



Analytical Study of The Physical and Cognitive Skills of Tennis Referees From The Perspective of The Supervising Committee

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Abstract

This study aimed to identify the effect of special exercises using weighted balls of varying masses and elastic resistance bands in futsal on perceptual abilities specifically the Nelson test of motor response (right and left) and perceptual motor coordination among players of the Baghdad Education (Al-Karkh II) team aged 15–16 years. The study was motivated by the observed weakness in perceptual abilities among players in the inter education directorates league. The researcher adopted an experimental approach using a pre-test/post-test design with two groups (experimental and control). The research population consisted of 60 players from six Baghdad Education Directorates while the study sample included 10 players representing 17% of the total population. The main experiment was conducted at the Al-Bayaa Youth Forum field to the Baghdad Provincial Council from 8/6/2025 to 3/8/2025 with three training units per week . The results indicated statistically significant differences between the pre- and post-tests in favor of the post-test demonstrating the effectiveness of using varied weighted balls and elastic resistance bands and their positive impact on developing perceptual abilities when incorporated into educational or training programs .

Keywords: skills, physical, cognitive, tennis referees, supervisory committee

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Introduction

Tennis is an individual sport that require a high level of accuracy in refereeing decisions due to the ball's high speed and constant changes in direction during play. The International Tennis Federation (ITF) noted that the nature of tennis matches requires referees to have a high level of observation, focus and the ability to make timely decisions (International Tennis Federation, 2022). Wissam Mohammed and Firas Mutashar (2020, p. 2) explained that some referees suffer from physical fitness issues and slow reaction times, which directly impacts their refereeing performance during matches. Sundus Musa Jawad (2020, p. 8) indicated that modern management in the field of refereeing contributes to understanding referees' feelings, needs and problems and addressing them fairly and objectively which helps enhance overall performance in sports competitions. Mohammed Nasr Al-Din Radwan (2016) emphasized that physical and cognitive skills are crucial factors that help referees choose the appropriate viewing angle and positioning, contributing to competitive fairness and reducing the likelihood of refereeing errors.

In this context Ali Kadhim Muslim (2024) indicated that developing the cognitive abilities of tennis referees contributes to raising the level of refereeing performance and decreasing role conflicts during match management through targeted training programs that focus on enhancing the cognitive aspects related to decision-making. Ahmed A. Mohamed (2025) also demonstrated that neuromuscular training contributes to improving the speed of motor response which is an important requirement associate to the referee's efficiency in following the fast-paced action on the tennis court. Hence the research problem arose from the observations of researcher Shahd Khalid, a second-grade national referee trained at the Iraqi Tennis Federation. She noted a disparity in the precision of refereeing decisions among referees which may be assigned to weak physical and cognitive fitness during match management. Regarding physical and cognitive skills: Physical and cognitive skills represent a set of abilities that integrate motor efficiency and the mental capacity to perceive surrounding situations quickly and accurately. These skills include speed of movement, balance, neuromuscular coordination and attention to various stimuli, which helps the individual to make an appropriate response at the right time (Schmidt, 2011, p. 118). Hence, the research problem arose. Research Problem: Despite the development of tennis, refereeing performance still suffers from inconsistencies in decision-making accuracy among referees, which can affect the fairness of competition. This is attributed to differences in their physical and cognitive skill levels which are essential for a referee to successfully follow the flow of play and make the right decision at the right time. Hence the research problem lies in the lack of clarity regarding the level of these skills among tennis referees in Iraq from the perspective of the supervising committee (Schmidt, 2011, p. 118).

Method and tools

The research implemented the descriptive approach using the survey method as it is one of the most suitable methods for studying the physical and cognitive skills of referees and showing the nature of the relationship between them and the level of refereeing performance.

Research community: The research community included all tennis referees in Baghdad for the (2025–2026) season.

The research community was identified as (60) tennis referees in Iraq and the research sample was selected from within this same community using a simple random method. They were directly included in the study without creating a new community or changing it in order to ensure accurate representation and objective results.

The sample was distributed as follows

- A survey sample of (9) judges representing (15%)
- The application sample consisted of (51) judges after excluding the pilot sample from the original population.

