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THE IMPACT OF USING EDUCATIONAL AID IN TEACHING FOREHAND AND BACKHAND SKILLS IN TENNIS FOR FEMALE STUDENTS

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Abstract
Researchers and educational specialists are continuously exploring effective educational methods and techniques, particularly in the context of motor learning principles and their applications in the educational process. Tennis, a highly popular sport, is valued by practitioners who enjoy mastering its skills. These skills require a solid foundation for optimal learning. The learning process is crucial as it establishes the basis for achieving sporting effectiveness. By employing a well-structured learning program that incorporates various modern educational methods and media, we can take into account the students' educational backgrounds, physical and mental abilities, and individual differences, ultimately leading to a higher level of skill performance.
The significance of this study lies in understanding how to learn the forehand and backhand techniques in tennis through the use of an assistive tool, which enhances the learning experience. The main research question is: Does the use of an assistive tool affect the learning and performance of forehand and backhand skills in tennis among female students? This study aims to determine the impact of exercises utilizing an educational aid on the development of forehand and backhand skills in tennis for female students.
The researchers adopted an experimental method suitable for addressing the research problem, employing an experimental design with two equal groups. The sample consisted of thirty third-year female students randomly selected using a lottery method for the academic year 2024-2025, divided into a control group and an experimental group, with 15 students in each group.
After statistically analyzing the data obtained from the tests, the researchers reached the following conclusions:
1. The educational aid acted as a guidance tool that significantly facilitated the teaching of the correct motor pathway for the striking arm.
2. Incorporating educational aids in lessons positively influences the skill learning process in tennis.
The researchers recommend the following:
1. Disseminate educational aids to colleges of physical education and sports sciences for use in tennis instruction.
2. Provide additional educational units focused on learning the forehand and backhand skills within the racquet sports curriculum.
3. Design educational curricula that employ teaching aids for other sports and activities.

Keywords: educational aid, forehand and backhand skills, tennis.

1- Introduction to the study:

1-1 Introduction and Importance of the study:

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Since ancient times, humans have sought ways to improve their lives, leading them to innovate and create numerous tools to fulfill their various professional needs. Over time, as human needs have evolved and diversified, life has become increasingly urbanized, with more people living in cities. This shift has been facilitated by the tools humans have developed throughout the ages. As a result, urban life has taken on a sense of luxury, allowing people to find recreational pursuits.
Among these innovations are the various sports that have emerged since the dawn of civilization. These sports, initially played by the noble classes, have evolved into competitive games enjoyed by people from all walks of life. Today, international championships are held for these sports, with prizes awarded to the top competitors.

Researchers and educational specialists are continually exploring effective teaching methods and approaches that incorporate the principles of motor learning. This goal involves integrating motor learning concepts with various teaching strategies to identify best practices tailored to learners' levels, abilities, ages, and academic backgrounds. The focus is on finding the most suitable methods for teaching both individual and group sports activities and skills.

Tennis is a sport that captivates the hearts and emotions of its fans, making it a prominent subject in local, regional, and international sports news. This widespread interest arises from the sport's ability to provide both male and female players with vitality and energy, all while helping them maintain their physical fitness. Often referred to as the "game of kings," tennis enjoys immense popularity, and its players take pleasure in mastering its skills to a satisfactory level.
Learning these skills requires a solid foundation, as skill acquisition is essential for effective performance in sports. Properly structured skill learning, utilizing various modern teaching methods and media, considers the educational level, physical and mental abilities, and individual differences of the students. This approach leads to a higher level of skill performance.
Both school teachers and sports coaches aim to enhance the technical and tactical capabilities of their students to help them improve. This endeavor is closely tied to establishing a strong foundation for player development. When learning the movements and skills associated with most sports, sources emphasize the importance of teaching these concepts using appropriate methods. Such methods positively influence the speed at which students learn and master these movements.
According to Ihsan & Mutasim, one of the primary responsibilities of a teacher is to identify suitable teaching methods tailored to the level of the students, the nature of the activity to be learned, and mastery of its motor patterns. This educational model should adapt to development and encourage student engagement and participation, allowing them to express their opinions and provide feedback on the effectiveness of the sport.
Tennis stands out as a sport suitable for all ages, from young children to older adults, and for both genders. The significance of this research lies in exploring the forehand and backhand skills in tennis through the use of an assistive tool. These tools facilitate the educational process and lessen the burden on both teachers and students by optimizing their energy and effort. The incorporation of an assistive tool enhances the students' learning ability and accelerates their skill maturity.

