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The relationship between muscular ability (force characterized by speed) of the upper and lower limbs and performance level in 50m freestyle swimming among juniors aged 13-15 years

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Abstract:

This study seeks to understand the relationship between muscular strength (force fast) of the upper and lower extremities and performance in the 50-meter freestyle race among young adults aged 13 to 15 years. A descriptive correlational approach was used, and the research sample included 8 junior swimmers who train at the ***Athletic Swimming Club in Hassi Bahbah in Djelfa***. To collect data, a set of physical tests were used.

The results showed the following:

There is a statistically significant correlation between the rapid strength of the upper extremities and the level of performance in the 50-meter freestyle race.

There is a statistically significant correlation between the rapid strength of the lower extremities and the level of performance in the 50-meter freestyle race.

These results confirm the general hypothesis of the study, which suggests a correlation between muscular strength (force fast) of the upper and lower extremities and performance level in the 50-meter freestyle race among young people aged 13 to 15 years.

Keywords:; muscular strength ,athletic achievement, freestyle swimming, junior category.

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1. INTRODUCTION

Swimming is one of the most important sports activities. Everyone of different ages and genders can practice it. Learning to swim is linked to the stages of physical and psychological development. Swimming also has many benefits. Therefore, it is essential for individuals to learn swimming techniques so they can utilize the water as a natural space that provides health and recreational benefits, and contributes to maintaining their health and quality of life when needed. Swimming enhances a person's physical fitness and helps improve blood circulation and respiratory health. It can be practiced as a hobby or for recreational purposes, and it can also be a competitive sport where you can participate in local, regional or international tournaments. However, swimmers must adhere to the principles of swimming safely and healthily to avoid diseases and accidents that may threaten their lives. He should also train based on sound scientific foundations to develop his physical abilities and increase his level to achieve the best results, by reaching the finish line in the shortest possible period of time to win the competition. This field contributes to the development of the individual in all respects, reflecting the principle of "sound mind in the healthy body". As adolescents engage in physical education activities, they experience a series of experiences and attitudes that reflect on their behaviours and shape their personal characteristics. Psychosocial studies have highlighted that the adolescent's personality is influenced by several factors such as family, society and school, which require an appropriate environment that develops and supports his desire for such activity. ***(Hamid Al-Taie, 2018, p. 69)***

Swimming is also one of the sports activities that depend in its principles on early practice in childhood and on good preparation, planning and preparation during the sports season in order to provide the young athlete with high skills and high physical abilities. This is to raise and improve the level of performance of the beginner and young swimmer (junior category) gradually and through stages. ***(Abdul Hussein Sahib, 2020, p. 99)***

Physical characteristics are essential for achieving an advanced level of swimming, as they contribute to improving the level of swimmers. These

characteristics are the key element that helps a swimmer perform basic skills effectively. Therefore, the importance of scientific research conducted to develop and organize sports training programs becomes clear, as they play a pivotal role in the progress of countries at the present time, especially if there is awareness among officials of the importance of sports in creating a base of young people by enhancing their physical abilities, which helps them achieve accomplishments. Long-term training programs are developed to ensure that young people reach a high level of physical ability that enables them to perform as well as their abilities allow, leading them to reach advanced levels of achievement. The physical abilities of young people are considered a basic and necessary condition, as they are the backbone on which different types of swimming are based, especially freestyle swimming. ***(dahmani, 2019, p. 03)***

Physical development is an important factor in swimming today. Therefore, scientific studies seek to better understand this development and analyze its various elements. Relationships between diverse physical traits are also explored. This focus is on enhancing and balancing these qualities, which helps improve swimmers' skills and performance to achieve the best results in sporting competitions. ***(Talha and Ben Abed, 2022, p. 36)***

Muscular ability is the most important component of a swimmer's physical fitness, as it represents the meeting point of maximum strength with speed and constitutes the scientific performance that the swimmer relies on in all stages of the race, starting from the strong start at the starting line, passing through the effective push with the limbs to move the body quickly through the water until reaching the final acceleration to end the race. It is considered a characteristic of strength
Speed is one of the most important physical qualities essential for achieving high performance and effectiveness at advanced levels. It determines the ability to maintain maximum speed over short distances and improve technique simultaneously. The 50-meter freestyle swimming distance is a clear indicator of the level of muscular ability in juniors, as performance in it reflects the extent of the interconnectedness of strength, speed and rapid muscle endurance This makes developing these capabilities essential in designing training programs aimed at raising the level of achievement and achieving optimal performance over short distances. ***(Hijab, Ben Masbah, 2018, p. 26)***

