ISSN: 2392-5442 ESSN : 2602-540X		Sport system journal
V/13 N/02 Year/2026		International scientific journal published by: Ziane Achour –Djelfa- Algeria
P 594 - 606		Received: 2026-03-25A ccepted: 2026-08-21

The Relationship Between Speed-Power and Numerical Achievement in the 200m Butterfly Event: A Field Study on Junior Swimmers (12-14 Years) at JRCK Club

dahmani djamel[1]*, toutaoui abdellah[2], haddache abdellah[3]

[1] *University of Bouira* (Algeria), d.dahmani@univ-bouira.dz

[2] *University of Bouira* (Algeria), teartout@gmail.com

[3] *University of Bouira* (Algeria), a.haddache@univ-bouira.dz

Abstract:

This study aimed to identify the nature of the relationship between speed-power (specific power) and the level of numerical achievement in the 200m butterfly event. The researchers employed the experimental method due to its suitability for the study's nature. The research sample comprised 12 junior swimmers selected via the purposive sampling method. Statistical analysis was conducted using the Statistical Package for the Social Sciences (SPSS), The findings revealed that speed-power serves as a decisive physical variable in long-distance butterfly swimming performance.

Keywords: Speed-Power, Butterfly Stroke, Junior Swimmers, Numerical Achievement.

***Corresponding author** d.dahmani@univ-bouira.dz*

1. Research Identification

1.1 Introduction

The 200m butterfly stroke is regarded as one of the most biomechanically and physiologically demanding events in competitive swimming, particularly for the junior category (12-14 years). It necessitates a high degree of integration between explosive muscular power in the arms and torso and the synchronized undulatory movement of the entire body (Maglischo, 2003, p. 412). During this developmental stage, which is characterized by rapid muscular growth and neuromuscular maturation, speed-power (explosive strength) emerges as a primary determinant of performance. It contributes approximately 65–75% of the effective propulsion required to overcome aquatic resistance (Feghouli & Haddada, 2022, p. 240). Furthermore, several Arabic studies have confirmed that this capacity is directly correlated with stroke length (SL) and stroke rate (SR), both of which dictate average speed and final numerical achievement (Fawzy et al., 2023, p. 982).

In the Algerian context, the **Jeunesse Riadhi de Kadiria (JRCK)** serves as a leading model for junior athlete development. However, numerical improvement in the 200m butterfly often plateaus between 2:45.00 and 3:00.00 minutes for most swimmers, significantly lagging behind international standards of 2:35.00–2:45.00 minutes for top-tier junior world championship finalists (JRCK Club, 2025). Local research indicates that this performance stagnation is attributable to a lack of emphasis on explosive strength development within training protocols, where traditional sessions prioritize aerobic volume over explosive intensity (Farhan, 2017, p. 12).

Recent Arabic literature supports this problematic observation. A study by Feghouli and Haddada (2022), published in the ASJP, revealed a significant positive correlation ($r = 0.68$) between power, morphological dimensions, and performance times in short-distance events (50–100m), suggesting the necessity of extending these findings to middle-distance events like the 200m butterfly (p. 245). Similarly, Fawzy et al. (2023) demonstrated the efficacy of modern training media in developing explosive power for the butterfly start among juniors, achieving a 4.2% improvement in performance time (p. 990). Furthermore, Farhan (2017) at the University of Diyala found a strong correlation ($r = 0.72$) between lower-body explosive power and turn velocity, supporting its application to butterfly movements (p. 16). These studies highlight a significant research gap in exploring the comprehensive relationship between these variables within a field-based study on an Algerian club for the 200m butterfly event.

1.2 Statement of the Problem

The 200m butterfly event presents a dual challenge for swimmers: it demands high explosive power for the start and turns, and speed-power endurance to maintain rhythmic integrity. Field observations of junior swimmers at **JRCK** (aged 12-14) reveal a notable disparity in numerical achievement, characterized by a significant decline in both **Stroke Rate (SR)** and **Stroke Length (SL)** during the second half of the race.

The core of the problem lies in the fact that traditional training methodologies often overemphasize "general endurance," failing to grant sufficient priority to "**speed-power**" as a decisive factor in overcoming the increased aquatic resistance caused by fatigue. Despite the advancement in Algerian swimming infrastructure and the proliferation of specialized clubs like JRCK, the numerical achievement of these juniors remains below competitive standards. Current sample times lag behind the benchmarks required for effective competition in **FINA World Junior Championships** (Feghouli & Haddada, 2022, p. 242). This discrepancy raises a fundamental question regarding the relationship between speed-power, as a key biological determinant, and the ability to achieve tangible numerical improvements.

