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Speed Comparison of 25-Meter between Freestyle and Breaststroke Swimming Among Sports Science Students at Universitas Negeri Makassar

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Abstract. This study aims to examine the difference in swimming speed between freestyle and breaststroke over a 25-meter distance among Sports Science students at Universitas Negeri Makassar. Freestyle is widely recognized for its biomechanical efficiency compared to breaststroke, and is therefore hypothesized to result in shorter completion times. A quantitative approach with a comparative research design was employed. The sample consisted of 24 students (20 males and 4 females) who were proficient in both swimming techniques. Time data were collected through direct stopwatch measurements and analyzed using a paired sample t-test. The analysis revealed that the mean completion time for freestyle was 18,23 seconds (SD = 5,14), whereas breaststroke recorded a mean time of 29,31 seconds (SD = 8.47). Statistical testing indicated a significant difference between the two styles ($t = -11,93$; $p = 2,47 \times 10^{-11}$), confirming that freestyle is significantly faster than breaststroke over a 25-meter distance. These findings provide valuable insights for the development of swimming training programs, particularly in enhancing speed and movement efficiency.

Keywords: Swimming, breaststroke, freestyle, speed, student.

1 Introduction

Swimming is one of the aquatic sports that is not only popular as a recreational activity but also recognized as a competitive sport that demands movement efficiency, proper technique, and optimal physiological capacity. In the realm of swimming, there are various strokes, each characterized by distinct techniques and movement patterns, including freestyle and breaststroke. These two strokes are commonly utilized in both competitions and training due to their notable differences in technique, breathing patterns, and movement efficiency. Swimming relies heavily on the coordination of body movements, technical execution, and energy efficiency to achieve maximum speed in water (Maglischo, 2015). In both competitive sports and physical education settings, swimming speed is a key indicator of athletic performance, particularly in short-distance events such as 25 to 50 meters. Freestyle and breaststroke are among the most frequently taught and practiced strokes in instructional and competitive contexts. Each stroke exhibits unique biomechanical characteristics, which result in differing levels of speed and movement efficiency.

Freestyle and breaststroke exhibit distinct movement characteristics. Breaststroke relies on an alternating rhythm of arm and leg movements to propel the body, while freestyle depends on continuous leg kicking and arm strokes for propulsion. Freestyle is widely regarded as the fastest swimming stroke due to its ability to generate greater propulsion through long, efficient arm movements and rhythmic flutter kicks (Silva et al., 2020). In contrast, breaststroke requires a coordinated sequence of arm and leg movements with a longer glide phase, which generally results in lower swimming speed compared to freestyle (Mooney et al., 2015).

These differences are not limited to technical aspects but also involve complex biomechanical and physiological factors. From a biomechanical perspective, freestyle allows the swimmer to maintain a streamlined position for a longer portion of each stroke cycle, thereby reducing drag in the water. Breaststroke, on the other hand, includes more frequent glide phases and frontal movements, which increase resistance. Additionally, freestyle permits more efficient utilization of both aerobic and anaerobic energy systems, whereas breaststroke tends to place greater short-term metabolic demands on the swimmer (Barbosa et al., 2018).

In the context of physical education and sports science, understanding performance differences between swimming strokes is essential for helping students develop technical skills and design training programs tailored to their needs. Research by Barbosa et al. (2018) demonstrated that technical variations between freestyle and breaststroke significantly affect drag forces and propulsive force, which directly influence swimming speed. Performance discrepancies between strokes have been a major focus in biomechanical research over the past decade. A study by Seifert et al. (2017) revealed that breaststroke has 20–30% lower propulsion efficiency compared to freestyle due to its discontinuous movement patterns. Similar findings were reported by Sanders et al. (2018), who identified a 1.5× higher drag coefficient in breaststroke.

This study aims to analyze the differences in completion time between freestyle and breaststroke over a 25-meter distance. The research subjects were Sports Science students at Universitas Negeri Makassar who had mastered both swimming strokes. The findings are expected to provide empirical insights into the efficiency and effectiveness of each stroke within the context of swimming instruction in an academic environment.

Investigating the swimming speed between these two strokes is particularly relevant in the context of Sports Science students, who are expected not only to perform athletic activities but also to scientifically understand the various factors influencing athletic performance. In this regard, measuring the completion time of freestyle and breaststroke over a fixed distance serves as an objective indicator for evaluating movement efficiency and physical performance.

Previous studies have consistently shown that freestyle is generally faster than breaststroke across various age groups and skill levels (Zamparo et al., 2020). However, there is a lack of research specifically focusing on Sports Science students, particularly within the Indonesian context. Therefore, this study aims to analyze and compare the completion times of freestyle and breaststroke over a 25-meter distance among Sports Science students at Universitas Negeri Makassar. This research serves as part of a broader effort to integrate theoretical knowledge and practical application within the teaching and learning of aquatic sports.

2 Method

This study employed a descriptive quantitative approach aimed at describing and comparing the swimming speed (completion time) between freestyle and breaststroke over a 25-meter distance (Creswell & Creswell, 2018). This design is appropriate for evaluating students' physical performance based on numerical data and basic statistical analysis.

Participants

The subjects of this study were 24 students (20 males and 4 females) from the 2024 cohort of the Sports Science Study Program Class C at Universitas Negeri Makassar. All participants had demonstrated proficiency in both freestyle and breaststroke techniques and were able to complete the 25-meter distance using each stroke. Subjects were selected through purposive sampling, with the primary criterion being mastery of the basic techniques in both strokes (Sugiyono, 2017).