On the other hand, muscular strength in general, and muscular ability in particular, constitute one of the most important characteristics of physical fitness in swimming, given that it is linked to most of the physical and physiological

requirements imposed by the competitive situations of the sport and affects its level and thus the level of achievement, as it is considered the basic nucleus of general physical capabilities. ***(raymend,1998,p57)***

Muscular ability is also divided, according to what many scientists agree, into a force characterized by speed that appears in repeated movements and an explosive force that appears in a single movement, so in addition to this precise classification, it expresses a muscular ability that requires speed and strength in execution in order to achieve high performance.

From the above, we face a problem that we will try hard to address, and it was as follows:

-Is there a correlation between muscular ability (strength characterized by speed) of the upper and lower extremities and the level of achievement of 50m freestyle swimming in juniors (13-15 years old)?

Several sub-questions have branched out, namely:

- Is there a correlation between the speed strength of the upper extremities and the achievement level of 50m freestyle swimming among juniors (13-15 years old)?

-Is there a correlation between the speed strength of the lower extremities and the achievement level of 50 m freestyle swimming among juniors (13-15 years old)?

2- Study hypotheses:

General hypothesis:

There is a correlation between muscular ability (strength characterized by speed) of the upper and lower extremities and the achievement level of 50 m freestyle swimming among juniors (15-13 years old).

Partial hypotheses:

-There is a statistically significant correlation between the speed strength of the upper extremities and the achievement level of 50m freestyle swimming among juniors (13-15 years old).

-There is a statistically significant correlation between the speed strength of the lower extremities and the achievement level of 50m freestyle swimming among juniors (13-15 years old).

3- Study objectives:

The objectives of the study are as follows:

- Knowing the extent and type of relationship between muscular ability and the level of achievement of 50 m freestyle swimming among juniors.

- Knowing the extent and type of relationship between the speed-distinctive strength of the upper extremities and the level of achievement of 50 m freestyle swimming among juniors

- Knowing the extent and type of relationship between the strength characterized by speed of the lower extremities and the level of achievement of 50 m swimming among juniors.

4- The importance of the study:

The importance of this study stems from the fact that it investigates the relationship between the muscular ability index, which is the strength characterized by speed, and the achievement level of 50 meters freestyle swimming among juniors. It also highlights the extent of the interconnectedness and overlap of different physical qualities in the training process, and points out the importance of developing important physical qualities in swimming to improve performance. Understanding this relationship contributes to providing accurate information that helps coaches design more effective training programs that aim to enhance the physical abilities that directly affect swimming speed, which supports improving the performance of juniors and raising their competitive level.

5- Study terms:

Muscular power: Muscular power (rapid force) is a motor component produced by linking two components: muscular force and motor speed. The relative importance of each of these two components varies according to the difference in the weight of the tool, weight, or force to be used in motor performance. ***(Khadir, meftah, 2022, p. 852)***

It is also defined as "the ability to conquer maximum or less than maximum resistance, but in the fastest possible time". ***(Talha and others, 2003, p. 67)***

Power characterized by speed: It is the individual's ability to confront multiple resistors at high speed, through motor performance that combines power and speed to a degree less than the maximum of each, but simultaneously ensures that the movement is repeated efficiently and quickly.***(Amr, Khaki, 1997, p. 83)***

Procedural definition: It is the swimmer's ability to produce strong and fast propulsion in every movement inside the water, which helps him increase and maintain his speed during performance.

