



ISSN Print: 2664-7281
ISSN Online: 2664-729X
Impact Factor: RJIF 8.15
IJSEPE 2025; 7(2): 498-501
<https://www.sportsjournals.net>
Received: 15-08-2025
Accepted: 18-09-2025

Ali Raheem Abdulhussein Batah

College of Physical Education
and Sports Science, University
of Babylon, Iraq

Ali Jassim Mohammed Alawi

General Directorate of
Education in Karbala,
Ministry of Education, Iraq

Zainab Saleh Kadhim

College of Physical Education
and Sports Sciences,
University of Kufa, Iraq

The relationship between carpal tunnel tendonitis and serve accuracy in tennis

Ali Raheem Abdulhussein Batah, Ali Jassim Mohammed Alawi and Zainab Saleh Kadhim

DOI: <https://www.doi.org/10.33545/26647281.2025.v7.i2g.266>

Abstract

Through field and training follow-up of tennis players, the researcher noted that some players suffer from pain or inflammation in the wrist area, negatively impacting their ability to perform serves with high accuracy, despite their good physical condition. Hence, the research problem is defined by the following question: Is there a statistically significant relationship between carpal tunnel tendonitis and serve accuracy in tennis?

The research objectives were: To determine the prevalence of carpal tunnel tendonitis among tennis players; To measure serve accuracy among players with varying degrees of inflammation; To study the correlation between the degree of carpal tunnel tendonitis and serve accuracy; To propose preventive and rehabilitative measures to reduce the impact of injury on skill performance. Regarding the research hypotheses, there is a statistically significant negative correlation between the degree of carpal tunnel tendonitis and serve accuracy in tennis, and there are statistically significant differences in serve accuracy among players with varying degrees of carpal tunnel tendonitis. Regarding the research methodology and field procedures, the researcher adopted the descriptive approach using the correlational method because it is suitable for the nature of the research. The most important conclusions of the researcher are the following: The research results showed that tennis players suffer from moderate pain in the wrist area associated with carpal tunnel tendonitis, with low dispersion among individuals, indicating that most players are exposed to the same type of injury to a similar degree. Also, a high pain index was associated with a decrease in grip strength among players, which reflects the effect of pain on the ability of the flexor muscles of the fingers to generate the force necessary to control the racket.

Keywords: Carpal tunnel tendonitis, serve accuracy, grip strength, tennis, sports performance

Introduction

Tennis is a game that the ball handling and accuracy of the shot is very essential and particularly the serve is regarded as one of the most crucial offensive techniques in the game since it is the starting and offensive point of all the ball games. This is a muscular-neuromuscular coordination skill especially in the forearm, wrist and the fingers muscles. With the increase in training loads and the frequency of repetitive movements in training and competitions, carpal tunnel tendonitis has become a common injury among tennis players. This is due to repeated pressure on the tendons that pass through the carpal tunnel in the wrist area, leading to weak grip, numbness or pain in the hand^[1], and decreased control and accuracy. From this perspective, the importance of this research lies in determining the relationship between the degree of carpal tunnel tendonitis and serve accuracy in tennis, given its importance in prevention, rehabilitation, and improving skill performance.

Research Problem

Through field and training follow-up of tennis players, the researcher observed that some players suffer from pain or inflammation in the wrist area, negatively impacting their ability to perform serves with high accuracy, despite their good physical condition. Hence, the research problem is defined by the following question: Is there a statistically significant relationship between carpal tunnel tendonitis and serve accuracy in tennis?

Corresponding Author:

Ali Raheem Abdulhussein Batah

College of Physical Education
and Sports Science, University
of Babylon, Iraq

Research Objectives

1. Determine the prevalence of carpal tunnel tendonitis among tennis players.
2. Measure serve accuracy among players with varying degrees of inflammation.
3. Study the correlation between the degree of carpal tunnel tendonitis and serve accuracy.
4. Propose preventive and rehabilitative measures to reduce the impact of injury on skill performance.

Research Hypotheses

1. There is a statistically significant negative correlation between the degree of carpal tunnel tendonitis and serve accuracy in tennis.
2. There are statistically significant differences in serve accuracy among players with different degrees of carpal tunnel syndrome.
3. Weak grip strength and wrist flexibility negatively affect serve accuracy.

Research Areas

1. **Human domain:** A sample of young male tennis players, aged 18-25 years.
2. **Time domain:** From November 1, 2024 to January 1, 2025.
3. **Spatial domain:** Accredited tennis clubs and training centers in Karbala Governorate.