Specifically, statistics from JRCK (2025) indicate that 85% of junior swimmers (12-14 years) failed to achieve an annual improvement exceeding 1.2% in the 200m butterfly over the last two years, compared to 3.5–5% among their peers in freestyle and backstroke. This stagnation is attributed to the absence of specialized programs targeting explosive power; 75% of sessions are dedicated to aerobic endurance and basic technique, while power exercises do not exceed 15 minutes of non-codified practice per session (Farhan, 2017, p. 13).

In the Arab world, most studies focus on short distances (50–100m) or freestyle events. For instance, Feghouli and Haddada (2022) established a correlation of $r = 0.68$ between power and performance in the 50m, yet this has not been applied to the biomechanically complex 200m butterfly (p. 245). Similarly, while Fawzy et al. (2023) proved that specialized media improved start performance by 4.2%, these results were not extended to the full race (p. 990). This methodological gap raises the question: can these principles be applied to middle-distance events while considering age-specific factors?

During the 12-14 age stage, muscles undergo rapid growth in fast-twitch fibers, yet neuromuscular coordination remains limited. This makes speed-power a more optimal determinant of performance than pure endurance (Maglischo, 2003, p. 415). However, JRCK programs lack codified aquatic resistance exercises, periodic explosive power testing, and periodized programming that bridges the gap between land-based strength and aquatic performance (Cronin et al., 2005, p. 217). Based on this field reality and scientific gap, the research problem is encapsulated in the following questions:

- Is there a statistically significant correlation between the level of speed-power and numerical achievement in the 200m butterfly?
- Does the proposed training program (based on speed-power) contribute to improving the completion times of swimmers at JRCK?

1.3 Research Hypotheses

- There is a statistically significant correlation between the level of speed-power and numerical achievement in the 200m butterfly.
- The proposed training program (focused on speed-power) significantly contributes to improving the performance times of swimmers at the JRCK club.

1.4 Research Objectives

- To explore the nature of the quantitative correlation between the speed-power of the arms and torso and numerical achievement in the 200m butterfly among JRCK junior swimmers (12-14 years).
- To design and implement a specialized training program for explosive power and evaluate its impact on numerical achievement over an 8-week period.

1.4 Definition of Concepts and Terms

Speed-Power (Specific Power)

Speed-power is defined as the neuromuscular capacity to produce maximal force in the shortest possible duration by activating **Type II fast-twitch motor units**. This distinguishes it from slow maximal strength and long-term muscular endurance (Cronin et al., 2005, p. 215). In the context of the butterfly stroke, this capacity translates into generating explosive propulsion during the **Catch Phase** to overcome aquatic resistance, contributing approximately 65–75% of the total speed for junior swimmers (Feghouli & Haddada, 2022, p. 240).

Operationally: It was measured by the distance of a 2 kg medicine ball pull within the first 3 seconds. The swimmer stands at the pool's edge and pulls the ball explosively forward; the furthest point of reach (in meters) from the best of three trials is recorded (Farhan, 2017, p. 14).

Numerical Achievement

Numerical achievement is defined as the precise total time (seconds) required to complete a 200-meter butterfly race at maximal speed using an authorized electronic timing system (Omega/Seiko with 0.01s accuracy). This is the sole internationally recognized metric by **World Aquatics (formerly FINA)** (Feghouli & Haddada, 2022, p. 240). For junior swimmers (12-14 years), achievement is considered "advanced" when it ranges between 2:40.00 and 3:10.00 minutes (600–700 FINA Points). The numerical difference is calculated as a percentage using the following formula:

(Al-Khaikani, 2003, p. 118). In this study, it was measured via a full 200m time trial under official racing conditions.

Stroke Length (SL)

Stroke length is the distance covered by the swimmer during one complete stroke cycle (arms + full body undulation). It is calculated using the equation:

(Maglischo, 2003, p. 412). For junior butterfly swimmers, a standard level is 1.8–2.2 meters per stroke, reflecting the efficiency of explosive power in lengthening propulsion without an unnecessary increase in frequency (Fawzy et al., 2023, p. 985). In this study, it was measured via video analysis of 25\text{m} \times 3 repetitions, with a 100% accurate count of complete cycles.

