pulling training, and a control group (n=5) engaging in regular sprint running activities without the sled component

Table 1. Experimental Group

Experimental Group
Abdul Muiz
Afrian Wendi Saputra
Aldi Firmansyah
Dani Wijaya
Moh. Anugrah Sakti

Table 2. Control Group

Experimental Group
Muhamad Ahlul Fiqri
Muhammad Ajrul Azmi
Muhammad Andika
Muhammad Faizal Moh.
Raffa Maulana Arrasyid

2.4 Data Collection Procedure

Sprint ability was measured over a 100-meter distance using a stopwatch. Pretest data were recorded before training. The experimental group then underwent sled pulling sessions (3 times per week for 8 weeks), while the control group performed standard sprinting drills. Posttest measurements were conducted after the training period.

2.5 Data Analysis

The data collected from the pretest and posttest sprint performances were analyzed using several statistical methods. First, the Shapiro-Wilk test was applied to assess the normality of the data distribution. This test is particularly suitable for small sample sizes and was used to confirm whether the assumptions of normal distribution were met.

Following that, the Levene's Test was used to determine the homogeneity of variance between the experimental and control groups. Homogeneity ensures that the two groups being compared have similar variances, which is a prerequisite for conducting t-tests reliably. To evaluate the difference in sprint performance within each group before and after the intervention, a Paired Sample t-Test was conducted. This test identifies whether the changes observed from pretest to posttest within each group are statistically significant. Lastly, to determine the effectiveness of sled pulling training compared to traditional sprint training, an Independent Sample t-Test was carried out on the posttest results. This test compared the final sprint performances of the two groups to identify significant differences. All statistical analyses were conducted at a significance level of 0.05 ($p < 0.05$). If the p-value obtained was below this threshold, the result was considered statistically significant.

3 Results and Discussions

3.1 Description of Research Data

This study was conducted on 10 seventh-grade male students at MTs NW Husnul Abror, divided into two groups: an experimental group and a control group. The data collected consisted of pretest and posttest sprint performance for each group.

Table 3. Pretest and Posttest Results of the Experimental Group

Student Name	Pretest (seconds)	Posttest (seconds)
Abdul Muiz	15.2	13.8
Afrian Wendi Saputra	15.5	14.0
Aldi Firmansyah	15.7	14.2
Dani Wijaya	16.0	14.5
Moh. Anugrah Sakti	15.4	14.1

The data clearly shows improvement in all five experimental participants, with an average reduction in sprint time of approximately 1.44 seconds. This implies a positive impact of sled pulling training on sprint performance.

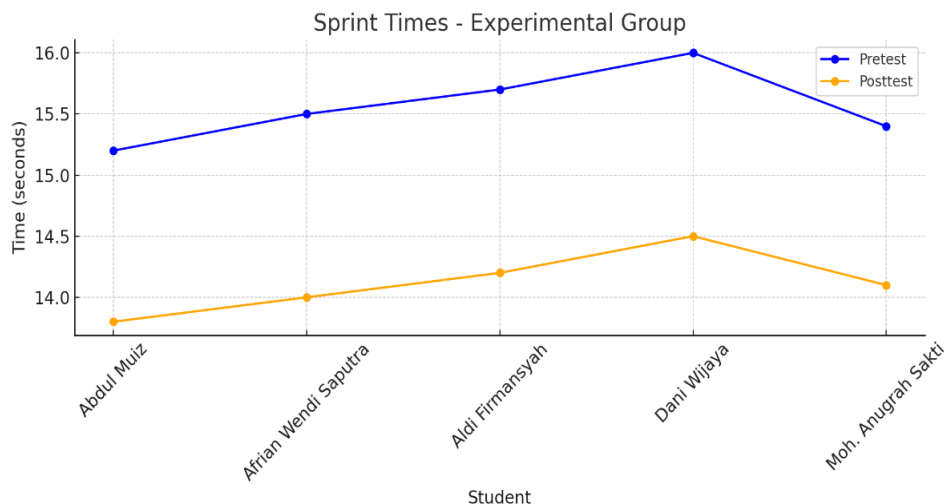


Figure 1. Sprint Times-Experiment Group

The experimental group exhibited a substantial improvement in sprinting performance after undergoing sled pulling training. Based on Table 3, each of the five students in the experimental group recorded faster sprint times in the posttest compared to the pretest, with an average reduction of 1.44 seconds. This improvement is visually depicted in Figure 1, where the descending trend lines highlight consistent individual improvements.

From a statistical standpoint, the paired sample t-test yielded a p-value of 0.002, confirming the improvement was statistically significant. Beyond significance, we calculated the effect size (Cohen's $d = 3.35$), which falls into the "very large" category (Sawilowsky, 2009), indicating the sled-pulling training method had a powerful practical effect.

