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The role of motor awareness and coordination in predicting the performance level of the forehand and backhand skills in tennis for female students

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Abstract

Artistic tennis is a sport that requires high motor coordination and sensory perception to perform the required motor skills. Given the diversity of motor skills in tennis, coordination plays a crucial role in fulfilling the requirements of technical performance and improving the required skill level. Kinesthetic perception is an important factor for athletes in their motor performance, and it is even more important in performing the skills of artistic tennis. All learners possess motor awareness abilities, but to varying degrees, expanding or contracting according to their natural aptitudes on the one hand, and individual differences on the other. The research problem involved identifying the reason for the weak performance level of third-year female students in the College of Physical Education and Sports Sciences in tennis skills. The study aimed to identify the role of motor awareness and coordination in predicting the performance level of the forehand and backhand skills in tennis for female students. The researchers hypothesized a statistically significant correlation between motor awareness and coordination with the performance level of the forehand and backhand skills in tennis for female students.

The researchers used a descriptive approach with correlational analysis. The research population consisted of 52 third-year female students from the College of Physical Education and Sports Sciences at Kirkuk University during the 2025-2026 academic year. The research sample, consisting of 40 students (77% of the original population after excluding absent students and the pilot sample), was randomly selected by lottery. The statistical methods used included percentages, mean, standard deviation, skewness, and correlation coefficient. The researchers concluded that motor coordination plays a significant role in improving the skill performance of forehand and backhand skills in tennis. They also found that motor awareness plays a significant role in enhancing the skill performance of technical tennis skills.

In light of the conclusions, the researchers recommended building an educational curriculum to develop coordination and motor awareness in order to raise the level of female students in tennis, and conducting similar research on other physical or motor qualities to identify strengths and weaknesses in the level of student performance, and emphasizing the development of physical and motor qualities to raise the level of skill and motor performance.

Keywords:

motor awareness, coordination, forehand and backhand, tennis.

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1- Introduction to the Research.

1-1 Introduction and Importance of the Research.

The scientific and technological advancements that have occurred in all aspects of life, particularly in education, and the use of learning and teaching methods, as well as the acquisition of experience and information in various sports skills and activities, have led to a common initial approach in teaching and practicing sports and games for beginners. This approach involves a gradual progression of learning motor skills, moving from easy to difficult and from simple to complex. This is achieved through explanation and demonstration of the skill's characteristics, along with repeated attempts to increase the acquisition of the required proficiency for an acceptable level of performance. This process, after gaining diverse experience in performance, qualifies them to move to the stage of implementing it realistically through play and competition. Researchers, experts, and specialists in learning and instructional design are continuously searching for the best methods of utilizing technology in learning, as well as selecting appropriate educational tools for learning motor skills, organizing exercises, providing feedback, and understanding all the requirements of the educational environment in order to achieve the goal of effective learning.

Motor awareness and coordination are crucial for developing artistic tennis skills. Artistic tennis movements require both motor coordination and motor awareness to execute the necessary skills. The learning process has evolved significantly in the modern era, relying on various motor learning methods that have had a clear and prominent impact on helping learners reach their full potential. These methods have become so important that they serve as a fundamental basis for planning the learning of different motor skills. For motor learning to be successful, attention must be paid to learners' cognitive and motor abilities, helping them unleash their potential so that it can be refined and developed, preventing its loss over time. Learners need to learn about their surroundings to demonstrate their physical, motor, and mental capabilities and achieve optimal performance. Tennis is a significant sport due to its numerous benefits, including the development of physical and motor skills, mental abilities, and an appreciation for aesthetics.

Artistic tennis is one of the sports that requires motor coordination and high sensory perception to perform the required motor task. Given the diversity of motor skills in tennis, coordination plays an important role in fulfilling the requirements of technical performance and raising the level of the required skills. Motor awareness is an important factor for the athlete in his motor performance and is more important in performing the skills of artistic tennis. Motor perceptual abilities are present in all learners but to varying degrees that expand or contract according to their natural predispositions on the one hand, and individual differences on the other hand. Motor perceptual abilities are capable of development and improvement through learning and practice. Since the high level of motor perception qualifies the individual to perform motor skills with high accuracy; Therefore, motor awareness is what provides us with important information regarding the body’s position in space and the relationship of its parts. Therefore, coordination and motor awareness are among the qualities that must be available during the performance of artistic tennis skills. Herein lies the importance of research in studying coordination and motor awareness and

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their relationship to the level of skill performance in artistic tennis for third-year students at the College of Physical Education and Sports Sciences / Kirkuk University.