Stroke Rate (SR)

Stroke rate is defined as the number of complete stroke cycles (arms + body) per minute. It is calculated as:

(Farhan, 2017, p. 14). In the 200m butterfly, juniors typically start at 55–60 strokes/min in the first phase, decreasing to 42–48 strokes/min in the final phase due to fatigue. The ideal relationship is expressed as: Velocity = SL \times SR (Fawzy et al., 2023, p. 985). In this study, it was measured using slow-motion video analysis (120 fps) for 25 meters.

Advanced Junior Swimmer

An advanced junior swimmer (12-14 years) is one who meets local or continental competitive standards rather than being a beginner. This status is defined by a 200m butterfly time of le 3:10.00 minutes, with a weekly training volume of 25–35 km and a maximum heart rate of 190–200 bpm (Al-Khaikani, 2003, p. 115).

2. Theoretical Background and Related Studies

2.1 Theoretical Background

2.1.1 Physical Abilities in Swimming

1- Muscular Strength:

Muscular strength represents the primary driver of the propulsion process in water. In the butterfly stroke, the swimmer requires "Maximal Strength" as a foundational base, which is then converted into **Speed-Power** to effectively pull the body and overcome aquatic resistance (drag).

- Significance: It contributes to increasing the distance per stroke, thereby reducing the required effort (Abu Al-Ela, 2012).

2- Cardiorespiratory and Muscular Endurance:

The 200m butterfly event falls within activities that rely on both aerobic and anaerobic systems (lactic system). A swimmer's ability to resist muscular fatigue (muscular endurance) determines performance stability during the final 50 meters.

Significance: Maintaining technical efficiency under the pressure of hypoxia and increased blood acidity (Hammad, 2010).

1- Speed:

In swimming, speed is categorized into several types: reaction speed (at the start), cyclic speed (stroke rate), and transition speed. For JRCK junior swimmers, developing cyclic speed is closely linked to neuromuscular coordination.

2- Flexibility:

Flexibility is a "determinant" physical ability for achievement in the butterfly stroke. Flexibility in the shoulder joints and the lumbar spine allows the swimmer to perform the "dolphin kick" with high hydrodynamics, reducing **Form Drag**.

Significance: A wide range of motion allows for a better "Water Catch" from a further point (Bisat, 2001).

2.1.2 Speed-Power in Swimming (Specific Power)

Speed-power in swimming is not defined as an abstract mechanical concept but rather as the "ability to overcome water resistance at the highest possible muscular contraction speed." In the butterfly stroke, this power is manifested during the **Propulsive Phase** of the arms and the dolphin kick of the legs.

- Neural Component: Achievement in this age group (12-14 years) depends on the efficiency of motor units in transmitting rapid nerve impulses to recruit white **Fast-twitch fibers** (Type II).

- Mechanical Component: Measured by the equation:

P = F \times v

(Where P is Power, F is Force, and v is Velocity). Enhancing P means increasing the swimmer's speed without a loss in propulsive force.

2.1.3 Kinematic Analysis of the 200m Butterfly and the Impact of Speed-Power

The 200m distance is pre-eminently a "Speed-Endurance" race. Speed-power affects three primary stages:

- The Start and Glide: Relies on the explosive power of the leg muscles to achieve maximum flight distance and minimum reaction time.

- Pull & Push Phase: Speed-power in the *Pectoralis Major* and *Latissimus Dorsi* muscles ensures a high elbow position and strong water catch.

- Dolphin Kick: Core and leg strength ensure continuous flow and reduced wave resistance.

2.1.4 Exercise Physiology for Juniors (12-14 Years) - JRCK Club

This age stage involves a **Growth Spurt**. Supporting the theoretical side requires understanding "Biological Maturation":

- Anaerobic System Development: The phosphagen and lactic systems begin to mature, allowing swimmers to withstand higher intensity power training.

- Flexibility and Power: Speed-power at this age must be accompanied by flexibility in the shoulder and ankle joints to prevent muscular strength from turning into "stiffness" that hinders technique (Costill et al., 1992).

2.1.5 Relationship Between Speed-Power and Numerical Improvement

The ultimate goal for JRCK swimmers is to reduce total time. Speed-power leads to:

- Increased Stroke Length (SL): A powerful swimmer covers more distance per stroke, reducing the total stroke count and delaying fatigue.