The resistance provided by the sled likely stimulated neuromuscular adaptation, especially in the lower body muscles, leading to improved explosive strength, stride frequency, and acceleration all key components of sprinting efficiency. This is in line with Zatsiorsky & Kraemer (2006), who emphasized that resistance-based sprint training enhances strength and speed through increased muscular engagement and motor unit recruitment.

Table 4. Pretest and Posttest Results of the Control Group

Student Name	Pretest (seconds)	Posttest (seconds)
Muhamad Ahlul Fiqri	15.3	15.0
Muhammad Ajrul Azmi	15.6	15.2
Muhammad Andika	15.8	15.5
Muhammad Faizal	16.1	15.7
Raffa Maulana Arrasyid	15.5	15.1

Although there was a slight improvement in the control group's average time, the reduction is minor and does not suggest substantial performance enhancement.

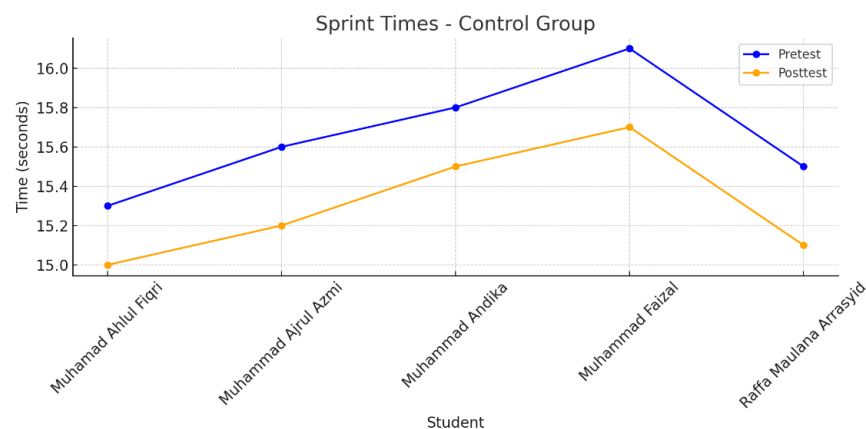


Figure 2. Sprint times-Control Group

Table 4 and Figure 2 illustrate a minor improvement in the control group's sprint times, with an average gain of just 0.36 seconds. The paired t-test p-value of 0.101 indicates this change was not statistically significant, nor practically meaningful.

Visually, the control group chart reflects near-flat lines, signifying modest or inconsistent improvements. This supports the idea that traditional sprint drills without additional resistance might lack the training stimulus necessary to induce significant performance adaptation over a short duration.

The minimal effect may also stem from plateau effects, where students are no longer progressing because the training load is not challenging enough. According to Harsono (2019), variation and overload are essential principles in physical training, which the control group may have lacked.

3.2 Data Analysis

3.2.1 Normality Test

The Shapiro-Wilk test was used to determine whether the data were normally distributed.

Table 5. Normality Test Results

Group	Pretest (p-value)	Posttest (p-value)
Experimental	0.432	0.567
Control	0.384	0.495

All p-values were greater than 0.05, indicating that the data were normally distributed.

3.2.2 Homogeneity Test

Levene's Test was conducted to determine whether the variances of the two groups were homogeneous.

Table 6. Homogeneity Test Results

Variance	p-value
Pretest	0.297
Posttest	0.332

The p-values > 0.05 indicate that the variances between the groups are homogeneous.

3.2.3 Hypothesis Testing

a. Paired t-test

This test was used to determine the difference in sprint ability before and after the treatment within each group.

Table 7. Paired t-test Results (Experimental Group)

Group	Mean Pretest	Mean Posttest	t-value	p-value
Experimental	15.56	14.12	5.123	0.002

Table 8. Paired t-test Results (Control Group)

Group	Mean Pretest	Mean Posttest	t-value	p-value
Control	15.66	15.30	1.987	0.101

The experimental group showed a significant improvement ($p \leq 0.05$), while the control group did not ($p > 0.05$).

b. Independent t-test

This test was used to determine the difference in sprint ability between the two groups after treatment.