1-2 Study Problem

Through their extensive experience in teaching tennis and a review of the approved curriculum, the researchers found a lack of evidence regarding the use of teaching aids and tools. They identified a weakness in the performance of third-year female students in executing forehand and backhand skills in tennis. This issue arose because these players were novices and faced significant challenges in initially learning the skills. They

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struggled to coordinate throwing and hitting the ball, which requires a high level of skill and physical effort. Consequently, the researchers aimed to introduce an assistive tool that could positively influence the learning of forehand and backhand skills. The study problem was framed around the question: "Does the use of an assistive tool impact the learning and performance of forehand and backhand skills in tennis for female students?"

1-3 Study Objective:

- To identify the effect of exercises that utilize an assistive tool on the development of female students' forehand and backhand skills in tennis.

1-4 Study Hypothesis:

There are statistically significant differences between the pre- and post-test results of the experimental group in learning forehand and backhand skills in tennis for female students, with improvements being observed in favor of the post-test.

3- study methodology and field procedures:

3-1 study methodology:

The researchers used the experimental method using the two-equivalent-groups method to suit the nature of the research. Table (1) shows the experimental design.

groups	Pre-test	Experimental procedure	Post-test
Experimental group	Forehand and backhand skill test	The approved approach using the assistive tool	Forehand and backhand skill test
Control group	Forehand and backhand skill test	The approved approach by the subject teacher	Forehand and backhand skill test

3.2 study Community and Sample:

The research sample consisted of 30 randomly selected third-year female students from a total research community of 40 students. To eliminate the potential for learning effects that could influence overall performance, 6 tennis, table tennis, and badminton players were excluded, as well as 4 students who participated in the exploratory experiment. This sample represented 75% of the total research community. The sample was then divided into two equal groups, an experimental group and a control group, each comprising 15 students. To ensure the homogeneity and equivalence of the members in both groups, the skewness coefficient was applied, as shown in Table 2.

Table 2 illustrates the homogeneity and equivalence of the two research groups in the pre-tests for the variables of age, height, weight, and tennis skills in forehand and backhand.

skill		Control group		Experimental gr		Tabular t value	Calculated t value	significance
	No.	mean	Std.	mean	Std.			
age	15	20.50	0.527	20.50	0.678	2 .09	0 . 38	Not sig.
height	15	179.10	4.483	178.50	1.00	2 .09	0. 59	Not sig.

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weight	**15**	**73.90**	**1.912**	**73.50**	**0.296**	**2 .09**	**0 .72**	**Not sig.**
forehand skil	**15**	**4.23**	**1.406**	**5.27**	**1.701**	**2 .09**	**0. 87**	**Not sig.**
Backhand sk	**15**	**3.93**	**1.437**	**5.10**	**1.768**	**2 .09**	**0 . 30**	**Not sig.**

Table 2 illustrates the results of testing the equivalence of the two research groups regarding the variables under investigation. The findings indicate that there are no significant differences between the groups. According to Mohammed (2010), if the T-value is greater than or equal to the significance level of 0.05, it suggests that the differences are not significant. Conversely, if the T-value is less than 0.05, it indicates that the differences are statistically significant (Mohammed, 2010, p. 32).

3.3 Educational Aid:

a wooden board measuring 2 meters in length and 2.5 meters in width. It is securely fixed to the ground with back supports at the center of its base. The board is painted in shades of dark blue to represent a net, while a white line separates the dark blue from a lighter blue, indicating the upper edge of the net. Students hit the ball over this white line to perform the skill correctly. Once the ball bounces back off the board, they can practice the skill again in succession. This design allows for training a larger number of students efficiently, saving time and effort, and it can be used in playgrounds and small spaces.

