



# The Effect of Temporal Perception Accuracy on the Speed of Offensive Response in Fencing Players

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## ABSTRACT

## Original Research Article

The present study aims to identify the relationship between temporal perception accuracy and attack response speed among third-year students at the College of Physical Education and Sport Sciences, University of Baghdad. The researcher adopted the correlation descriptive approach due to its suitability to the nature of the research problem. The sample consisted of 30 students intentionally selected from third-year fencing students.

Temporal accuracy of perception was measured using a time reproduction test, while attack response speed was estimated by measuring the time taken to initiate a direct lunge following a visual stimulus. The collected data were statistically analyzed using mean, standard deviation, and Pearson correlation coefficient.

The results revealed a statistically significant negative correlation between temporal perception accuracy and attack response speed. This indicates that lower time estimation error is associated with faster offensive response performance.

The study concluded that temporal perception plays an important role in motor response efficiency in fencing. It is recommended that coaches incorporate perceptual training elements into fencing training programs alongside physical and technical preparation.

**Keywords:** Temporal Perception, Response Speed, Fencing, Motor Performance, Motor Learning.

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## Chapter One

### Introduction and Importance of the Research

Fencing is a sport that demands high precision in timing, quick decision-making, and executing movements at the perfect moment. A fencer has little time to think during a match because the difference between scoring a touch and losing it can be a fraction of a second. Therefore, performance in fencing depends not only on strength or speed but also on the fencer's ability to judge time and coordinate their movements in harmony with their opponent's.

Temporal perception is a crucial cognitive aspect of athletic performance. It represents an individual's ability to estimate

time intervals and adjust the timing of their movements to suit the situation. In fencing, a player needs to choose the opportune moment to attack or counter. Even a slight error in timing can lead to a missed opportunity or conceding a touch to the opponent. Therefore, it can be said that temporal perception, while often subtle, is a significant factor in the speed of offensive response.

A review of previous studies reveals that most fencing research has focused on physical fitness elements such as transitional speed, explosive power, and simple reaction time. Some studies have also examined the kinematic analysis of skills. However, the cognitive aspect related to time perception has not received sufficient attention, particularly in Arabic studies. This raises an important question about the

nature of the relationship between accurate time perception and the speed of offensive response in fencers.

The importance of this research lies in its attempt to link a cognitive aspect, namely temporal perception, with a motor skill aspect, namely the speed of attack execution. Its findings can also guide coaches in incorporating training aimed at improving timing, not just physical speed. Thus, the research offers a scientific dimension that can contribute to a more comprehensive development of fencing performance.

## Research Problem

Fencing is characterized by its reliance on precise timing in executing offensive and defensive skills. The athlete must choose the opportune moment to initiate a movement and execute the thrust with a speed that matches the opponent's movement. While training in most clubs focuses on developing speed, strength, and agility, the aspect related to timing often receives less attention.

Through the researcher's observation of the field and performance during matches, it became clear that some players possess good physical speed but are slow to choose the moment to attack or initiate movement at an inopportune time. This indicates that the problem is not always related to slow movement but may be linked to an inaccurate estimation of the appropriate response interval.

Furthermore, the scarcity of studies addressing temporal perception in fencing, particularly within the local context, makes it difficult for coaches to rely on clear scientific indicators when designing training programs. Therefore, the research problem can be summarized in the following question:

Is there a statistically significant relationship between temporal perception accuracy and offensive response speed in fencers?

This question leads to an attempt to uncover the nature of this relationship and the extent of its impact on the level of offensive performance.

## Research Objectives

1. Identifying the level of temporal perception accuracy among the fencing players in the research sample
2. Identifying the level of offensive response speed among the fencing players in the research sample
3. Uncovering the nature of the relationship between temporal perception accuracy and offensive response speed in fencing players
4. Determining whether the accuracy of temporal perception can serve as an indicator that helps explain differences in the speed of offensive performance

## Research Hypotheses

1. There is a statistically significant correlation between temporal perception accuracy and offensive response speed in fencers.

2. The more accurate a player's perception of time, the faster their offensive response will be.
3. There are differences in the speed of offensive response depending on the level of temporal perception among the individuals in the sample.

## Research Areas

Human field: Third-year students at the College of Physical Education and Sports Sciences, University of Baghdad

Time frame: From 1/3/2025 to 1/6/2025

Spatial setting: Fencing hall at the College of Physical Education and Sports Sciences, University of Baghdad

## Chapter Two

### Theoretical Framework

#### Fencing Sport and the Nature of Performance in It

Fencing is an individual sport that relies on precise timing and rapid reaction time. The performance involves direct confrontation between two players, each attempting to score a legal touch within a very short time. Badr Al-Din points out that fencing requires an integration of physical, technical, and mental aspects, and that timing is a crucial factor in the success of both attack and defense (Ahmed Badr Al-Din, 2006, p. 41).