Freestyle swimming: It is called abdominal crawling swimming (Crawl) and ranked first among the four types of swimming because it is widely spread and quick to achieve the best economical results in the use of energy and in the time of covering distances. ***(Doraid Majid, 2016, p. 146)***

Sports achievement: Sports achievement can be defined as the athlete's willingness to make an effort to achieve a specific goal. ***(kamel rateb, 1997,72)***

Juniors: They are young children of both sexes, boys and girls whose ages range between (5-15) years. These years fall under all stages of middle childhood (8-10) years approximately, the stage of late childhood (11-12) years approximately, and the beginning of the first stage of adolescence. (Crowded, Mazari, 2020, p. 314)

The relationship between muscular ability (force characterized by speed) of the upper and lower extremities and achievement level of 50 m freestyle swimming among juniors aged 13-15 years

Procedural definition: They are young children whose ages range from 05-13 to 15 years.

6- Previous and similar studies:

- A study by Dahmani djamal, Mazari Fateh (2020) entitled: The strength characterized by speed and its relationship to achieving 50 m freestyle swimming among juniors aged 9-11 years.

The aim of the research was to study the relationship between the strength characterized by speed and the completion of 50 m freestyle swimming. The research assumed the existence of a significant correlation relationship between the strength characterized by speed and the completion of 50 m freestyle swimming. The researchers used the descriptive approach using the correlational relationships method due to its suitability to the nature of the research. The sample was chosen intentionally to represent the swimmers of the Generation Sports Club of the Youth of Kadiriyah (09-11 years), numbering 8 swimmers out of 14 The study was conducted in the semi-Olympic swimming pool in Al-Qadiriyah from 02/10/2017 until 03/10/2017. In the study, the two researchers used the SPSS statistical bag and reached the following conclusions:

There is a significant correlation between remarkable strength in speed and achieving 50m freestyle swimming.

The researchers recommended:

- The necessity of developing the "power characterized by speed" in completing the 50m freestyle swimming.
- Confirming the conduct of some physiological tests on the research sample and studying the extent of their relationship to the achievement of a 50-meter free yard.

- A study by Saadi Khadir and Madjadi Meftah (2022) entitled: The relationship between muscular ability (strength characterized by speed –explosive force) of the lower extremities and translational speed in football players.

This study aims to find out the relationship between the characteristics of the muscular ability of the leg muscles and the transitional speed of football players by conducting special physical exercises. The descriptive approach was used to suit the nature of the study. The research sample consisted of 18 football players in the reserve category (U21) who are active in the "Youth of Ain Oussara" team belonging to the second national division. The study was conducted at the "01 November" stadium In Ain Oussara - Djelfa Province on March 08 and 09, 2022, where the results concluded:

There is a positive correlation between translational speed and muscular capacity of the lower extremity muscles. Where there is a strong correlation relationship with the force characteristic of speed and an average correlation relationship with the explosive force.

A study by Amal Al-Zoubi (2016) entitled: The relationship between some types of strength and translational speed and their contribution to the digital level of javelin throwing effectiveness in athletics.

This study aimed to find out the relationship between some types of muscle strength and translational speed and their contribution to the digital level of javelin throwing effectiveness in athletics among students of the College of Physical Education at Yarmouk University. The descriptive approach was used to suit the nature of the study. The study was conducted on a sample of (21) students who were deliberately selected from the students of the Faculty of Physical Education at Yarmouk University. A set of physical tests were applied to them (grip strength test using a dynamometer, medical ball throwing test, long jump test from a standstill, 10-second pump exercise test, 30-second sitting exercise test from a lying position, 30-meter running test.

The results of the study were as follows:

-The existence of a statistically significant relationship between the explosive force of the muscles of the aiming arm, the explosive force of the muscles of the arms and shoulders, as well as the explosive force of the muscles of the legs, and the translational speed at the digital level of the effectiveness of the javelin throw.

There is no statistically significant relationship between the variables of maximum force "pulse force" and force tolerance of the arms and the force characterized by speed of the abdominal muscles, as the highest percentage contribution in the digital level to the effectiveness of throwing the spear was the explosive force of the aiming arm followed by the explosive force of the arms and shoulders muscles, followed by the explosive force of the leg muscles and then the translational speed, while the weakest percentage contribution in the digital level was the force of grip and force tolerance of the arms.

-The extent of benefit from previous and similar studies:

By the researcher's knowledge and analysis of these previous and similar modern studies, he can benefit from them from both the theoretical and practical aspects, as this benefit was represented in:

- Determine the steps followed in the research procedures, whether from a technical or administrative standpoint.
- Identify appropriate tests to measure research variables.
- Determine the appropriate method for the study, as most studies used the descriptive method due to its suitability to the nature of the study and the hypotheses built for this research.