Figure No. (1) shows the educational aid

3-4 Field study Procedures:

3-4-1 Determining Tennis Tests:

The researchers identified specific tests for evaluating forehand and backhand skills in tennis. They selected the Forehand and Backhand Accuracy Tennis Test (see Appendix 1). This standardized assessment has been applied to a sample similar to that of this study and in the same environment. To ensure its effectiveness, the researchers presented the test to five specialists in the fields of motor learning and racket sports, as well as experts in testing and measurement. All five experts approved the test.

3-4-2 Performance Evaluation Form:

The researchers developed a form to assess the skill performance of beginners (see Appendix 2). This form was reviewed by experts and specialists, receiving a high acceptance rate of 90%. It includes a breakdown of scores for various skills. For the forehand and backhand skills, the researcher assigned a score of 3 for the preparatory section, a score of 5 for the main section, and a score of 2 for the final section.

3-4-3 Skill Selection and Performance Evaluation:

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After consulting with experts and specialists in the sport, two skills were chosen for evaluation: the forehand and backhand strokes. The performance of each test subject in these two skills was assessed by three expert evaluators. Each test subject made three attempts for each skill, and the best attempt was recorded. The final score for each skill was determined by calculating the arithmetic mean of the scores given by the three evaluators.

Forehand and Backhand Ground Stroke Skills:

These two strokes share many similar stages but differ in their performance and the orientation of the racket face, forehand or backhand.

Assessment: The teacher, positioned on the opposite court, will toss the ball to the student being tested. The student will then perform both the forehand and backhand stroke skills.

1. **Preparatory Section** (Al-Kazemi, 2000, p. 64):
   - A. Assume the ready position to receive the ball.
   - B. Swing the hitting arm backwards.
   - C. Transfer body weight to the back foot.
   - D. Note that the highest score possible in this section is 3.
2. **Main Section**:
   - A. Execute the hitting movement by swinging the hitting arm forward to make contact with the ball.
   - B. Transfer body weight to the front foot.
   - C. Note that the highest score possible in this section is 5.
3. **Final Section**:
   - A. Continue the arm swing to complete the hitting movement.
   - B. Stop the body's momentum by moving the back foot forward to maintain balance.
   - C. Note that the highest score possible in this section is 2.

3-4-4 Tests Used:

1- Forehand and Backhand Test. (Aithar Abdul Karim et al., 2006, 69)

Objective: To measure forehand and backhand skills.

Equipment: a legal tennis court with the serve and backcourt areas divided into two equal zones, labelled A, B, C, and D. Tennis rackets, tennis balls, and a scoreboard.

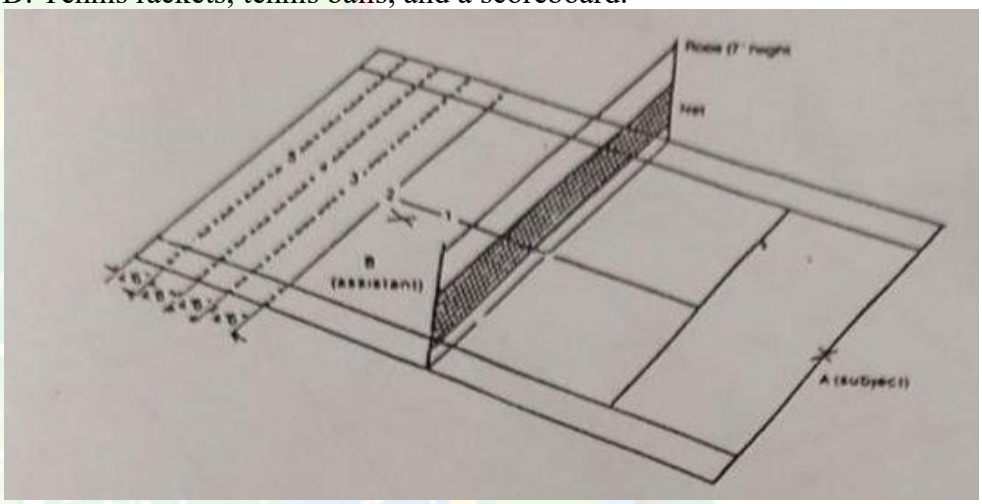

Figure 2: Hewitt test for forehand and backhand strokes

Procedures:

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1. The examiner stands diagonally at the center of the baseline, as shown in Figure 2.
2. The teacher is positioned on the opposite court to count the successful attempts.
3. A student assistant will collect the balls and assist the teacher.
4. The examiner returns the ball using either a forehand or a backhand shot.
5. The examiner is allowed two warm-up attempts.
6. The examiner has a total of 10 attempts: 5 from the right side and 5 from the left side.