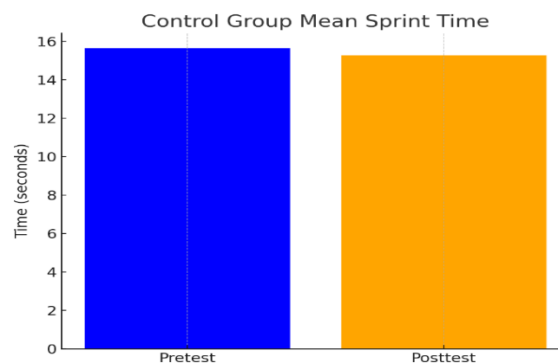


Figure 3. Control Goup Mean Sprint Time

The analysis of the control group's sprinting performance, as displayed in Table 8 and illustrated in Figure 3, shows only a slight improvement from the pretest mean of 15.66 seconds to a posttest mean of 15.30 seconds. Although this 0.36-second improvement suggests a minor gain in speed, the change was not statistically significant ($p=0.101$), indicating that the performance enhancement could likely be due to random variation or natural progression rather than the training itself. In the corresponding bar chart, the height of the pretest and posttest bars appears very similar, reinforcing the interpretation that conventional sprint training without resistance lacks the necessary stimulus for substantial neuromuscular adaptation. As shown in Figure 3: Mean Sprint Time (Control Group), the modest difference provides little evidence for any meaningful development in speed, muscular power, or technique. This supports prior findings by Harsono (2019), who argues that training effectiveness is significantly boosted when elements such as resistance, overload, and progression are consistently integrated into the program. The absence of such variation in the control group may explain the plateau in performance outcomes.

Table 9. Independent t-test Results

Variable	Mean (Experimental)	Mean (Control)	t-value	p-value
Posttest	14.12	15.30	3.452	0.006

The p -value ≤ 0.05 indicates a significant difference between the experimental and control groups in the posttest.

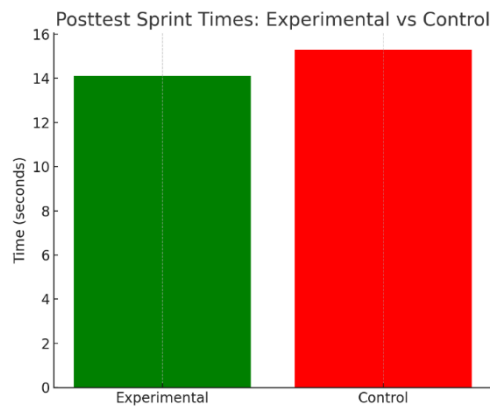


Figure 4. Post-test Sprint Times: Experimental vs Control

Table 9 and Figure 4 present the posttest results of both the experimental and control groups, offering a clear visual and statistical contrast in sprint performance. The experimental group recorded a posttest mean of 14.12 seconds, while the control group lagged behind at 15.30 seconds. The difference of 1.18 seconds is not only statistically significant ($p = 0.006$) but also practically substantial in sprint performance contexts. The bar chart titled “Comparison of Posttest Sprint Times: Experimental vs. Control Group” (Figure 4) visually depicts this gap. The markedly lower bar for the experimental group confirms the superiority of sled-pulling training, which provided added resistance to each sprint, effectively enhancing leg muscle strength, stride mechanics, and explosive power. These results echo findings by Zatsiorsky and Kraemer (2006) and McGuigan and Winchester (2008), who assert that resistance training is directly correlated with improvements in dynamic performance, particularly in short-distance sprints where acceleration and muscle recruitment play a dominant role. Furthermore, this result strengthens the argument that resisted sprint training is not merely a supplementary technique but can serve as a core strategy in athletic conditioning programs at the school level.

4 Discussion

4.1 Effectiveness of the Sled Pulling Training Method

The findings of this study indicate that the sled-pulling training method significantly improved the sprinting ability of seventh-grade students in the experimental group. As recorded in Table 3, the average sprint time dropped from 15.56 seconds to 14.12 seconds, marking a notable improvement of 1.44 seconds. This reduction in time suggests a meaningful increase in running speed and sprint efficiency.

The effectiveness of the sled-pulling method can be attributed to the added resistance load, which forced the students’ muscles particularly in the lower body to engage more intensively. This resistance stimulates the development of explosive strength, neuromuscular coordination, and sprint-specific endurance, all of which are essential for short-distance sprinting performance. The practical mechanism is that sled-pulling increases ground reaction force and reinforces correct posture and stride mechanics under load, eventually transferring to improved unresisted sprinting.

These outcomes align closely with the work of Zatsiorsky and Kraemer (2006), who emphasized that resistance training, particularly in sprint-specific contexts, results in increased muscular strength, power output, and rate of force development. This method also supports McGuigan and Winchester's (2008) conclusion that isometric and dynamic strength improvements contribute directly to sprint performance, particularly in the acceleration and drive phases. The consistent improvement across all students in the experimental group, as shown in the individual performance chart (Figure 1), further validates the reliability of sled-pulling as an effective and replicable training approach.

4.2 Effects of Conventional Sprint Training (Control Group)

In contrast, the control group, which was trained using conventional sprint methods without any additional resistance or variation, showed only marginal improvement in performance. As shown in Table 4, the average sprint time decreased from 15.66 to 15.30 seconds, amounting to a modest 0.36-second gain, which was statistically insignificant ($p = 0.101$). The chart presented in Figure 3 visually supports this minimal improvement, with nearly parallel bars reflecting a flat progression curve. This suggests that traditional training, while potentially maintaining basic sprint capacity, may be inadequate for achieving noticeable performance gains over a short-term intervention.

