



## Comparative Study of the Time Variable Between Grab Start and Track Start Types in Freestyle Swimming for Elite Swimmers

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### Abstract

Research aims to identify the time variable values between the two types of start: the Grab start and the track start in advanced freestyle swimming, and see the difference of the time variable between the two types of start: the Grab start and the track start in advanced freestyle swimming.

To achieve the research objective, the researcher used a descriptive method using a comparative approach, as it was best suited to the research problem. The research sample was selected purposively, consisting of four (4) advanced swimmers from the national 100m freestyle team, representing 80% of the original research population of five (5) swimmers, due to injury, one of swimmer was excluded. The researchers conducted the test with video recording, and performed kinematic analysis of the swimmers using the Kinovea analysis software to extract the biomechanical variables related to start time. Appropriate statistical analyses were performed, and the researcher concluded that the swimmers achieved a shorter start time in the Grab start compared to starting from the track start, indicating its better in improving the overall performance time of the freestyle swim. The Grab start contributed to reducing the time of the start and entering the water more efficiently, due to faster reaction times and more efficient distribution of kinetic energy. Furthermore, the type of start used had a clear impact on gaining initial speed, which positively affected maintaining movement rhythm during the first meters of the swim race.

The researcher recommends using the Grab start as a basically method in training and competitions in freestyle swimming for the advanced category, due to its superiority in reducing the time variable and improving the achievement, and the necessity of including special training for the start phase within the daily training units, with a focus on developing reaction speed and

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explosive power of the legs, also the necessity of using video recording and motion analysis to evaluate the swimmers' performance in the start phase and correct technical errors.

**Keywords:** time variable, Grab start and track start.



## Introduction

Swimming sport considered to have an important position among other sports. Its has a wide fan base and is practiced by all of ages. Certain sciences, particularly biomechanics, play a crucial role in analyzing and diagnosing swimmers' strengths and weaknesses. This provides coaches with a solid scientific foundation and accurate information that helps them enhance strengths and address weaknesses, which positively impacts performance development of sports performance results. Freestyle swimming is one of the most competitive swimming events, as achieving success depends on a combination of technical and physical factors that work together to reduce the overall performance time. The start is one of the most crucial phases in short and middle-distance swimming races, as it directly impacts gaining initial velocity and preservation of kinetic momentum during the first few meters of the race. Swimming requires a focus on developing all aspects of performance, particularly the biomechanical aspect, which is one of the most prominent aspects that becomes evident when analyzing a swimmer's performance during training and competition. Biomechanical variables are clearly visible during the execution of a skill or activity, in terms of force, speed, direction, and the angle of the mechanical action of the movement. Swimmers utilize these variables in accordance with their physiological and physical capabilities and the demands of that skill or activity. Swimming starting techniques have witnessed significant development. The Grab start has emerged as a modern that method aimed to improving reaction time and forward momentum, in contrast to the traditional track start, which is still widely used. These two types differ in terms of the body initial position, the mechanism of force generation, and the angle of the water entry, which is reflected in the time variable during the start stage and the subsequent performance stages. Despite the importance of this stage, it is noticeable that coaches tend to favor a particular type of starting technique without relying on precise scientific data, especially among advanced trainees. This highlights the need for a comparative study that clarifies the time differences between the two starting techniques, thus contributing to the selection of the optimal method for achieving the best results. In a study conducted by Jamil Kadhim Jawad (2003), developing explosive leg power led to increases the amount of propulsive force generated and a faster start. A study by Ali Malik Hamid Al-Shouk (2013) concluded that using a modern starting platform in training national short-distance races swimmers is essential. A study by Hala Hussein Ali (2015) demonstrated strong correlations between the propulsion phase and performance in both the propulsion force and time at the start of the race. This highlights the importance of the propulsion phase and its impact on the final result, as increased propulsion force results from a shorter propulsion time due to the inverse relationship between them, which arises from the speed of joint extension during the propulsion. Finally, a study by Ali Hashim Mohammed (2017) explored the use of a proposed device to improve certain biomechanical variables of the Grab start phase and its relationship to performance in the 50m freestyle for advanced swimmers.

The importance of this research lies in seeking to find the best ways and means that enable coaches to achieve athletic achievement, by revealing and highlighting the crucial role of the starting position in reducing the time of freestyle swimming, as well as providing coaches and swimmers with scientific indicators that help in choosing the most appropriate starting position,

and contributing to the development of training programs for the starting stage in line with their physical abilities and the effort exerted during competition.