Performance Method:
The examiner will execute forehand and backhand skills to the other side of the court, aiming to perform the skills accurately and land the balls in the highest scoring zones. Points are awarded for each successful attempt as follows:
- A ball that lands in area 4 receives 4 points.
- A ball that lands in area 3 receives 3 points.
- A ball that lands in area 2 receives 2 points.
- A ball that lands in area 1 receives 1 point.
- No points are awarded for balls that do not cross the net or fall outside the designated area.

The examiner's total score is the sum of the points scored from the ten attempts.

3-4-5 Pilot Study:
The researchers conducted their pilot study on Sunday, December 3, 2024, involving a sample of four third-year female students who were not participants in the main research. The study took place at 10:30 a.m. on the outdoor sports field, with assistance from the support team. The objectives of the exploratory experiment were as follows:
1. To assess the suitability of the field, tools, equipment, and research supplies for the study environment.
2. To identify variable units, tests, and any obstacles the researchers might face.
3. To organize educational units for each experimental group, determining the speed and angle of the ball based on the skill's difficulty level, type, class, and performance requirements.
4. To establish the time needed for practice to set a time limit for the number of educational units required.
5. To effectively distribute, organize, and streamline work among the study groups while using practical exercises to learn the selected skills.

3-4-6 Scientific Foundations of Tests:
First: Validity
The researchers established the test's validity by relying on content validity. This was achieved by presenting the test to five experts, all of whom agreed that it accurately measured what it was intended to measure.
Second: Reliability
On December 3, 2024, the researchers administered the test to a pilot sample and then retested the same group seven days later under similar conditions. They calculated the correlation coefficient between the first and second test applications, resulting in a reliability coefficient of 0.81. This value is considered to be a strong indicator of reliability.

3-4-7 Pre-test:
Pretests for the skills were conducted on December 10, 2024, to evaluate technical performance. The tests took place at 10:30 a.m. under the supervision of researchers and the support team. All test conditions—such as time, location, tools, and implementation methods—were carefully established to ensure consistency with the posttest conditions.

3-4-8 The Educational Curriculum:

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Before conducting the pre-test and implementing the educational curriculum, the researchers dedicated two introductory units to the two skills being studied. These units provided a general overview of the skills (see Appendix 3), explained how to perform them, and emphasized the importance of understanding each skill. This preparation aimed to ensure that the pre-test evaluation would be objective and accurate, offering a realistic assessment of the students' performance levels and establishing a consistent starting point for both groups.

The researchers utilized the educational aid to teach the forehand and backhand skills to the first experimental group. In contrast, the control group learned these skills without any intervention from the researchers, following the standard approach set by their subject teacher.

The educational curriculum for the forehand and backhand skills consisted of eight instructional units, delivered at a rate of two units per week. Each unit lasted 90 minutes and included a preparatory section, the main educational section, and a concluding section. This curriculum ran from December 3, 2024, to January 16, 2025.

3-4-9 Post-Test:

After completing the educational curriculum and its components for the two skills, a post-test was conducted for the study sample, which included both the control and experimental groups, on Thursday, January 18, 2025, at 10:30 a.m. The researchers prepared the necessary conditions in advance, ensuring that the time, place, and tools for the post-test were suitable. The procedures followed during the post-test were identical to those used in the pre-test, and the same staff members assisted in administering the test.

4. Presentation, Analysis, and Discussion of Results:

4-1 Presentation, Analysis, and Discussion of the Results of the Tennis Forehand and Backhand Skill Test:

4-1-1 Presentation of the Results of the Tennis Forehand and Backhand Skill Performance Test in the Pre- and Post-tests.