Alawi emphasizes that reaction time and response speed are fundamental factors in sports that rely on direct confrontation, as superiority in these sports is linked to the player's ability to convert visual stimuli into a motor response in the shortest possible time (Mohammed Hassan Alawi, 1990, p. 212). This is clearly applicable to fencing, which depends on the speed of analyzing the opponent's movements and making the appropriate decision.

Hammad also points out that competitive performance in individual sports requires a high degree of coordination between the nervous and muscular systems, and that the ability to control the timing during the execution of the skill is one of the important indicators of the player's level (Mufti Ibrahim Hammad, 1998, p. 167).

On the other hand, Qasim Hassan Hussein explains that perceptual processes, including sensory-motor perception, play an important role in organizing and directing movement, and that accurate time estimation contributes to improving the quality of motor response in competitive situations (Qasim Hassan Hussein, 2004, p. 98).

Wajih Mahjoub also points out that motor learning is not limited to acquiring skills only, but also includes developing the ability to estimate time and distance and neuromuscular coordination, which are elements directly related to performance in fencing (Wajih Mahjoub, 2002, p. 121).

From the above, it is clear that fencing is not a purely physical activity, but rather a complex activity that combines perception, neural processing, and motor execution. This justifies studying the relationship between the accuracy of temporal perception and the speed of offensive response among students.

### **The Concept of Temporal Perception**

Temporal perception is a component of sensorimotor perception, which relates to an individual's ability to estimate time intervals and organize their motor response according to a specific timing. Osama Kamel Rateb points out that perception in the sports field is not limited to receiving sensory stimuli but also includes interpreting and organizing them temporally in a way that serves skill performance (Osama Kamel Rateb, 2000, p. 88).

Abu Al-Ala Abdel Fattah confirms that timing control is one of the essential characteristics of skill performance in sports that rely on direct confrontation, as accurate time estimation contributes to improving execution efficiency and reducing errors (Abu Al-Ala Abdel Fattah, 2003, p. 143).

As Amrallah Ahmed Al-Basati explains, high athletic performance requires harmony between temporal perception and motor execution, especially in sports characterized by rapid changes in situations, where the player must choose the appropriate moment to start the movement (Amrallah Ahmed Al-Basati, 2008, p. 176).

From the perspective of measurement and evaluation, Abdul Sattar Jabbar Al-Dhamin points out that time estimation represents a measurable variable in the mathematical field, and it can be used as an indicator of the efficiency of neural processes related to response (Abdul Sattar Jabbar Al-Dhamin, 2009, p. 97).

In the context of sports psychology, Muhammad Nasr al-Din Radwan indicates that temporal perception is linked to the processes of attention and concentration, and that advanced-level athletes have a better ability to control timing during competitive performance (Muhammad Nasr al-Din Radwan, 2001, p. 112).

This demonstrates that temporal perception is a fundamental element in developing precise motor responses, especially in sports that rely on precise timing, such as fencing, where any error in estimating time may lead to a delayed response or its execution at an inopportune moment.

### **Temporal Perception and Athletic Performance**

Temporal perception is directly linked to the nature of performance in sports characterized by rapid changes in circumstances. An athlete's success depends on their ability to choose the appropriate moment to begin, stop, or modify a movement. Mohammed Hassan Alawi points out that accurate timing is a crucial foundation for skillful performance, and that precise time estimation contributes to

improving performance levels and reducing errors during competition (Mohammed Hassan Alawi, 1990, p. 219).

As Osama Kamel Rateb explains, an athlete with a better ability to regulate their timing is better able to manage their effort and control their speed of performance according to the demands of the competitive situation (Osama Kamel Rateb, 2000, p. 94). This is clearly evident in sports that rely on quick reactions, such as fencing.

From a physiological standpoint, Abu Al-Ala Abdel Fattah indicates that the neural processes responsible for sensory perception play a fundamental role in determining the speed of transmission of the neural signal from the sensory receptors to the neural centers and then to the muscles, and that any improvement in the efficiency of these processes is reflected positively on the speed of response (Abu Al-Ala Abdel Fattah, 2003, p. 156).