It is important to observe that the evaluation of the scale items did not depend on the referees' own responses but rather on the assessments of the specialized refereeing committee. This ensured objectivity and accuracy in judging performance levels as the committee possesses the technical expertise and specialized knowledge to evaluate referees during matches. Therefore the data collected indicates the perspective of the supervising committee not the referees' self-assessment thus improving the reliability of the findings and reducing bias in responses. Research Instrument: In this research the researchers relied on a physical and cognitive skills scale enhanced by researcher Shahd Khaled (an analytical study of the physical and cognitive abilities of tennis referees from the perspective of the supervising committee). The scale consists of eight items designed to assess the referees' skill levels. A five-point Likert scale was used to answer the items: (1 = Very weak, 2 = Weak, 3 = Average, 4 = Good, 5 = Excellent). This scale was chosen for its suitability to the nature of the research as it directly measures the physical and cognitive aspects related to refereeing performance. Validity and Reliability: The researchers relied on the physical and cognitive skills scale developed by researcher Shahd Khaled. The instrument's validity was by presenting it to a group of fifteen experts specializing in refereeing and physical education to assess the confirmed suitability and clarity of the items. The instrument's reliability was verified using Cronbach's alpha coefficient which yielded a value of 0.87 indicating a high degree of

reliability. The scale has a good degree of reliability that can be depended upon in field application.

The pilot test

The scale was conducted to a pilot sample consisting of (9) judges in order to ensure the clarity of the items and the ease of answering them and no significant obstacles appeared which indicates the suitability of the tool for application.

Main experiment

The scale was applied to the main research sample of (51) judges and after collecting the forms the data were extracted and statistically processed using the Statistical Package (SPSS) to extract the results.

Table1. *Show the research population and its samples*

NO.	Expert	Population	Pilot sample	Study sample
1	Baghdad	25	9	16
2	Najaf	9	—	9
3	Karbala	10	—	10
4	Dohuk	8	—	8
5	sulaymaniyah	8	—	8
Total	5	60	9	51
percentage		%100	%15	%85

The accuracy of the instrument was confirmed by presenting it to a panel of fifteen experts specializing in arbitration and physical education. Their task was to evaluate the clarity of the statements and their suitability for measuring physical and cognitive skills. All their comments were incorporated, and the statements were modified accordingly. To ensure the instrument's reliability, Cronbach's alpha coefficient was used yielding a value of 0.87 indicating good reliability for the study. An expert opinion form was also used to determine the clarity and validity of the statements, further enhancing the scale's reliability. Subsequently the scale was broken down into its primary components, with each component representing a specific axis. Eight statements were formulated and presented to the experts to confirm their suitability for measuring the scale's intended purpose. All statements aligned with the experts' recommendations and demonstrated their validity for measurement, as the chi-square (χ^2) value was calculated for each statement. The instrument underwent a pilot phase during which

it was administered to nine judges to ensure the clarity and ease of answering the statements. No difficulties were observed in understanding or completing the form. After minor adjustments based on expert feedback the scale was adopted. The implementation phase involved administering the scale to the main sample of sixty judges. The completed forms were collected after verifying their accuracy and completeness. The data were then entered into SPSS version 24 for analysis and results extraction. The discriminatory power of the statements was analyzed using the two-groups approach. The sample scores were ranked in descending order from highest to lowest. The top 30% and bottom 30% of the forms were then selected to form two groups with maximum differentiation. The discrimination coefficient for each statement was calculated using the independent samples test with the significance level considered an indicator of the statements' discriminatory power. The statistical kit was also used to calculate the arithmetic means and standard deviations for each element of the scale to test the difference between the arithmetic mean and the hypothetical mean using the F-test, to calculate the simple correlation coefficient between physical and cognitive abilities and the level of referees' performance, in addition to using the F-test to assess the quality of the linear regression model.

Table2. *show the discriminatory power of the physical and cognitive skills scale*

Item no.	Upper group		Lower group		Calculated (t)	(sig.)value	result
	سن	ع	سن	ع			
1	4,17	0,585	2,13	0,653	16,062	0,001	significant
2	4,26	0,554	2,11	0,727	16,165	0,000	significant
3	3,91	0,992	2,23	0,695	9,545	0,000	significant
4	4,66	0,879	2,17	0,657	15,562	0,000	significant
5	4,08	0,674	2,44	0,474	13,666	0,000	significant
6	3,96	0,887	2,23	0,442	12,013	0,000	significant
7	3,88	0,682	2,31	0,444	13,305	0,000	significant
8	4,21	0,824	2,36	0,472	13,405	0,000	significant

*Significant at sig**0,05** ≥

Results

To achieve the aim of identifying the centering and mechanism of the ruling the arithmetic mean, standard deviation, hypothetical mean and skewness values were used for the variables as represent in Table (3).

Table 3. *Shows the Arithmetic Means, Standard Deviations and Skewness Coefficients of the Studied Variables*

Variables	Arithmetic means	Mean	Standard Deviation	Skewness Coefficients
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	32,36	32	2,905	0,371
physical and cognitive skills scale.				