**Research Problem:**

Through the researcher's observation of training sessions and competitions for advanced swimmers, a clear disparity was noted in swimmers' time performance levels when using the two starting techniques. Furthermore, there is no clear scientific criterion to determine which technique is superior. Some advanced swimmers possess similar physical and technical abilities, yet their time results differ, which is partly attributed to the starting technique used and its execution.

The problem is further complicated by the scarcity of Arabic studies comparing the Grab start and the track start and their impact on time performance in advanced swimmers. This creates a knowledge gap among coaches and those working in the training field, limiting the possibility of developing training programs for the starting stage based on sound scientific principles.

Therefore, the research problem is defined as the need for a comparative scientific study that reveals the differences in time performance between the Grab start and the track start in advanced freestyle swimming. The aim is to determine the most effective technique for improving time performance and to provide results that can be used to guide the training process and raise the competitive level of swimmers.

**Research Objective:**

- To determine the time variable between the start of the Grab and the start of the track in advanced freestyle swimming.
- To determine the time difference between the start of the Grab and the start of the track in advanced freestyle swimming.

1-4 Research Hypothesis:

- There are statistically significant differences in time between the start of the Grab and the start of the track in advanced freestyle swimming.

1-5 Study Scope:

1-5-1 Human Scope: Advanced National Team Swimmers.

1-5-2 Time Scope: From (December 26, 2025) to (January 30, 2026).

1-5-3 Spatial Scope: Al-Shaab Olympic Swimming Pool, Baghdad.

**Methodology:**

**Research Methodology:**

The researcher used the descriptive method with comparative approaches, as it was suitable for the research problem.

**Research Population and Sample:**

The research sample was selected purposively. It consisted of (4) swimmers from the national 100m freestyle swimming team in the advanced category, representing (80%) of the original research population of (5) swimmers. One swimmer was excluded due to injury.

### **Data Collection Methods and Equipment Used in the Research:**

#### **Data Collection Methods:**

- Arabic and foreign references and sources.
- Personal interviews.
- Data entry form.
- Testing and measurement.
- Pilot study.
- Kinesthetic analysis software (Kinovea).

#### **Equipment and Equipment Used in the Research:**

- Three Casio digital electronic timing watches.
- One Lenovo laptop.
- One Japanese-made whistle.
- Two Japanese-made CASIO underwater cameras with a speed of 25 frames per second.
- One Japanese-made CASIO high-speed camera with a speed of 120-1000 frames per second.

#### **Procedures:**

##### **Biomechanical Variables (Start Time):**

The following mechanical variables are extracted through image analysis using the Kinvea software and the following equation:

$$\text{Time} = \text{Number of Images} \times \text{Time per Image.}$$

Absorption phase time: This is the time it takes for the swimmer from the moment they begin the movement after the starting position until they reach maximum knee flexion.

Propulsion phase time: This is the time it takes for the swimmer from the moment they first extend their knee after reaching maximum flexion until their body reaches full extension.

Flight phase time: This is the time it takes for the swimmer from the moment their feet leave the starting block and they take flight until their center of gravity enters the water.

##### **Pilot study:**

The researcher conducted the Pilot study on Friday, December 26, 2025, at the Al-Shaab Olympic Swimming Pool at 3:00 PM. The purpose of the test was to verify the functionality and accuracy of the main camera, as well as its proper placement in the main test to ensure accurate of the swimmers' performances.

##### **Main study:**

The researcher conducted the main study on Friday, January 2, 2026, at 3:00 PM in the Al-Shaab Indoor Swimming Pool. After setting up the video camera and confirming its functionality,

the swimmers warmed up. They then began performing start attempts, with the first swimmer performing their first attempt, followed by the second swimmer, and so on. Each swimmer was given (3) start attempts for the Grab start type and (3) start attempts for the track start type, resulting in a total of (6) start attempts for each swimmer in both types. One attempt per swimmer was used in each start type, based on the longest horizontal distance achieved by the swimmer through analysis of all attempts. The swimmers were filmed from the right side individually. The second track (in the pool) was chosen as the starting point for the test due to its suitability for the positioning of the two underwater cameras. The experiment was conducted with the assistance of the team.