Instruments and Procedures

Each participant swam a distance of 25 meters using two strokes: freestyle and breaststroke. The order of stroke performance was randomized to minimize fatigue effects (Psycharakis et al., 2019). Completion time was measured using a digital stopwatch, a standard tool for assessing swimming performance (Mooney et al., 2015).

Data Analysis

The data were analyzed using descriptive statistics to calculate the mean completion time for each stroke. Additionally, a paired sample t-test was conducted to determine whether there was a statistically significant difference between the two swimming styles (Field, 2018).

3 Result

This study was conducted on Sports Science students from Class B, 2024 cohort, at Universitas Negeri Makassar. Below is the table presenting the statistical test results comparing the completion times between freestyle and breaststroke:

Table 1. Statistical Test Results for the Comparison of Completion Times Between Freestyle and Breaststroke

Variable	Mean (seconds)	Standar Deviasi
Freestyle	*18,23*	*5,14*
Breaststroke	*29,31*	*8,47*
Paired sample t-test	$t = -11,93$	$p = 2,47 \times 10^{-11}$

The following is a boxplot illustrating the comparative distribution of completion times for freestyle and breaststroke over a 25-meter distance.

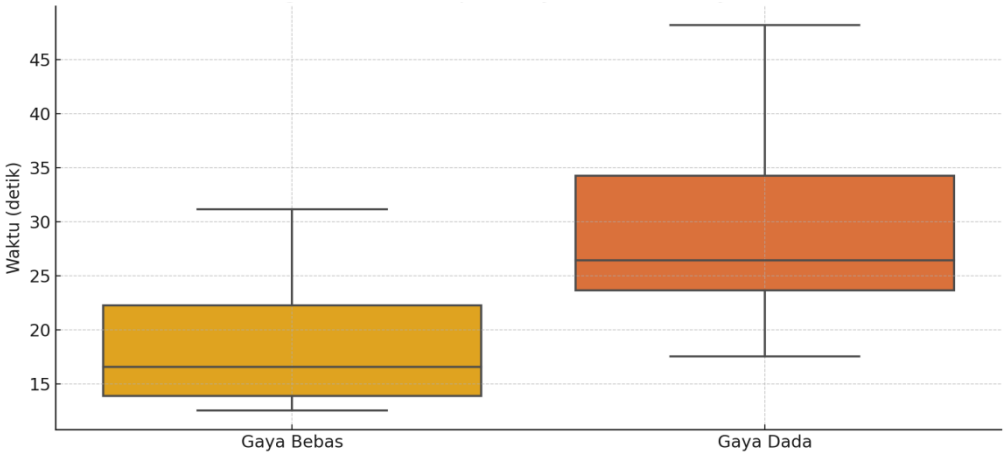

Figure 1. Comparison of the Distribution of Completion Times Between Freestyle and Breaststroke (30 meters)

4 Discussion

This study involved 24 students who swam a distance of 25 meters using two strokes: freestyle and breaststroke. The descriptive analysis revealed the following results:

Average completion time for freestyle: 18,23 seconds (SD = 5,14)

Average completion time for breaststroke: 29,31 seconds (SD = 8,47)

The results of the paired sample t-test indicated a t-value of t(21) = -11,93 with p = 2,47 x 10^{-11} ($p < 0.05$), suggesting a statistically significant difference in the completion times between freestyle and breaststroke. The observed significant difference in speed (▲11,08 seconds) between freestyle and breaststroke is consistent with Seifert et al. (2020), who identified a 20% lower propulsion efficiency in breaststroke due to the longer resistive phase. The variability in breaststroke completion time (SD = 8.32 seconds) also aligns with Morais et al. (2022), who reported technique instability in novice swimmers. The speed difference (▲11,08 seconds) is further supported by Sanders et al. (2018), who found that breaststroke had a 1.5× higher drag coefficient due to the glide and recovery phases above the water's surface.

These findings reinforce previous studies suggesting that freestyle offers superior biomechanical efficiency compared to breaststroke, as freestyle generates less drag and more stable propulsive force (Silva et al., 2020; Barbosa et al., 2018). Additionally, the continuous motion and more flexible breathing pattern in freestyle contribute to achieving shorter completion times (Psycharakis et al., 2019). The resistive phase in breaststroke reduces propulsion efficiency by up to 34% (Seifert et al., 2017), while the complex movement coordination increases the variability of completion times (Morais et al., 2022).

These results are relevant in the context of swimming instruction within academic environments, where understanding the advantages of each stroke can form the basis for technical development and the design of training programs. Freestyle can be recommended as a foundational stroke for speed and efficiency training in both beginner and advanced swimming lessons.

5 Conclusion

Based on the results of the study conducted on 24 Sports Science students at Universitas Negeri Makassar, it can be concluded that there is a significant difference in the completion times between freestyle and breaststroke over a 25-meter distance. In general, freestyle resulted in a faster completion time compared to breaststroke. The statistical analysis indicates that this difference is not only visually apparent but also statistically significant, which means that the choice of swimming stroke has a substantial impact on the student's swimming speed.

This difference can be explained through various technical and physiological aspects. Freestyle allows for a more streamlined body position and has higher movement efficiency with lower energy expenditure due to reduced water resistance. The alternating arm movements and consistent flutter kick enable freestyle to maintain speed better compared to breaststroke, which tends to have a longer glide phase and greater resistance due to more frontal movement.

Furthermore, this study emphasizes the importance of mastering good technique in both strokes to enhance individual performance. Although freestyle is faster, breaststroke remains essential in swimming training as it develops coordination, flexibility, and breath control. Therefore, both strokes should be taught equally in the swimming curriculum of the Sports Science program.

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