Table4. Shows the Calculated *t*-values for the Significance of Differences Between the Arithmetic Means and the Hypothetical Means of the Studied Variables

variables	mean	Standard deviation	Hypothetical mean	Calculated -t-value	Sig	significance
physical and cognitive skills scale.	32,36	2,905	24	22,293	0,000	Significant

Significant at sig0.05 $\geq$

Table5. Shows the Pearson Correlation Coefficients and the Estimated Effect of Physical and Cognitive Skills on Tennis Referees

Independent variable	Independent variable	Pearson correlation coefficient	Linear regression coefficient	Contribution percentage	standard error
physical and cognitive skills scale	Tennis referees	0,672	0.451	0,450	0,128

Table6. Shows the Results of the *F*-test for Evaluating the Goodness of Fit of the Linear Regression Model for the Physical and Cognitive Skills Variable among Tennis

Independent variable	Independent variable	constant	Sum of squares	Degrees of freedom	Mean square	Calculated -f-value	Sig	significance
physical and cognitive skills scale	Tennis referees	Regression	61,462	1	61,462	102,436	0.000	Significant
		Errors	34,806	58	0.600			

* Significant at sig 0.05 $\geq$

Table 7. Shows the Estimates of the Constant and the Slope (Effect) of the Physical and Cognitive Skills Results among Tennis Referees

variable	variables	Beta (B)	Standard errors	Calculated -t-value	sig	significance
Tennis referees	Estimates of the Constant	0.572	0,013	8.959	0.000	Significant
Physical and Cognitive Skills	0.819	0.161	12.253	0.000	Significant	Physical and Cognitive Skills

Discussion

Table (3) shows that the arithmetic means, standard deviations and skewness coefficients for the physical and cognitive skills variable demonstrate a good degree of homogeneity among the sample members. The arithmetic mean (32.36) is close to the median (32) indicating a balanced allocation of data and the lack of significant deviations in the responses of the sample members.

This reveals the fact that the referees possess similar levels of these skills indicating that these skills are crucial and indispensable neediest for the job. This findings can be explained in light of what Schmidt (2011) indicated namely that physical and cognitive skills are an integration of motor performance and mental processes officiating requires speed of movement synchronized with accurate perspective of the situation, and this can only be attained through a similar level of these skills among the referees. This homogeneity also reflects the nature of the preparation and training that the referees undergo which aims to improve a minimum appropriate level of competence in them. The results in Table (4) showed statistically important differences between the arithmetic mean and the hypothetical mean favoring the arithmetic mean. This indicates that the participants exhibited a higher-than-average level of physical and cognitive skills a positive indicator reflecting the referees' effectiveness in performing their tasks.

This result can be clarified by the nature of tennis matches, which requirements rapid decision-making do to the ball's high speed and constant alterations in direction. This requires that the referee possess high levels of focus, attention and quick response. This result is also connected to analytical skills allowing the referee to quickly analyze the refereeing situation and select the appropriate decision. The referee does not depend on solely on visual remark but also on interpreting the situation and understanding its dimensions. This aligns with Koontz & Weihrich (2010), who noted that analytical skills promote to making decisions draw

on logical and scientific principles. concerning the results in Table (5), they demonstrated a clear positive correlation between physical and cognitive skills and the performance level of tennis referees with a correlation coefficient of 0.672, reflecting the strong relationship between the two variables This demonstrates that a higher level of these skills among referees directly leads to develop officiating performance This relationship can be explained by the fact that a referee with good positioning and mechanics skills is better able to choose the suitable position on the court giving them a obvious view of the game and thus enabling them to make accurate decisions This is verified by the FIBA (2022) guidelines on the significance of proper positioning in enhancing decision accuracy This result is also linked to leadership skills, as the referee plays a leadership role during a game managing players and controlling the flow of play This needs self-confidence and the capacity to make crucial decisions. As noted by Mohammed Hassan Alawi (2002), leadership contributes to guiding behavior and achieving discipline within sports competitions. The results in Table 4 showed that the linear regression model was important indicating that physical and cognitive skills have a real impact on the level of referee performance This can be explained by the fact that these skills do not operate in isolation but rather are integrated with a range of other elements such as psychological and social aspects A referee needs to control their emotions and cope with psychological pressure during a match particularly in sensitive situations that require decisive decisions. Silva (1984) pointed out that psychological balance is a fundamental factor in successful athletic performance This result is also connected to emotional intelligence as a referee who possesses the ability to control their own emotions and understand the emotions of others is better equipped to handle stressful situations and make balanced decisions. Goleman (1995) indicated that emotional intelligence contributes to improved performance in situations that demand emotional control.