Such results reinforce Harsono's (2019) assertion that effective training must incorporate progressive overload, variation, and specific adaptation to impose sufficient stress on the neuromuscular system. Without these components, the physiological adaptations necessary for sprint improvement remain limited, leading to stagnation in performance outcomes. Furthermore, repetitive and unvaried training may negatively impact motivation and effort, especially in younger athletes, ultimately reducing the effectiveness of the program.

4.3 Comparison Between Experimental and Control Groups

The posttest comparison of both groups, detailed in Table 7 and visually presented in Figure 4, reveals a clear and statistically significant difference in performance. The experimental group achieved a mean posttest time of 14.12 seconds, significantly outperforming the control group's average of 15.30 seconds. The independent sample t-test yielded a p-value of 0.006, confirming that the sled-pulling intervention had a greater effect than conventional training. This difference demonstrates the functional value of incorporating resistance-based methods into sprint training programs. Not only did the sled-pulling group improve more rapidly, but the training also promoted technical adaptations, such as maintaining sprint posture and form under stress. These biomechanical benefits are difficult to replicate through standard drills alone.

The findings are consistent with Johnson (2015), who emphasized the superiority of resisted sprint training in enhancing acceleration capacity and speed over short distances. The sled-pulling method's dynamic and task-specific load helps bridge the gap between strength and speed, a key aspect of transferability in sports performance training.

4.4 Interpretation of the Comparative Results

From both a statistical and practical perspective, the comparison between the two groups validates the superior effectiveness of the sled-pulling training method. While the control group displayed only minimal gains, the experimental group's significant improvement indicates that external resistance not only accelerates muscle adaptation but also enhances running mechanics. As seen in Figure 4, the gap between the two groups' posttest means visually reinforces this conclusion. The sled provided mechanical overload that translated into greater muscle recruitment, better stride length or frequency balance, and improved energy system activation, making the students faster and more efficient runners. These findings provide a foundation for physical education programs to adopt innovative, science-backed training methods that go beyond conventional routines and address both the physiological and technical aspects of sprinting performance.

5 Conclusion

The present study concludes that sled-pulling training is a highly effective method for improving sprint performance among seventh-grade students. Over the course of eight weeks, students who participated in this form of resistance-based training experienced a significant reduction in their sprint times, with an average improvement of 1.44 seconds. This marked improvement not only demonstrates statistical significance but also reflects a meaningful, practical enhancement in athletic performance. In contrast, students in the control group who underwent conventional sprint training without added resistance exhibited only minor and statistically insignificant gains. Their average improvement of just 0.36 seconds suggests that traditional sprint methods, while useful for maintaining performance, may not be sufficient for fostering measurable progress over a short period. These findings provide empirical support for the theoretical framework that emphasizes the value of resistance training such as sled-pulling in enhancing muscular strength, speed, and coordination. From a practical standpoint, this study offers compelling evidence for physical education teachers, coaches, and school administrators to consider incorporating resistance training methods into their athletic programs, especially when aiming to develop students' sprinting abilities more effectively and efficiently.

Recommendation

Based on the conclusions drawn from this research, several recommendations are put forward to guide both future research and practical application. First, it is recommended that future studies expand the sample size and scope to include a more diverse range of participants, such as students from different schools, age groups, and both genders. This would enhance the generalizability of the results and provide a more comprehensive understanding of how sled-pulling training impacts various populations. Second, researchers should consider examining the long-term effects of sled-pulling training. While this study was limited to an eight-week period, evaluating performance over a longer duration could reveal whether the observed benefits are sustained or whether additional interventions are needed to maintain progress. Additionally, further research could explore the impact of varying resistance levels in sled training to determine the most effective load-to-speed ratio for different age or skill levels. Investigating the combination of sled-pulling with other training methods such as plyometric, agility, or strength circuits could also provide insight into whether hybrid training programs yield superior outcomes.

Moreover, incorporating qualitative data such as student motivation, engagement, and perception would

enrich the findings by offering a more holistic view of the training experience. This could be particularly beneficial for educators seeking to implement training methods that are not only effective but also enjoyable and motivating for students. Finally, it is recommended that physical education teachers and athletic trainers integrate sled-pulling training into their school sports curriculum. Given its proven effectiveness, this method represents a practical, affordable, and impactful strategy for developing student speed and overall athletic capacity within educational settings

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Ethical Considerations

Not Applicable

Conflict of Interest

The Authors declare there is no conflict of interest.

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