Amrallah Ahmed Al-Basati also confirms that the harmony between perception and motor execution is a fundamental condition for achieving masterful performance, especially in sports that require quick and accurate responses in a short time (Amrallah Ahmed Al-Basati, 2008, p. 183).

Therefore, it can be said that temporal perception is not merely an abstract mental ability, but a fundamental factor that affects the speed of response and the accuracy of execution. This justifies studying its relationship to the speed of offensive response in fencing, as it is one of the sports that depends on the crucial timing of recording the touch.

### **The Relationship Between Temporal Perception and Response Speed**

The relationship between temporal perception and response speed is a crucial topic in motor learning and sports psychology. Response speed depends not only on muscular strength or physical readiness, but also on how sensory information is processed and temporally organized before movement begins. Qasim Hassan Hussein points out that motor response involves stages including receiving the stimulus, analyzing it, and making the appropriate decision. The more precise the temporal processing, the shorter the response time (Qasim Hassan Hussein, 2004, p. 105).

Wajih Mahjoub also explains that reducing the time of transition from perception to motor execution is an indicator of the development of the motor nervous system, and that advanced-level athletes are characterized by a higher speed in organizing motor timing compared to beginners (Wajih Mahjoub, 2002, p. 138).

In the field of mathematical measurement, Abdul Sattar Jabbar Al-Dhamin confirms that response time is one of the sensitive indicators that is affected by the individual's ability to estimate the time interval between the appearance of the stimulus and the start of the movement, which indicates the existence of a relationship between temporal perception and

performance efficiency (Abdul Sattar Jabbar Al-Dhamin, 2009, p. 101).

As Risan Khribat Majid points out, developing speed in individual sports is not achieved solely through physical training, but requires improving the neural processes related to perception and decision-making, because a delay in timing leads to a weakening of the effectiveness of the response (Risan Khribat Majid, 2013, p. 167).

From the foregoing, it is clear that temporal perception is an essential part of the series of processes that precede the motor response, and that any error in estimating time may lead to a slow start to the movement or its execution at an inappropriate moment. This makes studying the relationship between the two variables essential in a sport that depends on precise timing, such as fencing.

### Previous Studies

Many Arab studies have focused on fencing from various physical and skill-based aspects, emphasizing the development of speed, reaction time, and offensive preparation, given their crucial role in determining the right touch and achieving superiority in competition.

Nour Hatem Al-Haddad's 2023 study aimed to design a reaction agility test for fencers, providing an objective measurement tool that reflects the speed of a fencer's response to various stimuli. The researcher used a descriptive approach to construct the test and establish its scientific basis, concluding that the test can be used as an indicator to measure the level of reaction agility in fencers, thus confirming the importance of rapid response in this sport (Nour Hatem Al-Haddad, 2023).

Ali Fouad Majeed and Abdulhadi Hameed Mahdi (2022) conducted a study to identify the effect of specific exercises on developing the movement speed of the armed arm in wheelchair fencing for young people under 20 years of age. The results showed significant differences in favor of the group that underwent the specific exercises, indicating that developing movement speed contributes to improving skill performance (Ali Fouad Majeed and Abdulhadi Hameed Mahdi, 2022).

In the same context, a study by Ashraf Mosaad Ibrahim Obaid and others in 2024 addressed the effectiveness of offensive preparation methods in the World Fencing Championships for foil weapons. The results showed that the success of the touch is related to choosing the appropriate time for preparation and execution, which reflects the importance of the timing element in competitive performance (Ashraf Mosaad Ibrahim Obaid and others, 2024).

At the Jordanian level, Khaled Atiyat, Akef Taifour and Tsutomu Taira (2011) addressed some physical attributes related to performance in fencing, and their results indicated a relationship between some physical variables and competitive

performance efficiency, which confirms that excellence in fencing depends on the integration of multiple elements (Khaled Atiyat et al., 2011).

A review of these studies reveals that most research focused on physical, skill-based, and technical analysis aspects, while not directly addressing the relationship between temporal perception accuracy and offensive response speed in fencing, particularly among physical education students. This is where the current research focuses, attempting to link a cognitive variable with a motor skill variable within the context of fencing.

## Chapter Three

### Research Methodology and Field Procedures

#### Research Methodology

The researcher adopted the descriptive approach with its correlational method, as it was suitable for the nature of the research problem and its objectives. This approach aims to study the relationship between two or more variables as it exists in reality, without direct intervention by the researcher in any of them. This method is used to reveal the strength and direction of the relationship between the variables through appropriate statistical analyses.