- How to use statistical processing as well as refute or deny research results through these studies.

7- Field procedures for the study:

-Exploratory study:

An exploratory study is an initial experiment that precedes the main experiment and is applied to a small sample from the same research population and is conducted in conditions similar to those of the main experiment. Its importance lies in identifying the negatives facing the researcher in his experiment. ***(Tamar, 2023, p. 17)***

-We conducted a survey study on (4) swimmers from the Athletic Swimming Club in Hassi Bahbah, Djelfa, for the 2024/2025 sports season. They are from the same original study community and outside the main study sample.

Its purpose was as follows:

*ensure the suitability of the place designated for conducting tests and the order in which they are performed.

*Ensure that these tests are appropriate for the study sample.

*identifying errors and problems that appear during measurement in the basic study.

*Knowing the time it takes to conduct tests.

*The suitability of the tests for the study sample and the extent of the testers' readiness to conduct the tests.

*Get an idea of how swimmers mentally and physically received the tests used in the study.

*Verify the scientific parameters (validity/constancy) of the various tests used in the program.

- Community and study sample: It is a set of characteristics determined by the researcher that are controlled by all members of the sample. It is considered one of the basic points that the researcher must take into account and pay great attention to. Without determining the community and identifying the elements within it, the researcher cannot control all the variables associated with the research (Boudaoud, Atallah, 2009, p. 69)

The study population consists of swimmers from the semi-Olympic swimming pool Hassi Bahbah in Djelfa, which contains 6 sports clubs. The study sample was selected intentionally and consisted of 8 swimmers from the junior category (13-15 years old), specializing in freestyle swimming, from the Athletic Swimming Club Hassi Bahbah in Djelfa.

Study variables:

There is no single definition of a variable, but methodological scholars agree on the fact that the variable is related to the concept and we call it that because it refers to something that may take different values, and the variable descends from the concept or from indicators and thus makes the phenomenon measurable. ***(Angers, 2004, p. 168***)

***Independent variable:** It is the variable that the researcher controls by fixing all variables, except for one variable. It is the variable that the researcher assumes is the cause or one of the causes of a certain result, and studying it may lead to knowing its effect on another variable.

In our study, the independent variable was identified: muscular ability (strength characterized by speed) of the upper and lower extremities.

***The dependent variable:** The dependent variable is defined as changing as a result of the effect of the independent variable, or it is the variable on which the effect of the independent variable is to be known. The dependent variable has been determined as: Achievement level: 50 meters freestyle swimming.

-Research areas:

***Human field:** This field was represented by the administrative and pedagogical staff of the Athletic Swimming Club.

*spatial field: The semi-Olympic swimming pool feels like Djelfa

***Time domain:** Physical tests for the main experiment were conducted on 10/20/2025 and 10/21/2025

-Data collection tools:

In order to reach solutions to the problem at hand and verify the validity of the research hypotheses, the most effective methods and tools must be followed through study and examination. Therefore, the following data collection tools will be relied upon:

***Theoretical study (bibliographic analysis):** represented by Arabic and foreign sources and references, including books, memoirs, dictionaries, magazines, and the Internet...Etc., the aim of which is to form a theoretical background that helps the researcher complete the field study.

***Physical measurements:** The following measurements were performed:

- Measure height and weight.
- Age (in years)

In order for these measurements to be accurate and not affect the study sample, a pharmacist was consulted and a height and weight device was used.

***Physical tests used in the study:**

Pull-up test on the handle for (10 seconds):

Objective of the test: To measure the speed-characterized force of the upper extremities (arm muscles).

***Performance method:** The individual clings to the attachment device and begins by pulling the body upward by bending the arms from the elbow joint, then

extending completely without touching the ground, and it is preferable to bend the legs from the knee joint towards the back.

Registration:

-Records the laboratory as many correct times as possible of going up and down.

Test conditions:

-Perform as many times as possible within (10 seconds).