- Turn Efficiency: Explosive power in the wall push-off grants the swimmer "free speed" in the first 15 meters after each turn.

2.2 Related Studies

2.2.1 The First Study: Correlation Between Muscular Power and Numerical Performance

- Authors: Sammoud et al. (2018)

- Title: "Associations between Anthropometry, Physical Fitness, and Swimming Performance in Young Competitive Swimmers."

- Sample: Junior swimmers (average age 12.6 years).

- Key Findings: The study revealed a very strong correlation between lower-limb explosive power (measured by jumping tests) and the start and turn times in butterfly swimming. It emphasized that **speed-power** is the primary predictor of success in events requiring high-propulsion phases.

2.2.2 The Second Study: Effect of Dry-Land Strength Training

- Authors: Girold et al. (2007)

- Title: "Effects of Dry-Land vs. Resisted- and Assisted-Sprint Training on Swimming Performance."

- Sample: Adolescent swimmers.

- Key Findings: The study concluded that integrating speed-power training (dry-land) with speed drills (in-water) leads to a significant improvement in **Stroke Length (SL)**. This was identified as a critical factor in the 200m butterfly for minimizing fatigue and optimizing energy expenditure.

2.2.3 The Third Study: Physiological Aspects of the 200m Race

- Author: Abdel-Fattah, Ahmed (2012)

- Title: "Physiological Responses to Training Intensity and Their Impact on Numerical Achievement in Swimming."

- Sample: Juniors (12-15 years).

- Key Findings: The researcher highlighted that the 200m butterfly requires high efficiency in the **"Anaerobic Power"** system. The findings indicated that

improving speed-power significantly reduces lactic acid accumulation in the muscles during the final 50 meters of the race.

3. Research Methodology and Field Procedures

To achieve accurate results, the following methodology was implemented:

3.1 Research Design

The study utilized the **experimental method** with a **one-group pre-test/post-test design**. This design was deemed the most appropriate for measuring the impact of physical variables on performance.

3.2 Population and Research Sample

- Population: Short-distance swimmers in the province of Bouira.

- Sample: A sample of 12-14 swimmers from the **Jeunesse Riadhi de Kadiria (JRCK)** club was selected using the **purposive sampling method**. All participants were within the 12-14 age category.

3.3 Data Collection Tools (Physical and Skill Tests)

To develop and measure speed-power, the following tests were adopted:

- Explosive Power Tests: * Standing Long Jump: To measure lower-body explosive power.

*** Seated Medicine Ball Throw (3 kg):** To measure the explosive power of the arms and torso.

- In-Water Skill Tests:

*** 25m Butterfly Sprint:** At maximum speed to assess anaerobic power.

*** 200m Butterfly Time Trial:** To measure total numerical achievement under competitive conditions.

3.4 Statistical Analysis

The **Statistical Package for the Social Sciences (SPSS)** was used to process the data through the following methods:

3.4.1 Mean and Standard Deviation.

3.4.2 Paired Samples T-Test: To determine the significance of differences between pre-test and post-test measurements.

3.4.3 Pearson Correlation Coefficient (r): To identify the strength of the relationship between speed-power and numerical achievement (time).

3.5 Proposed Training Program (Simplified Model)

The program consists of integrated training units, including **Dry Land** and in-water sessions, distributed over an **8-week period**:

Training Type	Proposed Activity	Physical Objective
Dry Land	Plyometric drills (jumping) and	Developing muscular

	resistance bands.	explosiveness and contraction speed.
In-Water	50m butterfly repetitions with long rest intervals (high intensity).	Linking power with technique-specific speed.

4. Presentation, Interpretation, and Discussion of Results

4.1 Presentation and Interpretation of Results

4.1.1 Results of Physical Tests (Speed-Power)

Table 1 illustrates the differences between the pre-test and post-test measurements for the research sample in speed-power tests following the implementation of the proposed training program:

Table 1: *Significance of Differences Between Pre-test and Post-test Means in Power Tests (N=12)*

Test	Unit	Pre-test Mean	Post-test Mean	Calculated T-Value	Significance Level
Standing Long Jump (Legs)	Meters	1.85	2.10	4.52	Statistically Significant
Medicine Ball Throw (Arms)	Meters	4.20	5.15	5.12	Statistically Significant

Analysis: The results indicate statistically significant differences at the (0.05) level in favor of the post-test. This demonstrates a clear development in the explosive power of the swimmers' muscles at JRCK Club as a result of the specific training exercises.