John W. Creswell explained that correlational studies are used when the goal is to determine the nature of the relationship between variables without imposing experimental treatment or changing the natural conditions of the study (John W. Creswell, 2014, p. 338).

Jerry Thomas, Jack Nelson, and Steven Silverman also confirmed that correlational research is one of the most frequently used designs in sports science when studying the relationship between the physical, skill, or cognitive aspects of athletic performance, especially when the goal is to explain individual differences between players (Jerry Thomas et al., 2015, p. 181).

Since the current research aims to reveal the relationship between temporal perception accuracy and offensive response speed among third-year students at the College of Physical Education and Sports Sciences, University of Baghdad, without applying a training program or experimental intervention, the descriptive correlational approach was the most suitable to achieve the study's objectives.

This approach also allows the use of the correlation coefficient to determine the strength of the relationship between the two variables, which was indicated by William J. Hopkins when he discussed the use of correlational analysis in interpreting sports performance indicators and showing the degree of correlation between them (William J. Hopkins, 2000, p. 3).

## Research Community and Sample

The research community consisted of third-year students at the College of Physical Education and Sports Sciences, University of Baghdad, for the academic year 2024-2025, who were studying fencing as part of the prescribed curriculum.

The research sample was selected purposively from third-year fencing students. The sample consisted of (30) students after excluding those who did not train regularly or who had injuries that might affect their performance during tests. Purposive sampling is a suitable method in sports studies when the goal is to select individuals who possess specific characteristics that serve the research objectives (Mohammed Hassan Alawi, 1999, p. 214).

The researcher ensured a degree of homogeneity among the sample members in terms of their academic level and educational experience in fencing, in order to minimize the influence of extraneous variables that might affect the research results. Wajih Mahjoub emphasizes that sample homogeneity contributes to increasing the accuracy of the results and reducing unwanted variance among its members (Wajih Mahjoub, 2002, p. 89).

Measurements were also taken on all members of the sample under the same spatial and temporal conditions to ensure the objectivity of the results and to meet the requirements of scientific measurement.

## Methods, Devices, and Tools Used in Research

In order to achieve the research objectives and collect data related to its variables, the researcher used a set of methods, devices, and tools that are appropriate to the nature of the study and were chosen in accordance with the measurement requirements in the field of mathematics.

First, the means

1. Arabic and foreign sources related to the research topic
2. Results recording forms for temporal perception and offensive response speed tests
3. A support team is available to organize the testing process and data entry.

Secondly, devices and tools

1. Digital stopwatch for accurately measuring response time
2. A laptop computer for displaying the visual cues of the temporal perception test.
3. A display screen or projector for showing visual stimuli
4. College-approved legal fencing tool
5. The fencing arena inside the hall designated for testing
6. A measuring tape to determine the legal distance between the player and the goal.
7. A special form to record the number of correct touches

The validity of the equipment used was verified before the start of the tests to ensure measurement accuracy, and the testing conditions were standardized for all members of the sample in terms of location, lighting, and timing.

## Exploratory Experiment

Before commencing the main experiment, the researcher conducted a pilot study on a sample of (5) third-year students from outside the main research sample, on a date preceding the actual implementation of the research.

The exploratory experiment aimed at the following:

1. Ensure that test instructions are clear to students.
2. Identify any difficulties the researcher may encounter during implementation.
3. Determine the time required for each test.
4. Verify the functionality of the equipment and tools used.
5. Train the support team on organizing the measurement process and recording the results.

The results of the pilot test showed that the tests could be carried out smoothly after making some minor adjustments related to the way the light signal was given and standardizing the readiness position before implementation.

Based on the findings of the pilot study, the final testing mechanism was established in preparation for the main trial.

## Main Experiment

After completing the pilot study and finalizing the testing mechanism, the researcher conducted the main experiment on a sample of 30 third-year students at the College of Physical Education and Sports Sciences, University of Baghdad, from April 15, 2025 to April 30, 2025, within the total research period.

The tests were conducted inside the college's fencing hall under the same spatial conditions in terms of lighting, distance, and playing surface. Students were divided into small groups to organize the process and ensure accurate measurements, with each student being tested individually.

Initially, the test steps and instructions were clearly explained to all students. They were then given short practice attempts to ensure their understanding of the performance. Following this, the time perception test was administered by having the student reproduce the specified time interval, and each student's results were recorded in a separate form.

After completing the temporal perception test, the student moved on to the offensive response speed test. In this test, the student stood in the official dueling readiness position, and upon the light signal appearing, immediately executed the offensive thrust. The time taken was measured and recorded. Each student was given three attempts in each test, and the arithmetic mean of the three attempts was used to represent their final score.