The tester is credited with half an attempt every time the player's body rises without his chin reaching the level of the hands, provided that the number of counted halves does not exceed two halves. ***(Haider Mohamed and others, 2022, p. 332).***

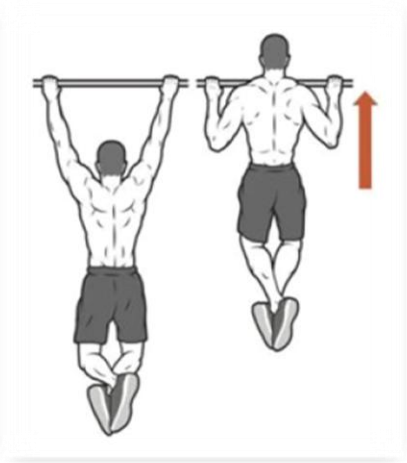


Figure (01): Shows how to tighten the handle (bend and extend the arms)

Testing successive jumps in place for (15 seconds):

Objective of the test: To measure the speed-characterized force of the leg muscles (muscle ability).

Tools used:

Stopwatch –Draw a circle on the ground with a diameter of two feet.

- Performance method:

The tester stands inside the circle with the arms stationary in the middle. When the start signal is heard, the tester jumps in place as many times as possible for a period of (15 seconds).

-Registration:

The laboratory records the number of jumps it made during this period, which is specified as (15 seconds).

-Directions: The jump is made inside the circle drawn on the ground. ***(gunouna, 2018, p. 126)***

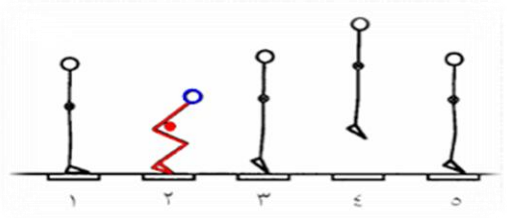


Figure (02): Shows the method of successive jumps in place

- 50-meter freestyle swimming test:

Tools used: stopwatch, whistle, registration form.

Performance method: The laboratory stands at the standing platform and performs its warm-up. When the referee hears the word "Your place," the swimmer takes a starting position and waits to hear the whistle. When he hears it, he jumps from the platform into the water and covers a distance of 50 meters (25m going and 25m back) while pushing the wall in the second stage. Freestyle swimming is at maximum speed in order to record the shortest possible time. ***(Dahmani, Mazari, 2020, p. 325)***

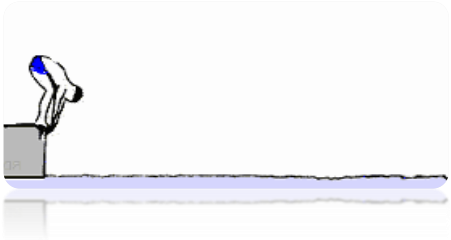


Figure (03): Shows how to start a 50m race

08-Scientific parameters of the applied tests:

In order for the tests developed to measure the variables of the study to be credible and measure what they were developed for, they must meet the conditions for good tests, and they are also called the psychometric properties of the study, and they are arranged in order of importance as follows:

-Honesty.
-Stability.
-Objectivity.

A- The validity of the test: Validity means that the test or instrument measures what it was designed to measure, and achieving the validity of the test is more important than consistency, because the measuring or testing instrument may be fixed, but it is not valid. ***(Awaud, Mervet, 2002, p. 167)***

The researcher relied on the honesty of the judges, which is measuring the content of the test for the thing that needs to be measured. We presented the tests to a group of sports training professors and swimming experts, and their number was (05). The suitability and validity of the tests to achieve the purposes of the study was approved. The researcher also used self-honesty, which is calculated using the square root scale of the stability coefficient using the following equation: ***: (Self-honesty =$\sqrt{\propto}$).***

B- Test stability: This means that the test is able to give almost the same results when applied again to the same individuals and in the same circumstances.
(AlAzaoui, 2008, p. 129)
To calculate the stability of the test (pulling up on the block for 10 seconds), the test (consecutive stability in place for 15 seconds), and the test (completing 50 meters of freestyle swimming), the retest method was used (Test –retest).
- Retest Method: The researcher conducted tests on the exploratory sample consisting of (4) swimmers who were not included in the main research sample on (2025/10/10). After one week, the test was repeated on the same sample under the same conditions on (2025/10/17). Subsequently, the Pearson correlation coefficient was calculated between the results of the individuals in the two applications. The results of the statistical analysis are presented in Table No. (01).