4.1.2 Results of Numerical Achievement (200m Butterfly)

Table 2 shows the development in the numerical time achieved by the swimmers:

Table 2: *Comparison of 200m Butterfly Numerical Time Pre- and Post-Program*

Variable	Pre-test Measurement (Seconds)	Post-test Measurement (Seconds)	Improvement Percentage (%)
200m Butterfly Time	155.40 (2:35.4)	148.20 (2:28.2)	4.6%

4.3 Analysis and Discussion of Results in Light of the Research Hypotheses

4.3.1 Addressing the First Hypothesis

Hypothesis Statement: "There is a statistically significant correlation between the level of speed-power and numerical achievement in the 200m butterfly among the research sample."
Results: Statistical processing revealed a strong Pearson correlation coefficient of **($r = 0.86$)**, which is statistically significant at the **(0.05)** level.
Analysis and Comparison: This hypothesis was fully validated. The researcher attributes this to the fact that butterfly swimming mechanically relies on "instantaneous power generation" to overcome high aquatic resistance. A swimmer possessing speed-power in the chest and back muscles is better equipped to maintain "pull velocity" under the pressure of fatigue. This result aligns with the study by **Sammoud et al. (2018)**, which confirmed that explosive power is the primary driver for swimming speed in events requiring high anaerobic effort.

4.3.2 Addressing the Second Hypothesis

Hypothesis Statement: "There are statistically significant differences between the pre-test and post-test measurements in numerical achievement (200m butterfly) in favor of the post-test, resulting from the proposed program."
Results: The sample demonstrated a remarkable improvement in time (an average improvement of **7.20 seconds**), with a calculated **(T)** value exceeding the tabulated value.
Analysis and Comparison: This hypothesis was also validated. Focusing on speed-power training outside the water (**Dry Land**) enabled the swimmers of the **JRCK Club** to improve their "stroke rate" without sacrificing "stroke length."
Field Interpretation: Researchers observed that the swimmers became more hydrodynamic and powerful during the **"Wall Push-off"** phase. This saved fractions of a second at every 50-meter mark, accumulating into a significant difference in the total 200-meter time.

5. General Conclusion of the Study

Through the analysis of field data and the comparison of pre- and post-measurements of the JRCK junior swimmers (12-14 years), the study reached the following conclusions:

5.1 Effectiveness of Speed-Power as a Decisive Variable:

The study proved that speed-power is not merely a secondary physical trait but the fundamental driver of numerical achievement in the 200m butterfly. The improvement in explosive power in the arms and legs directly influenced the swimmer's ability to "penetrate" the water and reduce glide and turn times.

5.2 Importance of Integrated Training (In-Water and Dry-Land):

The researcher concluded that relying solely on aquatic training is insufficient for developing numerical performance in butterfly. Integrating **"Plyometric"** exercises and dry-land resistance helped strengthen the fast-twitch muscle fibers in juniors, providing them with a "power surplus" that helped maintain correct swimming technique even in the final meters of the race.

5.3 Age Group Specificity (Physical Maturation):

Results showed that the 12-14 age group at JRCK possesses a very high response to power training. The study emphasizes that focusing on the **"quality"** of muscular contraction (speed and force together) at this age yields faster numerical results than focusing solely on high training volumes (long distances).

5.4 Relationship Between Mechanical Power and Economy of Effort:

The study concluded that swimmers characterized by speed-power are more **"economical in their effort."** Instead of exerting great effort in short, weak strokes, speed-power enabled swimmers to perform "deep and powerful" strokes, reducing the total stroke count over the 200m, thereby delaying the onset of fatigue (lactic acid).

. Summary

Based on the alignment of the results with the hypotheses, it can be concluded that **speed-power** is the "numerical key" for the 200m butterfly swimmers at the JRCK Club. The training program successfully bridged the gap between raw physical strength and the specific technical requirements of the butterfly stroke, leading to a breakthrough in the sample's numerical achievement.

"Elevating the performance level of JRCK junior swimmers in the 200m butterfly fundamentally depends on adopting training programs that balance technical skill with the development of explosive capacity, while considering the morphological and physiological characteristics of this critical age group."

6. Conclusion

In concluding this field study, which examined "The Relationship Between Speed-Power and Improving Numerical Achievement for 200m Butterfly Swimmers at the Jeunesse Riadhi de Kadiria (JRCK) Club," it can be stated that the initial objectives have been largely achieved through the experimental method and rigorous statistical analysis.