The researcher ensured uniformity in distance and posture for all members of the sample, and sufficient rest periods were provided between attempts to avoid the effect of fatigue on the results.

Thus, the data related to the research variables were collected in preparation for their statistical processing and analysis in the third chapter.

### Statistical Methods

In order to process the data obtained from the temporal perception and offensive response speed tests, the researcher used a set of statistical methods appropriate to the nature and objectives of the research, relying on the statistical software (SPSS).

The following methods were used

1. The arithmetic mean is used to determine the overall average score of the sample members in each variable.
2. Standard deviation is used to identify the extent to which scores are dispersed around the arithmetic mean.
3. Pearson's correlation coefficient reveals the strength and direction of the relationship between temporal perception accuracy and offensive response speed.
4. The statistical significance level is 0.05 for judging the significance of the results.

Pearson's correlation coefficient was chosen because the research variables are quantitative and measured at a cutoff level, and because the goal is to reveal the nature of the relationship between them, not to compare two groups.

The data was thus prepared for analysis, paving the way for the presentation and discussion of the results in Chapter Three.

## Chapter Four

### Presenting and Discussing the Results

#### Table Presentation

After completing the data collection and statistical processing, the results for the research variables were extracted and presented in tables showing the arithmetic means, standard deviations, and correlation coefficient between the two variables.

**Table 1.** The arithmetic mean and standard deviation of the two research variables are shown.

variable	arithmetic mean	standard deviation
Accuracy of temporal perception	0.14 seconds	0.05
Speed of offensive response	0.62 seconds	0.08

The table above shows that the mean time perception accuracy was 0.14 seconds with a standard deviation of 0.05,

while the mean offensive response speed was 0.62 seconds with a standard deviation of 0.08, indicating a relatively small variance among the sample in both variables.

**Table 2.** The correlation coefficient between temporal perception accuracy and offensive response speed.

The two variables	Correlation coefficient	Level of significance
Temporal perception × Response speed	-0.67	0.01

### Discussion of Tables and Results

The research results showed a significant inverse correlation between time perception accuracy and offensive response speed, with a correlation coefficient of -0.67 at a significance level of 0.01. This result indicates that the lower the student's time estimation error, the faster their offensive response, and vice versa.

This result can be explained by the fact that dueling relies heavily on choosing the right moment to launch an attack, which is linked to the player's ability to judge the time interval between their own movement and that of their opponent. A player with a more accurate sense of timing is better able to synchronize their movement with the appropriate timing, thus reducing hesitation and increasing the speed of execution.

Furthermore, reducing time estimation errors contributes to minimizing the delay between stimulus appearance and response, which directly impacts performance speed. This aligns with the kinesthetic concept that cognitive processes precede and prepare for motor execution; therefore, any improvement in cognitive abilities can positively influence skill performance.

These results confirm that performance in fencing depends not only on physical abilities but is also influenced by subtle cognitive factors such as time perception and response organization. Therefore, it can be argued that developing temporal awareness could be a significant approach to improving the speed of offensive response among third-year students.

This result also supports the research hypotheses that assumed a statistically significant relationship between the two variables, thus reinforcing the importance of focusing on cognitive aspects within training programs in fencing.

### Conclusions

In light of the findings, the following can be concluded.

1. Third-year students at the College of Physical Education and Sports Sciences, University of Baghdad, possess an acceptable level of temporal perception accuracy and offensive response speed.
2. There is a statistically significant inverse correlation between temporal perception accuracy and offensive response speed.

3. The lower the margin of error in estimating the time, the faster the offensive action is executed.
4. Temporal perception is a significant factor in explaining individual differences in the speed of offensive response among members of the sample.
5. Research confirms that performance in fencing is linked to cognitive factors in addition to physical and skill-based factors.

## Recommendations

In light of the conclusions reached, the researcher recommends the following:

1. The need to focus on developing temporal awareness among fencing students by introducing special training that relies on controlling timing and responding to visual signals.
2. Coaches should be directed not to focus solely on physical aspects, but also to pay attention to cognitive factors that contribute to improving performance speed.
3. Conducting similar studies on different age groups or on players of advanced levels to determine the nature of the relationship between the two variables at higher levels.
4. The possibility of expanding the scope of research in the future to study the relationship between temporal perception and other variables such as accuracy of attack or tactical decision-making.
5. Adopting the results of this research as a scientific indicator that can be used in developing educational curricula for the sport of fencing

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