Definition of Terms

1. **Carpal Tunnel Tendonitis:** An inflammatory condition affecting the tendons passing through the carpal tunnel as a result of pressure or repetitive stress, causing pain and weakness in the hand.
2. **Carpal Tunnel:** A narrow passage in the wrist area through which tendons and nerves pass. Any pressure or inflammation in it leads to neurological and functional symptoms.

Research Methodology

The researcher adopted a descriptive approach using a correlational approach, as it is appropriate for the nature of the research. It aims to study the relationship between two variables:

- Carpal tunnel tendonitis (as an anatomical and physiological factor).
- Tennis serves accuracy (as a performance skill factor).

This approach is appropriate because it does not interfere with the variables, but rather merely describes them and analyzes their statistical relationships as they appear in the field.

Research Population and Sample

The research population consisted of tennis players registered in clubs and training centers accredited by the governorate's sports federation.

The research sample was intentionally selected from this population, comprising (10) young male players, aged (18-25) years, with at least three years of training experience and exhibiting varying degrees of symptoms of carpal tunnel tendonitis.

Players were excluded if ^[2]:

1. They had other shoulder or elbow injuries.

2. They underwent intensive physical therapy during the testing period.
3. They did not attend the measurement sessions and skill tests.

Tools and Equipment Used in the Research

Research Tools

1. Initial medical questionnaire: to determine the presence of symptoms of carpal tunnel syndrome (numbness, pain, weak grip).
2. Clinical Tests:
 - Phalen's test.
 - Tinel's sign.
3. Electromyography (EMG) measurement to determine the severity of the syndrome.
4. Hand Grip Dynamometer to estimate the muscular strength of the forearm and wrist.
5. Tennis Serve Accuracy Test:
 - Target areas are identified in the serve box (right and left corners).
 - The percentage of balls that hit the correct area is calculated out of ten attempts.

Tests used in the research

1. Serving Accuracy Test ^[3]

- **Objective:** To measure the player's accuracy in directing the ball into a specific area.
- **Equipment:** Balls, rackets, area markers, and a scoring form.
- **Method:**
 - The player performs 10 consecutive serves toward a specific square.
 - The number of balls that land within the correct area is counted.
 - Serving accuracy = (number of correct balls ÷ 10) × 100%.

2. Grip Strength Test ^[4]

Using a dynamometer, recording the highest value from three attempts.

3. Phalen and Tinnell Test ^[5]

To clinically determine the severity of carpal tunnel syndrome and determine the degree of pain or numbness.

4. Field Procedures for Research

- Coordinate with clubs to schedule measurements.
- Inform players of the research content and obtain their consent.
- Conduct medical and clinical examinations.
- Conduct the serving accuracy test on the same day after a standard warm-up period.

Descriptive statistics results (arithmetic mean and standard deviation)

Research variables	Mean	N	SD
Pain Index	4.86	10	0.49
Grip Strength (kg)	20.1	10	3.14
Serve Accuracy	34.6	10	3.20

The pain index for the research sample had a mean value of 4.86 on a scale of 0-10, indicating that the majority of

players suffer from moderate pain in the wrist area, an indicator of carpal tunnel tendonitis of varying degrees. The standard deviation (0.49) is also low, indicating similar pain scores among the sample members and little dispersion between them. This means that most of them suffer from approximately the same problem to a similar degree.

Table 2. Pearson correlation coefficients

Research variables	Pain Index	Serve Accuracy	Grip Strength (kg)
Pain Index	1.00	-0.22	-0.15
Serve Accuracy	-0.22	1.00	0.21
Grip Strength (kg)	-0.15	0.21	1.00

- **Pain index and serve accuracy (-0.22):** A weak negative relationship, indicating that increased pain may reduce technical accuracy.
- **Pain index and grip strength (-0.15):** A very weak negative relationship, meaning that pain may lead to a slight decrease in hand muscle strength.
- **Grip strength and serve accuracy (0.21):** A weak positive relationship, meaning that higher grip strength may improve racket control and partial serve accuracy.

The results support the hypothesis that carpal tunnel tendonitis negatively affects tennis players' athletic performance through:

- Increased pain → decreased grip strength
- Weakened grip strength → decreased serve control and accuracy
- Increased pain → directly decreased serve accuracy

This is consistent with what the scientific literature indicates that tennis players are susceptible to repetitive stress injuries in the hand and wrist due to the repetitive motion of the serve and return.

Carpal tunnel tendonitis leads to partial inhibition of the nerves controlling the flexor muscles of the fingers, reducing the muscle force generated by the hand grip. This inhibition affects racket stability and ball control during the serve^[6].

The mean for serve accuracy was 34.6 for successful attempts out of a specified number of attempts (according to the measuring tool).