**Statistical Methods:**

The researcher used the (IBM.SPSS. Ver20) statistical package.

- Mean.
- Standard deviation (SD).
- Skewness coefficient.
- T-test for paired samples.

**Results and Discussion:**

**Analysis and Discussion of Biochemical Indicators:**

**Table 1.** shows the statistics of the time variable results for the two types of start: the Grab start and the track start

significance	Sig	T	track start		Grab start		variable
			SD	mean	SD	mean	
significance	0.00	6.51	0.11	0.60	0.16	0.40	Absorption phase time
significance	0.00	7.41	0.29	0.40	0.12	0.22	Propulsion phase time
insignificance	0.533	2.51	0.23	0.34	0.17	0.30	Flight phase time

**Discussion:**

After presenting the results of the absorption phase time variable for the two start types in the research sample, the results showed a significant difference between the two start types, favoring

the Grab start. The researcher attributes this result to the difference in the body's center of gravity position between the two start types in the ready position. In the track start, the center of gravity is further back than in the Grab start. This increases the time required to move the body forward and downward, away from the leading edge of the starting block, towards the pool. This creates a state of imbalance that helps the swimmer overcome their body's inertia and propel themselves further and faster.

Since the displacement involved in moving the center of gravity forward and downward in the track start is bigger than in the Grab start, this transfer process will take longer (the lower the body's center of gravity, the greater the distance and time required to lift and move it forward) (Risan Khuraibat and Najah Mahdi, 1992, p. 315). Regarding the variable of the push-off phase, the results showed a significant difference between the two types of starts, favoring the Grab start.

The researcher attributes this result to the fact that pushing off with both feet simultaneously in a Grab start generates greater force than pushing off with each foot sequentially, as in a track start. (Many strength training exercises require the use of both limbs, whether the legs together, as in knee flexion exercises or leg presses, or the arms together, as in chest presses from a prone position. In these cases, the force exerted by one limb alone is less than if the performance depended on each limb individually. This phenomenon is called bilateral deficiency. Conversely, bilateral performance may improve more than individual performance of each limb as a result of training in bilateral movement. This is achieved by activating muscle fibers in training the bilateral action of both limbs together, which leads to the force produced by one limb during the bilateral action being greater than the force produced by the same limb in individual performance, as observed in weightlifters in the sport of lifting.) Weightlifting, and the disappearance of the bilateral deficit phenomenon in such athletes is attributed to the role of neurological adaptation to training using both limbs (Abu Al-Ala Ahmed Abdel Fattah, 1997, pp. 117-119). From this, it becomes clear that the amount of propulsive force produced by the swimmer during the burst start (bilateral performance) is greater than that produced during the track start (single-limbs performance). As the force generated in the propulsion phase increases, the time required for this phase decreases. Therefore, a significant difference was observed between the two types of starts in the propulsion phase time variable, favoring the Grab start.

Regarding the flight time variable, the results showed a random difference between the two start types. The researcher attributes this result to the fact that the flight time for a swimmer in a Grab start should be less than the flight time in a track start due to the difference in launch speed, which, according to the research results, favored the Grab start. However, the difference in the launch angle for the research sample between the two start types—the launch angle (below the horizon) in the Grab start being smaller than the launch angle in the track start—caused an increase in flight time in the Grab start because the launch angle in this type of start appeared higher than in the



track start (the greater the launch angle, the longer the flight time) (Talha Hussein Hossam El-Din, 1993, p. 310). This led to a convergence in flight time between the two start types, which caused the random difference between them in this variable.

### **Conclusions and Recommendations:**

#### **Conclusions:**

- Swimmers using the Grab start achieved faster times compared to starting from the track, demonstrating its greater effectiveness in improving overall freestyle performance time.
- The Grab start contributed to reducing the time of the launch phase and better entry into the water, due to faster reaction time and more efficient distribution of kinetic energy.
- The type of start used has a clear impact on gaining initial speed, which positively affects maintaining movement rhythm during the first meters of the race.

#### **Recommendations:**

- Adopt the Grab start as a fundamental technique in training and competitions for advanced freestyle swimmers, given its proven superiority in reducing time variance and improving performance.
- Include specific drills for the launch phase in daily training sessions, focusing on developing reaction speed and explosive power of the lower limbs.
- Utilize video recording and motion analysis to evaluate swimmers' performance during the launch phase and correct technical errors.



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