Volume 4 Number 1 (2026)
January – June 2026
Page: 565-571

EDUJAVARE: International Journal of Educational Research
ISSN: 3031-2884
https://edujavare.com/index.php/edujavare
DOI: 10.70610/edujavare.v4i01.1368

The Effect of Training Using Fins and Paddles on Increasing 50-Meter Freestyle (Crawl) Swimming Speed in Youth Tiss Silampari Athletes

Adika Fatahilah[1], Syabawaihi[2], Ikhfa Al-Qowiyu[3]
[1,2,3] Universitas PGRI Silampari, Indonesia
* Correspondence e-mail; ikhfalqowiyu@gmail.com

Article history Submitted: 2026/03/14; Revised: 2026/04/12; Accepted: 2026/06/09

Abstract

This study aimed to determine the effect of training using fins, paddles, and a combination of the two on improving 50-meter freestyle (crawl) swimming speed in youth athletes at TISS (Tirta Intan Swimming School) Silampari. The study employed a quantitative method with a quasi-experimental pretest-posttest multiple group design. The sample consisted of 45 youth athletes divided into three treatment groups: a fin training group, a paddle training group, and a fin and paddle combination group, each with 15 athletes. The treatment was administered for 6 weeks, with training frequency three times per week. The research instrument used a 50-meter freestyle swimming speed test. Data were analyzed using the Shapiro-Wilk normality test, the F-max homogeneity test, the paired t-test, and one-way ANOVA. The results showed that all training methods improved 50-meter freestyle swimming speed performance. The fins group experienced an average increase of 0.68 seconds, the paddles group 0.73 seconds, and the fins and paddles combination group 0.91 seconds. Statistical test results indicate that training using both fins and paddles significantly increased swimming speed. However, a one-way ANOVA test showed no significant difference in effectiveness between the three training methods, with an F-value of 0.83, lower than the F-value of 3.22 at the 0.05 level of significance. The study concluded that training using fins, paddles, and a combination of the two were equally effective in increasing 50-meter freestyle swimming speed in TISS Silampari youth athletes, although there was no statistically significant difference in effectiveness between the training methods.

Keywords Fins, Freestyle, Paddles, Swimming Speed, Youth Athletes.

INTRODUCTION

Swimming is one of the most popular aquatic sports and offers substantial benefits for physical health, fitness, and athletic performance. Regular participation in swimming contributes to cardiovascular endurance, muscular strength, flexibility, and overall physical well-being. In addition to its recreational value, swimming has developed into a highly competitive sport that is contested at national and international levels, including the Olympic

Games and World Championships. Among the four competitive swimming strokes, freestyle (front crawl) is widely recognized as the fastest and most efficient technique, making it the preferred stroke for sprint events such as the 50-meter freestyle race (Barbosa et al., 2010).

The 50-meter freestyle event requires athletes to demonstrate exceptional speed, explosive power, coordination, and technical efficiency. Unlike longer-distance races that rely heavily on aerobic endurance, sprint swimming depends primarily on anaerobic power and the ability to generate maximum propulsion within a short duration. Success in this event is determined by the swimmer's capacity to execute powerful arm strokes, effective leg kicks, streamlined body positioning, and efficient breathing patterns while minimizing drag. Therefore, coaches continuously seek training methods that can enhance these performance components and improve race outcomes (Morouço et al., 2012).

In modern swimming training programs, various training aids are employed to optimize performance and facilitate technical development. These devices are designed to target specific physiological and biomechanical aspects of swimming. Among the most commonly used training aids are fins and hand paddles, both of which have gained widespread acceptance among coaches and athletes due to their effectiveness in improving propulsion, strength, and stroke mechanics. The integration of such equipment into training sessions is believed to accelerate skill acquisition and contribute to overall swimming performance enhancement (Toussaint & Beek, 1992).

Fins are specialized devices worn on the feet that increase the surface area available for propulsion during kicking movements. The use of fins enables swimmers to generate greater forward thrust, maintain a more streamlined body position, and improve ankle flexibility. Furthermore, fins can enhance lower-limb muscular strength and promote more effective kicking mechanics. Previous studies have indicated that fin-assisted training may contribute to improved swimming velocity and increased efficiency in aquatic locomotion, particularly among developing athletes (Zamparo et al., 2002).