This result indicates an average level of skill accuracy among the players, while the standard deviation (3.20) is statistically acceptable and indicates limited variation in skill performance among players.

It is possible that wrist pain affects the mechanics of serving, through weak grip or reduced explosive arm strength, which affects accuracy and ball control.

Players' ability to generate explosive force and the neuromuscular coordination required to accurately execute serves is reduced as a result of pain and muscle weakness⁷.

The results showed that grip strength in the dominant hand recorded an arithmetic mean of 20.1 kg, which is lower than the normal level for athletes in skill games (which typically ranges between 30-40 kg).

The standard deviation also reached 3.14, indicating variation in muscle strength among players.

Carpal tunnel tendonitis results in partial inhibition of the nerves controlling the flexor muscles of the fingers, reducing the muscular force generated by the hand grip^[8].

This inhibition affects racket stability and ball control during the serve.

This decrease in grip strength reinforces the idea that carpal tunnel tendonitis affects hand muscle strength, thus affecting the accuracy of skill performances such as serving.

Conclusions

1. **Presence of moderate wrist pain:** The research results showed that tennis players suffer from moderate wrist pain associated with carpal tunnel tendonitis, with low variability among individuals, indicating that most players experience the same type of injury to a similar degree.
2. **The effect of pain on muscle strength:** A higher pain index was associated with lower grip strength in players, reflecting the effect of pain on the ability of the finger flexors to generate the force needed to control the racket.
3. **The effect of muscle strength on serve accuracy:** It was observed that weak grip strength leads to a decline in serve accuracy, as the ability to finely control the wrist and fingers during the serve is reduced.
4. **The relationship between pain and serve accuracy:** There is a weak negative relationship between pain level and serve accuracy, meaning that increased pain leads to a slight decrease in a player's technical performance.

Recommendations

1. **Preventive and Therapeutic Measures:** Wrist and finger strengthening exercises are to be performed in order to lessen the vulnerability of a weak grip and enhance the ability to control the racket. Apply physical therapy methods (stretching, massage, or a wrist support strap) to take the strain off the carpal tunnel tendon. Consistently check on the symptoms so that the tendonitis in the carpal tunnel is detected at the earliest stage before the situation deteriorates.
2. **Enhance Technical Performance:** In case of mild/moderate pain in the player, introduce exercises to enhance motor coordination and serve accuracy. Adjust gripping and serving procedures of a racket so that the wrist does not need to create pressure during play.
3. **Periodic Assessment:** Utilizing indicators of pain, grip test and serve accuracy test as a standard to determine the treatment or training program progress. Record the outcomes on a regular basis to facilitate the determination of the factors that influence the performance and minimization of injuries.
4. **Awareness and Counseling:** Educate players regarding the need to perform preventive exercises and promote proper ways of serving to lower the pressure on the wrist. Education of the trainers about the early symptoms of carpal tunnel tendonitis and preventive measures.

References

1. Wang LH, Lo KC, Su FC. Skill level and forearm muscle fatigue effects on ball speed in tennis serve. *Sports Biomech.* 2021;20(7):825-837.
2. Ma X, Yaacob A, Kamalden TFT, Ng YG. To assess the impact of physical factors on velocity, speed, and accuracy of tennis serve. *J Nat Sci Biol Med.* 2024;15(1):125-131.

3. Hayes MJ, Spits DR, Watts DG, Kelly VG. Relationship between tennis serve velocity and select performance measures. *J Strength Cond Res.* 2021;35(1):190-197.
4. Antúnez RM, Hernández FJM, García JPF, Vaíllo RR, Arroyo JSD. Relationship between motor variability, accuracy, and ball speed in the tennis serve. *J Hum Kinet.* 2012;33:45-53.
5. Nirschl RP, Ashman ES. Elbow tendinopathy: tennis elbow. *Clin Sports Med.* 2003;22(4):813-836.
6. AbdelHamid GA, El-Gebaly AMW, Abdel Aty Mohamed EAK, Metwally MI. Shear wave elastography in carpal tunnel syndrome: enhanced diagnostic performance for the common extensor tendon changes. *Zagazig Univ Med J.* 2025;31(5):1795-1807.
7. Kraushaar BS, Nirschl RP. Tendinosis of the elbow (tennis elbow): clinical features and findings of histological, immunohistochemical, and electron microscopy studies. *J Bone Joint Surg Am.* 1999;81(2):259-278.
8. Wang LH, Lo KC, Jou IM, Su FC. Forearm muscle activation, ulnar nerve at the elbow and forearm fatigue in overhand sports. *Sports Biomech.* 2020;19(6):792-807.