The contribution rate of 45% indicates that physical and cognitive skills are an important element in explaining the variation in referee performance levels but they are not the only factor. Other factors influence performance such as the legal domain, which included the referee's knowledge of the laws and regulations of the game enabling them to apply them correctly during a match (ITF, 2023). This finding can also be explained in light of the perspective of continuous improvement, as maintaining a high level of performance requires the referee to continue training and updating their skills to keep pace with the latest developments in the game, as noted by Hassan Ali.(2011) that continuous improvement contributes to improving professional efficiency and raising the level of performance. As for the results of Table (5)it demonstrate a direct and strong effect of physical and cognitive skills on the performance of referees as the value of the slope coefficient reached (0.819) which is a high value indicating that any improvement in these skills is reflected positively and

significantly on the level of performance This reflects that these skills are among the basic pillars on which the referee depends in managing the match as they help him to make the correct decision move around the field efficiently keep up with the speed of play as well as his ability to deal with the different situations that may occur during the match.

The researchers believe that these results confirm that physical and cognitive skills are not merely secondary requirements but rather show the true foundation for successful refereeing performance Those who possess these skills are better equipped to achieve fair refereeing, reduce errors and raise the overall quality of performance within the system.

Sports competitions. The researchers also explained that these skills demonstrate a practical application of general abilities as they appear clearly in actual performance situations within the match which justifies the use of the term (skills) in this research, as it reflects the practical aspect of refereeing performance more accurately.

Conclusions

1. There is a statistically importance effect of physical and cognitive abilities in improving the accuracy of refereeing performance among tennis umpires.
2. Most of the umpires in the sample possess a moderate to better level of physical and cognitive skills.
3. There is a positive relationship between possessing physical and cognitive skills and the development of umpires' performance.
4. Physical and cognitive skills contribute 45% to explaining the variance in the level of umpires' performance.
5. The results explain the importance of continuous training in enhancing these skills among umpires.

Appendix (2)

No.	Items	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1	The referee possesses the physical fitness to maintain high concentration throughout the match					
2	. The referee moves quickly and efficiently to reach the correct position in a timely manner.					
3	The referee has good balance while moving which helps them make accurate decisions.					
4	The referee demonstrates physical endurance during long or demanding matches.					



- 5 The referee has adequate reaction time to handle unexpected situations during the match.
- 6 The referee possesses excellent visual perception enabling them to track the ball with high accuracy.
- 7 The referee can focus and pay attention to minute details despite having multiple tasks during the match.
- 8 The referee demonstrates high coordination between their visual and physical movements when making decisions.

Physical and cognitive skills scale

Appendix (2)

Name of experts to whom the items were presented for evaluation

University of Diyala, Administration and Organization	College of Basic Education	Prof. Dr. Mohammed Fadel	1
Sports Management	College of Physical Education and Sports Sciences for woman	Prof. Dr. Suhair Mutab Munaf	2
Measurement Tests / Tennis	College of Physical Education and Sports Sciences for woman	Prof. Dr. Warda Ali Abbas	3
Sports Management	College of Physical Education and Sports Sciences / University of Al-Muthanna	Prof. Dr. Khalid Aswada	4
Sports Management	College of Physical Education and Sports Sciences / University of Diyala	Prof. Dr. Othman Mohammed Shahada	5
Sports Training / Racket Games	College of Physical Education and Sports Sciences / University of Al-Qadisiyah	Prof. Dr. Alaa Abdul Wahab	6
Sports Management	College of Physical Education and Sports Sciences for woman	Prof. Dr. Ali Abdul Latif	7
Sports Management	College of Physical Education and Sports Sciences for woman	Prof. Dr. Salah Wahab	8
Training Physiology / Racket Games	College of Physical Education and Sports Sciences for woman	Prof. Dr. Abeer Hatam	9
Sports Management	College of Physical Education and Sports Sciences for woman	Dr. Basim Sami Suhaid	10
Sports Management	College of Physical Education and Sports Sciences for woman	Assistant Professor Dr. Nibal Karim Abdullah	11



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Sports Management	College of Physical Education and Sports Sciences for woman	Assistant Professor Dr. Muhammad Qusay Muhammad	12
Motor Learning/Racket Games	College of Physical Education and Sports Sciences, University of Baghdad, Al-Jadriya	Assistant Professor Dr. Ali Makki	13
Psychology/Racket Games	College of Physical Education and Sports Sciences for woman	Dr. Nazik Subhi Matar	14
Motor Learning/Racket Games	College of Physical Education and Sports Sciences for woman	Dr. Muhammad Hassan Halil	15



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