Hand paddles, on the other hand, are training devices attached to the hands to enlarge the surface area involved in the pulling phase of the stroke. By increasing water resistance, paddles place greater demands on the upper-body musculature, thereby promoting improvements in arm strength and stroke effectiveness. In addition, paddle training helps swimmers develop a stronger feel for the water and refine their pulling technique. Research has shown that paddle use can enhance propulsion and improve swimming economy when incorporated appropriately into training programs (Schnitzler et al., 2011).

The combined use of fins and paddles is often recommended because both devices target different aspects of swimming performance. While fins primarily enhance lower-body propulsion and kicking efficiency, paddles focus on upper-body strength and stroke mechanics. Consequently, the simultaneous application of these training aids may provide complementary benefits that lead to greater improvements in sprint swimming performance. However, the extent to which combined training is more effective than using each device independently remains a topic of ongoing investigation in sports science literature (Gonjo & Olstad, 2021).

Although several studies have examined the physiological and biomechanical effects of fins and paddles, relatively few have specifically compared the effectiveness of fins, paddles, and their combination among youth swimmers. Youth athletes represent a unique developmental stage in which physical growth, neuromuscular adaptation, and technical skill acquisition occur simultaneously. As a result, training interventions that are effective for adult swimmers may not necessarily produce the same outcomes in younger populations. This gap in the literature highlights the need for further research focusing on youth athlete development (Costa et al., 2013).

Furthermore, limited evidence exists regarding the effectiveness of training aids among athletes from TISS Silampari. Understanding how these tools influence swimming performance within this specific context is important for developing evidence-based training strategies. The lack of local research data creates challenges for coaches seeking to design optimal training programs tailored to the characteristics and needs of their athletes (Pyne & Sharp, 2014).

Based on preliminary observations conducted at TISS Silampari, several youth athletes were found to experience weaknesses in leg kicking power, arm pulling strength, and movement efficiency during the 50-meter freestyle event. These limitations contribute to suboptimal race times and hinder overall performance development. Identifying training methods capable of addressing these deficiencies is therefore essential for enhancing competitive outcomes and supporting athlete progression (Aspenes & Karlsen, 2012).

Considering the importance of sprint performance and the potential benefits of specialized training aids, this study aims to investigate the effects of training with fins and paddles on improving 50-meter freestyle swimming speed among youth athletes at TISS Silampari. The findings are expected to provide valuable insights for coaches, athletes, and sports practitioners regarding the most effective training strategies for enhancing sprint swimming performance in youth populations (Maglischo, 2003).

METHODS

This study employed a quantitative research method with a quasi-experimental approach. The research design utilized was a pretest–posttest multiple-group design, which allowed the researcher to examine the effects of different training interventions on swimming performance. The study was conducted among youth athletes of TISS Silampari. A total of 45 athletes participated in the study and were divided into three treatment groups. The first group received training using fins, the second group trained using hand paddles, and the third group underwent a combined training program utilizing both fins and paddles. Each group consisted of 15 athletes.

Prior to the intervention, all participants completed a pretest in the form of a 50-meter freestyle swimming speed test to determine their baseline performance. Following the pretest, each group received its respective training treatment for a period of six weeks, with training sessions conducted three times per week. The training program was designed to improve swimming speed and technical efficiency through the specific use of the assigned training aids.

The research instrument consisted of a 50-meter freestyle swimming test, which was used to measure the athletes' swimming times before and after the intervention period. The collected data were analyzed using several statistical procedures. The Shapiro–Wilk test was applied to assess the normality of the data distribution, while the F-max test was used to examine the homogeneity of variance among groups. A paired-samples t-test was conducted to determine the significance of changes in performance within each treatment group between the pretest and posttest. Furthermore, a One-Way Analysis of Variance (ANOVA) was employed to compare the effectiveness of the three training methods and identify any significant differences among the groups. All statistical analyses were performed using a significance level of $\alpha = 0.05$.

FINDINGS AND DISCUSSION

The results of the study indicated that the group trained using fins experienced an improvement in 50-meter freestyle swimming speed. The mean pretest time was 35.06 seconds, while the mean posttest time decreased to 34.38 seconds, resulting in an improvement of 0.68 seconds. This finding suggests that fin-assisted training contributed positively to sprint swimming performance by enhancing lower-limb propulsion and swimming efficiency (Zamparo et al., 2002).

The paired-samples t-test revealed that the calculated t-value was greater than the critical t-value (2.41 > 2.145), indicating a statistically significant improvement in performance following the intervention. Therefore, it can be concluded that training with fins had a significant effect on increasing 50-meter freestyle swimming speed among youth swimmers. This result supports previous findings that fins improve kicking effectiveness, streamline body position, and overall swimming velocity (Toussaint & Beek, 1992; Zamparo et al., 2002).