1-2 Research Problem

As researchers interested in and following the sport of tennis, they observed skill and physical problems faced by female students during tennis lessons. Among these problems is a weakness in the students' performance level in applying technical tennis skills, as well as a lack of use of teaching aids, relying instead on the traditional method of learning the skill. Therefore, the researchers decided to study coordination and motor awareness and their relationship to the performance level of technical tennis skills among third-year female students in the College of Physical Education and Sports Sciences. This requires decisiveness and firmness in determining the required performance, which is one of the important abilities that must be studied and analyzed to clarify its reality and concept based on the needs and characteristics of the learners. Interacting with this leads to achieving the desired goals of the educational process and providing learners with experiences and knowledge specific to the game of tennis, and developing motor skills to be more productive, especially when learning some basic tennis skills for female students.

1-3 Research Objective:

- To identify the relationship between motor awareness and coordination with the level of technical performance in tennis among the female students in the research sample.

1-4 Research Hypothesis:

- There is a statistically significant correlation between motor awareness and coordination with the level of technical performance in tennis among the female students in the research sample.

3- Research Methodology and Field Procedures

3-1 Research Methodology:

The researchers used the descriptive method with correlational analysis, as it was suitable for the nature of the research problem.

3-2 Research Population and Sample:

The research population was selected from third-year female students at the College of Physical Education and Sports Sciences, Kirkuk University, for the 2025-2026 academic year, morning program, totaling (52) students. The research sample consisted of (40) students from Section (C), after excluding (4) students from the pilot study, (2) students who failed, and (6) absent students. This sample constituted (77%) of the original population.

3-3 Tests Used in the Research:

3-3-1 Numbered Circles Test (1, 1978, p. 426)

Purpose of the Test: To measure leg-eye coordination.

Equipment: A stopwatch. Eight circles, each with a diameter of sixty (60) centimeters, are drawn on the ground and numbered as shown in Figure (1).

Figure (1) Performance Specifications: The subject stands inside circle number (1). Upon hearing the start signal, the subject jumps with both feet together to circle number (2), then

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to circle number (3), then circle number (4), and finally circle number (8), at maximum speed.

Recording: The time taken by the subject to move through the eight circles is recorded.

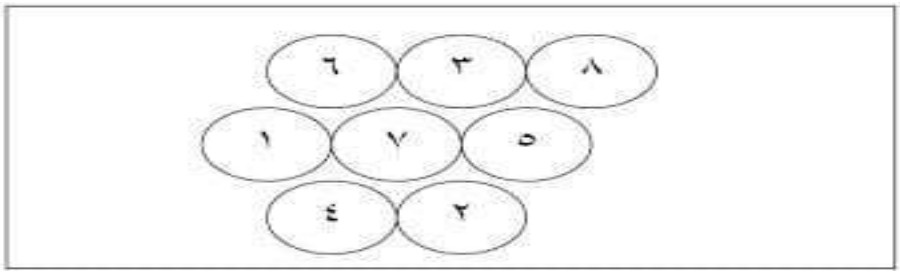

Figure (1) Numbered Circles Test

3-3-2 Kinesthetic awareness Test (1, 1999, 212)

Purpose of the test:

- To measure the ability to perceive the distance of a forward jump.
- Method of performance: This is done by traversing a specified distance forward without using the sense of sight. Achieving the required distance indicates a high level of perception of the forward jump distance. The distance beyond the line marking the required distance is considered an error in estimation; a decrease in this error indicates a high level of perception of the forward jump distance, while an increase indicates a lack of perception of this distance.
- Equipment: Measuring tape – Blindfold – Chalk – Marking tape.
- Test specifications:
- Two lines are drawn on the ground with a distance of 24 inches (58.81 cm) between them.
- The athlete stands at the starting line.
- The required distance for the forward jump is visualized.
- The blindfold is placed over the eyes, and a five-second wait is observed. - Jump from the starting line, attempting to touch the ground with both heels at the finish line.
- Two jump attempts are allowed.
- Scoring: - The distance jumped between the lines is recorded to the nearest quarter inch (0.61 cm).
- The total of the two attempts is calculated at the end.