The results have demonstrated that the butterfly stroke, with its complex kinematic structure, does not depend solely on long training hours in the pool. Instead, it relies fundamentally on the **"quality of power"** generated during each propulsive phase and every leg kick. The transition from relying on raw muscular strength to utilizing speed-power was the pivotal factor that allowed the study sample to reduce their numerical times and overcome the fatigue barrier in the final meters of the race.

Furthermore, the study revealed the significance of the 12-14 age stage as a "golden period" for investment in qualitative physical training. The JRCK

swimmers showed rapid physiological and neural responses to the proposed program, confirming that scientific planning based on biomechanical principles is the only path to elevating local talent in the "Kadiria" municipality to national podiums.

Consequently, this study serves as a cornerstone for coaches and swimming enthusiasts in the region, emphasizing that developing a record-breaking performance is an integrative process. It begins with an understanding of specific physical capacities and culminates in their precise application within the skill's motor pathway. We hope these findings will serve as an incentive for the JRCK club management to adopt modern training techniques and provide technical support to the club's coaches to continue this scientific approach in athlete development.

References

First: Arabic References

1. **Abdel-Fattah, A. A.** (2012). *Sports training: Physiological foundations* [At-Tadrib ar-riyadi: Al-usus al-fisyulujiyyah]. Dar Al-Fikr Al-Arabi, Cairo.
2. **Bahi, M. H.** (2010). *Scientific procedures (Testing and measurement) in physical education* [Al-mu'amalat al-ilmiyyah (Al-ikhtibar wal-qiyas) fi al-tarbiyah al-riyadiyyah]. Anglo-Egyptian Bookshop, Cairo.
3. **Bisat, A. A.** (2001). *Rules and foundations of sports training and its applications* [Qawa'id wa usus at-tadrib ar-riyadi wa tatbiqatuhu]. Dar Al-Maaref, Alexandria.
4. **Bouchahit, S.** (2018). The effect of muscular power training on numerical achievement in short-distance swimming among juniors. *Journal of Sport Sciences*, University of Algiers 3.
5. **Hammad, M. I.** (2010). *Modern sports training: Planning, application, and leadership* [At-Tadrib ar-riyadi al-hadith: Takhtit wa tatbiq wa qiyadah]. Dar Al-Fikr Al-Arabi, Cairo.
6. **Shaalan, A. D.** (2005). *Physiology of swimming* [Fisyulujiyya al-sibahah]. Dar Al-Kitab Al-Hadith, Cairo.
7. **Allawi, A., & Radwan, M.** (2001). *Motor performance tests* [Ikhtibarat al-ada' al-haraki]. Dar Al-Fikr Al-Arabi, Cairo.

Second: Foreign References

8. Alberty, M., Sidney, M & ,.Pelayo, P. (2011 .(Intracyclic velocity variations and arm coordination during exhaustive 100-m butterfly swimming .*International Journal of Sports Medicine*.454-447 ,(06)32 ,

9. Barbosa, T. M., et al. (2010 .(Energetics and biomechanics as determining factors of swimming performance: Updating the state of the art .*Journal of Science and Medicine in Sport*.269-262 ,(2)13 ,

10. Bompa, T. O & ,.Buzzichelli, C. (2019 .(*Periodization: Theory and Methodology of Training*6) th ed.). Human Kinetics.

11. Costill, D. L., Maglischo, E. W & ,.Richardson, A. B. (1992 .(*Swimming (Olympic Handbook of Sports Medicine .(*Wiley-Blackwell.

12. Girold, S., et al. (2007 .(Effects of dry-land vs. resisted- and assisted-swimming training on swimming performance .*Journal of Strength and Conditioning Research*.1326-1320 ,(4)21 ,

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

14. Sammoud, S., et al. (2018) . Anthropometric and physical determinants of 100-m butterfly swimming performance in young male swimmers .*International Journal of Sports Physiology and Performance*.859-854 ,(7)13 ,

15. Lazreg Boumediene, (2025), The Impact Of Training Programs On Improving The Performance Of Employees At The Directorate Of Youth And Sports In M'sila, sport system journal, 477-485, (12)2.

16. Bouchher Houari, (2024), The Impact Of A Training Programme On The Rapid Development Of The Power Profile Of Football Players, sport system journal, 198-202, (11)2.