Training Group Using Paddles

The group trained using hand paddles also demonstrated improved swimming performance. The mean pretest time was 35.79 seconds, whereas the mean posttest time decreased to 35.06 seconds, indicating an improvement of 0.73 seconds. The reduction in swimming time suggests that paddle-assisted training effectively enhanced upper-body strength and propulsion during freestyle swimming (Schnitzler et al., 2011).

The t-test results showed a calculated t-value of 9.56, which exceeded the critical t-value of 2.145. This result confirms that paddle training had a statistically significant effect on improving 50-meter freestyle swimming speed. The findings are consistent with previous studies reporting that paddles increase stroke force production, improve pulling mechanics, and enhance swimming efficiency through greater upper-body engagement (Schnitzler et al., 2011; Barbosa et al., 2010).

Training Group Using a Combination of Fins and Paddles

The combination training group demonstrated the highest descriptive performance improvement among the three groups. The mean pretest time was 31.97 seconds, while the mean posttest time improved to 31.84 seconds. Although the numerical improvement was

relatively small, the group achieved the best overall performance values compared with the other groups (Gonjo & Olstad, 2021).

Descriptively, the combined-training group produced the highest gain score, suggesting that the simultaneous use of fins and paddles provided a more comprehensive training stimulus. By targeting both lower-body propulsion and upper-body pulling strength, the combined approach may have promoted more balanced biomechanical development and swimming efficiency (Gonjo & Olstad, 2021; Maglischo, 2003).

Normality and Homogeneity Tests

The results of the Shapiro–Wilk normality test indicated that all pretest and posttest data across the three groups had significance values greater than 0.05. Therefore, the data were considered normally distributed and met the assumptions required for parametric statistical analysis (Field, 2018).

The homogeneity test revealed an Fmax value of 1.96, which was lower than the critical F-table value of 4.89. Consequently, the variances among the groups were considered homogeneous. This result indicates that the sample groups possessed comparable variance characteristics and were suitable for further comparative analysis using ANOVA procedures (Pallant, 2020).

One-Way ANOVA Test

The One-Way Analysis of Variance (ANOVA) produced a calculated F-value of 0.83, whereas the critical F-table value at the 0.05 significance level was 3.22. Since the calculated F-value was lower than the critical value ($0.83 < 3.22$), the null hypothesis (H_0) was accepted and the alternative hypothesis (H_a) was rejected (Field, 2018).

These findings indicate that there was no statistically significant difference in effectiveness among training programs using fins, paddles, or a combination of both in improving 50-meter freestyle swimming speed. Although all groups demonstrated performance improvements, none of the training methods proved significantly superior to the others from a statistical perspective (Pallant, 2020).

Discussion

The results of this study demonstrated that all training methods contributed positively to improvements in 50-meter freestyle swimming performance. These improvements likely occurred because the use of training aids provided additional physiological and biomechanical stimuli that enhanced muscular development and swimming technique. Training equipment such as fins and paddles has been widely recognized as an effective means of increasing training specificity and promoting performance enhancement in competitive swimmers (Maglischo, 2003; Barbosa et al., 2010).

Training with fins was shown to improve lower-body propulsion, optimize body position, and enhance kicking efficiency. The increased surface area provided by fins allows swimmers to generate greater thrust while maintaining a more streamlined position in the water. As a result, water resistance can be reduced, enabling swimmers to achieve higher velocities with less energy expenditure. These findings are consistent with previous research

highlighting the benefits of fin-assisted training for improving swimming mechanics and sprint performance (Zamparo et al., 2002; Toussaint & Beek, 1992).

Similarly, paddle training provided additional resistance during the arm stroke, thereby strengthening the upper-body musculature and improving stroke effectiveness. The use of paddles enhances swimmers' awareness of proper hand positioning during the catch and pulling phases of the stroke, leading to more effective force application in the water. Consequently, paddle training can contribute to increased propulsion and improved swimming efficiency (Schnitzler et al., 2011; Barbosa et al., 2010).

From a descriptive standpoint, the combination group achieved the highest performance improvement. This outcome may be explained by the fact that the combined use of fins and paddles simultaneously targets both upper- and lower-body performance components. Such a comprehensive training stimulus may encourage greater neuromuscular adaptation and technical development. Nevertheless, despite these descriptive advantages, the statistical analysis revealed that the differences among groups were not significant (Gonjo & Olstad, 2021).