- Objectivity: This refers to the test being free from bias. The tests used in this research are entirely free from self-assessment, due to the objectivity and proficiency of the assisting staff. Additionally, timing units are used in recording, making the applied tests objective.

Table No. (01) illustrates the scientific foundations of the tests applied in the study.

Test name	*sample*	*DF*	*α*	*Stability coefficient*	*Validity coefficient*
Pull-up test on the handle for (10 seconds)	***04***	***03***	***0.05***	0.865	0.93
Testing successive jumps in place for a period of (15 seconds)				0.956*	0.97
50m swimming test (free)				0.897	0.94

Table (01): We observe that all reliability coefficient values ranged between (0.956-0.865), all of which are very high and strong values. This indicates the consistency and stability of the applied tests. We also note that the validity

coefficient values ranged between (0.93-0.97), all close to one, indicating that the tests have achieved self-validity. This allows us to apply these tests in the field study to obtain accurate results.

09- Statistical tools:

The researcher relied on the following statistical methods, using the SPSS22 statistical packages program:

Arithmetic mean $\bar{X}$.

- Standard deviation S.
- Pearson correlation coefficient R.

10-Presentation and discussion of the results

Test	*unit of measurement*	*arithmetic mean*	*standard deviation*
Pull-up test on the handle for (10 seconds)	*Number of repetitions*	*3.13*	*0.79*
Testing successive jumps in place for a period of (15 seconds)	*Number of repetitions*	*7.38*	*0.95*
50m swimming test (free)	*second*	*29.94*	*1.74*

From Table (02), which shows the results of the tests on the sample under study, it is clear that the results of the pull-up test on the handle for a period of (10 seconds) had an arithmetic mean of 3.13 and a standard deviation of 0.79, and the results of the test of successive jumps in place for a period of (15 seconds) had an arithmetic mean of 7.38 and a standard deviation of 0.95 Also, the results of the 50m freestyle swimming achievement test (freestyle) had an arithmetic mean of 29.94 and a standard deviation of 1.74. The results of the arithmetic mean values and standard deviations indicate that the performance of the sample members is close and stable, which indicates their homogeneity. This homogeneity supports the reliability of the data and makes it suitable for conducting correlation analyses accurately.

Presentation and discussion of the results of the first hypothesis:

*hypothesis text: "There is a statistically significant correlation between the speed strength of the upper extremities and the achievement level of 50 m freestyle swimming among juniors"

The relationship between muscular ability (force characterized by speed) of the upper and lower extremities and achievement level of 50 m freestyle swimming among juniors aged 13-15 years

Table (03): Shows the correlation between the speed force of the upper limbs and the achievement level in the 50m freestyle swimming event among junior athletes.

Variables	***Correlation coefficient***	***DF***	***α***	***sig***	***Statistical decision***
Pull up on the handle for (10 seconds)	***0.73***	***06***	***0.05***	***0.039***	***Statistically significant***
50m swimming (free)					

From the results shown in Table No. (03), it is clear that the correlation value has reached (0.73), and the probability value sig has reached (0.03) at the significance level α (0.05). Since the probability value sig is less than the significance level α, we reject the zero hypothesis and accept the alternative hypothesis, which states that there is a strong correlation between the speed-distinctive strength of the upper extremities and the achievement level of 50 m freestyle swimming in juniors.

The results of the analysis showed a positive association between the speed-characterized strength of the upper extremities and the level of achievement in the 50-meter freestyle distance among the junior sample (13-15 years old), indicating that swimmers who have greater strength in moving their arms at short-term speed tend to achieve better times in the race.

This correlation supports the hypothesis that there is a correlation between the variable of strength characterized by speed for the upper extremities and the variable of performance at the 50-meter freestyle level, and reflects the importance of the muscular strength of the arms in accelerating and controlling movement in the water over short distances, because in the 50-meter race, performance depends greatly on the explosive ability of the individual's muscular strength, especially at the beginning of the race and the stage of pushing into the water These results are consistent with the study of ***(Saadi Khadir and Majadi Meftah 2022)*** and the study of ***(Amal AlZoubi 2016)***, which indicated in their results that muscular and explosive strength play a major role in improving performance in short speed races, as increasing the strength characterized by speed leads to moving the arms at a faster rate and increasing forward thrust, thus improving the overall race time.