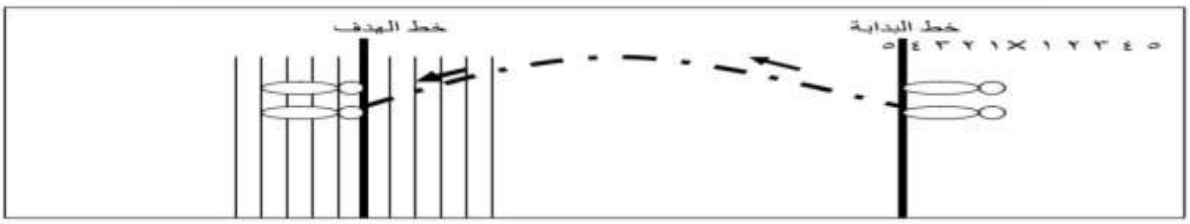

Figure (2) Kinesthetic awareness Test

3-3-3 Hewitt Test of Forehand and Backhand skills (Al-Kazemi, 2000, p. 64):

Test Name: Test of Forehand and Backhand skills

Test Objective: To measure the accuracy of forehand and backhand skills.

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Test Description:

This test is conducted on a standard tennis court. Rackets, 30 tennis balls, a scoring form, and a rope are provided, as shown in the figure, illustrating the test-taker's positioning, the test procedure, and the scoring system.

A rope is attached to two posts at the top and bottom of the net, parallel to the net, at a height of 7 feet from the ground and 4 feet from the net, as shown in the figure.

Three parallel lines are drawn between the service line and the baseline, with a distance of 4.5 feet between the lines. The player stands at the center mark, located at the midpoint of the baseline, and is given five practice attempts to assess their performance. Following instructions from the instructor, the ball must be thrown directly over the service line using a pitcher, if available, or by the instructor. The player then attempts to return the ball with their racket using either a forehand or backhand skills. Each player is allotted ten attempts for the forehand skill and ten for the backhand skill. The player's score is the sum of the points earned from these ten attempts. The ball must pass over the net and under the rope. The player receives progressively higher scores from 1 to 5. If the ball passes over the rope, it is worth half the score for the correct area it lands on. The maximum score is 50.

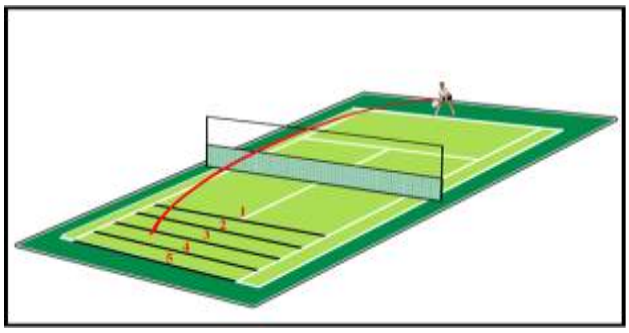

Figure (3) Hewitt Test of Forehand and Backhand skills

3-4 Pilot Study

A pilot study was conducted on the research tests with a sample of (6) third-year female students from the College of Physical Education and Sports Sciences on Sunday, February 22, 2026.

The pilot study aimed to:

1- Determine the time required to implement the educational unit.

2- Assess the suitability of the equipment and tools used in the research.

3- Identify the conditions under which the tests were administered and any associated difficulties in order to address them during the actual research test.

4- Verify the competence of the support team in performing their duties during the testing process.

3-5 The Scientific Basis of Tests.

The purpose of conducting tests is simply to help us evaluate performance and obtain accurate results that enable researchers to make judgments and then take appropriate decisions. These tests must possess high levels of validity, reliability, and objectivity. Therefore, the researchers established the scientific basis for the selected tests, as follows:

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3.5.1 Test Validity:

This is defined as "the degree to which a test measures what it is intended to measure." (1, 2001, p. 64) In other words, a valid test measures the function it was designed to measure and does not measure anything else instead or in addition to it. (2, 2000, p. 287) Researchers have used self-validity.