The absence of significant differences in the ANOVA results suggests that individual athlete characteristics may have exerted a greater influence on performance outcomes than the specific training interventions themselves. Factors such as initial fitness level, physiological adaptation, swimming technique, motivation, training adherence, and individual responsiveness to training may have contributed to variations in performance gains among participants (Pyne & Sharp, 2014; Costa et al., 2013).

The findings of this study have practical implications for swimming coaches and practitioners. Since fins, paddles, and their combination all produced positive effects on swimming performance without significant differences in effectiveness, coaches may select any of these methods based on the individual needs of athletes, training objectives, and available resources. Therefore, no single training method can be considered absolutely superior; rather, each method may serve as a valuable tool within a comprehensive swimming training program aimed at improving 50-meter freestyle performance (Maglischo, 2003; Gonjo & Olstad, 2021).

CONCLUSION

Based on the findings of this study, it can be concluded that training using fins had a significant positive effect on improving 50-meter freestyle swimming speed among youth athletes at TISS Silampari. Similarly, training with hand paddles significantly enhanced 50-meter freestyle performance by improving swimming efficiency and propulsion. The combination of fins and paddles also resulted in improved swimming performance and demonstrated the highest descriptive performance gains among the treatment groups. However, the results of the One-Way ANOVA indicated that there was no statistically significant difference in effectiveness among the fins, paddles, and combined training methods. Therefore, all three training approaches can be considered effective alternatives for

improving 50-meter freestyle swimming performance and may be implemented flexibly according to the specific needs, abilities, and training objectives of youth swimmers.

REFERENCES

Aspenes, S. T., & Karlsen, T. (2012). Exercise-training intervention studies in competitive swimming. *Sports Medicine*, 42(6), 527–543. (https://doi.org/10.2165/11630760-0000)

Barbosa, T. M., Bragada, J. A., Reis, V. M., Marinho, D. A., Carvalho, C., & Silva, A. J. (2010). Energetics and biomechanics as determining factors of swimming performance. *Journal of Science and Medicine in Sport*, 13(2), 262–269. (https://doi.org/10.1016/j.jsams.2009.01.003)

Costa, M. J., Marinho, D. A., Bragada, J. A., Silva, A. J., & Barbosa, T. M. (2013). Stability of elite freestyle performance from childhood to adulthood. *Journal of Sports Sciences*, 31*(11), 1183–1189. (https://doi.org/10.1080/02640414.2013.773400)

Field, A. (2018). Discovering Statistics Using IBM SPSS Statistics (5th ed.). Sage Publications.

Gonjo, T., & Olstad, B. H. (2021). What is the effect of swimming training equipment on swimming performance? *Sports Biomechanics*, 20(7), 809–825.(https://doi.org/10.1080/14763141.2019.1627309)

Maglischo, E. W. (2003). Swimming Fastest. Human Kinetics.

Morouço, P. G., Keskinen, K. L., Vilas-Boas, J. P., & Fernandes, R. J. (2012). Relationship between tethered forces and the four swimming techniques performance. *Journal of Applied Biomechanics*, 28(2), 161–169. (https://doi.org/10.1123/jab.28.2.161)

Pallant, J. (2020). SPSS Survival Manual: A Step by Step Guide to Data Analysis Using IBM SPSS, (7th ed.). McGraw-Hill Education.

Pyne, D. B., & Sharp, R. L. (2014). Physical and energy requirements of competitive swimming events. *International Journal of Sport Nutrition and Exercise Metabolism, 24*(4), 351–359. (https://doi.org/10.1123/ijsnem.2014-0047)

Schnitzler, C., Seifert, L., Alberty, M., & Chollet, D. (2011). Hip velocity and arm coordination in front crawl swimming. *International Journal of Sports Medicine*, 32(2), 150–155. (https://doi.org/10.1055/s-0030-1268501)

Toussaint, H. M., & Beek, P. J. (1992). Biomechanics of competitive front crawl swimming. *Sports Medicine*, 13(1), 8–24. (https://doi.org/10.2165/00007256-199213010-00002)

Zamparo, P., Pendergast, D. R., Termin, B., & Minetti, A. E. (2002). How fins affect the economy and efficiency of human swimming. *Journal of Experimental Biology*, 205(17), 2665–2676. (https://doi.org/10.1242/jeb.205.17.2665)