In short, the results confirm that improving the speed strength of the upper extremities may be an effective strategy for raising the level of achievement over short distances, with the need to combine it with technical training to ensure the

best possible performance. From all of the above explanations, we can say that the first hypothesis has been achieved.

Presentation and discussion of the results of the first hypothesis:

*hypothesis text: There is a statistically significant correlation between the speed-distinctive strength of the lower extremities and the achievement level of 50 m freestyle swimming.

Variables	***Correlation coefficient***	***DF***	***α***	***sig***	***Statistical decision***
Pull up on the handle for (10 seconds)	***0.77***	***06***	***0.05***	***0.026***	***Statistically significant***
50m swimming (free)					

From the results shown in Table No. (04), it is clear that the correlation value has reached (0.77), and the probability value sig has reached (0.026) at the significance level α (0.05). Since the probability value sig is less than the significance level α, we reject the zero hypothesis and accept the alternative hypothesis, which states that there is a strong correlation between the speed-characterized strength of the lower extremities and the achievement level of 50 m freestyle swimming in juniors.

This result means that the improvement in speed-characterized strength in swimmers is clearly significantly related to the improvement in the completion time of 50 meters of freestyle swimming. The trend of the correlation coefficient also indicates that the increase in the level of speed-characterized strength is positively reflected in performance, which confirms the physiological motor importance of this ability in short races that depend on the ability to launch strongly and push effectively during the different stages of swimming.

These results are consistent with the study of ***(dahmani and Mazari 2022),*** which indicated the existence of a close relationship between the characteristic force, speed, and motor speed. It also indicates that since the swimmer performs the leg strokes quickly and forcefully in a 50-meter free swim to overcome water resistance and move forward, developing the characteristic force, speed, of the leg muscles leads to developing motor speed, and thus works to develop the element of speed, as (Mohamed Othman) confirms that " "The force characteristic of speed is one of the factors affecting speed" ***(Mohamed Othman, 1990, p. 117).*** The results showed consistency with scientific analysis of the relationship between the two variables, as the recorded correlation between the force characteristic of speed of the lower extremities and the achievement level of 50 meters freestyle swimming indicates the importance of explosive and fast capabilities in improving time

performance during this type of short races. This consistency is a supporting indicator for the validity of the hypothesis Based on the achieved statistical significance, it can be confirmed that the second hypothesis has actually been achieved.

General conclusion:

Based on the statistical results obtained, it can be said that there is a statistically significant correlation between the muscular ability (strength characterized by speed) of the upper and lower extremities and the achievement level of 50 meters freestyle swimming among juniors in the category (13-15 years). This pivotal periodic correlation of this physical ability reflects the improvement of the muscular performance during short races, as fast muscular ability contributes to raising the efficiency of pushing and moving and achieving better time.Accordingly, the general hypothesis is confirmed, which highlights the necessity of focusing on developing muscular ability (strength characterized by speed) in training programs for the junior category to support improving achievement levels.

Suggestions:

- Conduct a future study that includes different age groups to compare the effect of rapid force at different age stages.
- Expanding the research sample in future studies to increase the accuracy of the results and enhance their generalizability.
- Proposing standard training programs that trainers can apply to scientifically raise the muscular capacity of young people
- Conducting applied studies comparing different training methods (pluralometric, resistance, water) to find out which one is more effective in developing strength characterized by speed.

11 -Conclusion:

The results of this study confirm the importance of muscular ability (strength characterized by speed) of the upper and lower extremities in improving the level of achievement at the 50-meter freestyle swimming level among juniors. These results also serve as a basic reference and starting point for future studies in this field to develop more effective training programs and a deeper understanding of the physical factors affecting athletic performance.

Moreover, the results provide practical evidence for coaches and physical education teachers on the need to integrate rapid strength training into youth preparation programs, which enhances their competitiveness and achieves the best results in short races. The study also encourages future applied research that

compares different training methods and studies their impact on physical abilities and athletic performance, which contributes to developing scientific knowledge and improving swimming training practices.

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