3.5.2 Test Reliability:

Reliability means that if the test is administered again to the same individuals, it will give the same or similar results. It also means that the test results are consistent with each other if repeated multiple times. (1, 1999, 70) The researchers used the test-retest method, as the tests were applied to the sample of the pilot experiment, which consisted of (6) female students, on Sunday, 2/22/2026, and the same tests were repeated after seven days on Sunday, 3/1/2026, as the results of the tests proved that they have a high degree of reliability, as shown in Table (1).

Table (1) shows the reliability and validity of the tests

Abilities	Unit of measurement	Correlation coefficient	Significance	self-validity
Kinesthetic awareness Test	cm	0.498	Not sig	0.710
Coordination test	sec	0.862	Not sig	0.92

3-5-3 Test Objectivity.

Objectivity is one of the important conditions that must be met in any test. It means that the subjective judgments of the tester are not influenced, or that objectivity is present without bias or subjective intervention by the tester. The greater the degree of subjectivity in the test judgments, the less objective they are, and the less subjectivity is influenced by the judgments, the greater their objective value. (2, 1993, 225)

3-6 Field Research Procedures

3-6-1 Kinesthetic Awareness and Coordination Test:

The researchers conducted the kinesthetic awareness and coordination test on Tuesday, March 3, 2026, for section (A). Each student was given two attempts at each test, and the best attempt was selected

3-6-2 Skill Performance Tests:

The skill tests in tennis were conducted on Wednesday, March 4, 2026, for third-year female students. The motor exercises consist of a set of skills from the curriculum of the College of Physical Education / third year. These are optional exercises that include the curriculum skills and are linked optionally by the students to the tennis material, which includes the skills of serving, forehand and backhand skills, the smash, the forehand and backhand volley, and the breaker.

3-6-3 Performance Evaluation:

After conducting the skills tests and recording them on video, the performance was reviewed by (4) expert evaluators to assess the movements using a specific evaluation form.

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The evaluation was based on the performance of each of the tested movements and was conducted using a scoring system for the selected skills. The evaluation score was set on a range of (0-10) points per skill. Direct observation was not used; rather, the evaluation was based on the recorded performance in the video. The final score was calculated by excluding the highest and lowest scores and using the arithmetic mean of the two middle scores. (1, 2001, 1)

3-7 Statistical Methods:

The researchers used the Statistical Package for the Social Sciences (SPSS). The formulas used are:

1- Percentage.
2- Arithmetic Mean.
3- Standard Deviation.
4- Skewness Coefficient.
5- Correlation Coefficient.
4- Presenting, analyzing, and discussing the results.
4-1 Presenting the statistical description of the research variables.

Table (2) shows the arithmetic means, standard deviations, and skewness coefficient for the research sample variables.

Variables	Mean	Standard Deviation	Skewness Coefficient	Lowest value	Highest value
forehand	**7.12**	**1.52**	**0.081**	**3**	**9**
backhand	**7.20**	**1.46**	**0.078**	**3**	**8**
Coordination	**8.12**	**10.80**	**0.973**	**4.10**	**13**
Kinesthetic awareness	**2.67**	**2**	**0.069**	**2**	**15**

4-2 Presenting, analyzing, and discussing the inter-variable correlation coefficients for the research variables.

Table (3) shows the correlation coefficients for the coordination and kinesthetic awareness tests and their relationship to the performance level of tennis skills.

Variables	Coordination			Kinesthetic awareness		
	correlation coefficients	true significance	result	correlation coefficients	true significance	result
forehand	0.059	0.419	Not sig	0.061	0.071	Not sig
backhand	0.063	0.512	Not sig	0.065	0.078	Not sig

From the table above regarding the study of the correlation relationship between motor coordination and the tennis skills under investigation, we note that the values of the correlation coefficient for coordination tests with the skill performance level tests for the forehand and backhand skills were, respectively: (0.059, 0.063). In order to identify the reality of the correlation, the true significance of the correlations for the two skills was compared, as it was, respectively, (0.419, 0.512) with a significance level of (0.05) and a

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degree of freedom of (38), which indicates that it has no significant differences, because the true significance value is greater than the significance level of (0.05). Similarly, from Table (3), we observe that the correlation coefficients for the kinesthetic awareness test and the skill performance level for the forehand and backhand skills were (0.061, 0.065), respectively. When comparing the true significance of the two skills in tennis, which is (0.071, 0.078), with the significance level of (0.05), we find that it is greater than the significance level, meaning that the correlation is not significant. From the above, we find that all correlational relationships between the motor tests and the motor exercises for the two skills are not significant. This means that the motor exercises require a high degree of coordination and kinesthetic awareness. This is also attributed to the students' poor physical fitness, which has led to their low performance level. This necessitates attention to this problem by those in charge and an emphasis on revising the admission process for female students in the College of Physical Education and Sports Sciences. On the other hand, it is essential to emphasize the development of coordination and kinesthetic awareness, which will lead to an improvement in the skill performance level for the exercises. The motor skills of the two skills. Researchers see the need to prepare an educational curriculum for female students that includes special exercises that focus on developing perceptual-motor abilities, as well as providing a suitable environment that helps female students develop their physical, motor, and perceptual abilities, since "providing suitable environmental conditions and active movement helps in dealing with large amounts of information and processing it, and then acquiring the experiences necessary for the growth of perceptual-motor skills."

The use of diverse teaching aids proved effective in achieving optimal performance accuracy. The improvement in skills led to enhanced performance precision, as most exercises in the curriculum incorporated this characteristic. These exercises primarily involved playing the ball in specific directions and at varying distances. The research findings also align with the study by Haitham Mahmoud (2002, p. 123), which indicated that the use of scientifically sound educational programs, particularly those employing training aids, resulted in a statistically significant improvement in accuracy. Furthermore, the proper preparation of exercises, their timing, and the provision of necessary resources all contributed to increased learning potential.

As Nahida (2002, p. 13) points out, a skill that is not easy, has specific characteristics, and is performed from different locations and with different movements, requires diverse practical exercises and different teaching methods to perform repetitions from multiple locations and utilize the necessary learning competencies. Thus, we observe the superiority of the experimental group that used the cooperative learning strategy within its educational units and in the main section for learning these skills. The students in this group benefited from the diversification, overlap, and change in the performance locations of the various exercises. Varied or varied exercises are considered the best method in the learning stages because they achieve the development of movement programs and rules that benefit the learner and help them perform the skill under conditions similar to play, requiring them to perform from different locations, angles, and directions. This helps organize the content of the material, contributing to making the students more prepared to receive information

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quickly and correctly, and more motivated to learn, thus organizing and integrating their coursework. This is what Amer (2011, p. 14) confirmed.

In general terms, it can be said that high-level skill performance should be based primarily on cognitive processes. Therefore, researchers believe that any error made by a student due to a weak ability to translate information into correct application will yield negative results. Hence, the importance of linking skills to students' cognitive abilities, as there is a positive relationship between cognitive abilities and the speed of learning and developing skills. When a student possesses good cognitive-motor skills, it means the development of the nervous system, which is reflected in other aspects and serves as an indicator for them.

Developing mental processes is of paramount importance due to their role in enhancing skill performance. The importance of kinesthetic awareness and reaction speed is evident in tennis, as these are fundamental functions that contribute to the comprehension and acquisition of motor skills. Indeed, no individual can be skilled in technical performance without a fully developed and effective cognitive function.

Most researchers and experts in the field of physical education have confirmed this relationship, including Al-Mustafa, who stated, "There is a positive relationship between mental processes and the speed of motor skill development." The higher the level of kinesthetic awareness and reaction speed, the higher the level of skill performance in tennis. (Abdulaziz, 1998, p. 31).

5 - Conclusions and Recommendations

5-1 Conclusions

1. Motor coordination plays a significant role in improving the skill performance of forehand and backhand strokes in tennis.
2. Kinesthetic awareness plays a significant role in improving the skill performance of technical tennis skills.

5-2 Recommendations

1. Develop an educational curriculum to enhance coordination and kinesthetic awareness in order to improve the students' performance in tennis.
2. Conduct similar research on other physical or motor attributes to identify strengths and weaknesses in the students' performance.
3. Emphasize the development of physical and motor attributes to improve the skill and motor performance.

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