Table 3 shows the means, standard deviations, and t-values for the pre-test and post-test results of forehand and backhand skills in tennis.

Statistics	Pre-test		Post-test		Calculated t value	Tabular t value	significance
group	mean	Std.	mean	Std.			
control	9.65	3.87	18.47	1.62	7.13	2 .04	significant
experimental	10.24	4.12	22.86	2.07	8.12		significant

Table 3 presents the results of evaluating the forehand and backhand skills of the two research groups, comparing pre-test and post-test scores. The findings revealed a significant improvement in favor of the post-test scores for the experimental group. Specifically, the arithmetic mean and standard deviation for the pre-test were 10.24 and 4.12, respectively. In contrast, the post-test scores rose to 22.86, with a standard deviation of 2.07. To assess the significance of the differences in the arithmetic means between the pre- and post-tests for the experimental group, a calculated T-value of 8.12 was obtained. This value exceeds the Tabular T value of 2.04 at 14 degrees of freedom, which is below the significance level of 0.05. This indicates that there are significant differences favoring the post-test results.

The results for the control group showed that the arithmetic mean and standard deviation in the pre-test were 9.65 and 3.87, respectively. In the post-test, these values changed to an arithmetic mean of 18.47 and a standard deviation of 1.62. The calculated t-value was 7.13, which is greater than the table value of 2.04 at a degree of

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freedom of 14 and a significance level of 0.05. This indicates that there are significant differences in favor of the post-test results.

Table 3 demonstrated significant differences favoring all post-tests in both forehand and backhand tennis skills for the control and experimental groups. The researchers attribute the development observed in the experimental group to its use of educational aids in the curriculum, which are important tools in modern learning. This approach led to notable improvements in learning the two skills.

The effectiveness of the assistive tool, combined with a variety of exercises designed to teach these skills, contributed to the enhanced learning outcomes. Numerous studies have shown that assistive tools engage learners and reinforce their understanding, all while reducing the time and effort needed for the learning process.

Consequently, there is an increasing interest in utilizing educational tools for motor skills training and explanation, as these tools can help save the time and effort of the teacher (Nahida Abdul, 2008, p. 171). They also provide more opportunities for teachers to guide students. The primary goal of each unit is to effectively deliver the required material to the learner. In this method, the teacher's role is crucial, as they guide students throughout the educational period to help them acquire motor skills. The guidance provided by the teacher is a key factor in a student's ability to learn these movements (Mahmoud Daoud et al., 2000, p. 83).

The researchers attribute the improvements seen in the control group to the educational curriculum implemented by the teacher. This curriculum emphasizes numerous repetitions to develop skills, showcase models, and provide feedback. Additionally, the analysis reveals significant differences in skill variables between the pre-tests and post-tests of the control group. "The repeated practice of skill exercises enhances the endurance of the body's organs, contributing to better performance and higher achievements" (1) (Muhammad, Mahdi, 2013, 52).

4-1-2 Presenting and analyzing the post-test results of the forehand and backhand tennis skill test for the control and experimental groups.

Table 4 shows the average scores, standard deviations, and t-values for the post-test results on forehand and backhand skills in tennis.

Statistics / test	control		lexperimental		**Calculated t value**	**significance**
	mean	Std.	mean -	Std.		
Forehand and backhand skills	**18.47**	**1.62**	**22.86**	**2.07**	**5.46**	**significant**

Table 4 presents the results of the two research groups regarding the post-test performance in forehand and backhand tennis skills. The control group achieved an average score of 18.47 with a standard deviation of 1.62, while the experimental group recorded an average score of 22.86 with a standard deviation of 2.07. A calculated t-value of 5.46 was obtained, which exceeds the Tabular T value of 2.04 at a 0.05 significance level with 28 degrees of freedom. This finding indicates a significant difference between the two groups, favoring the experimental group.

The results for the control group in the forehand and backhand tennis skills test are also presented in Table 4. The researchers attribute the development observed in this group to the educational curriculum implemented during the tennis lessons, which had a noticeable impact on their performance outcomes. Conversely, the experimental group demonstrated a significant improvement in the post-test results. The researchers believe this difference is due to the influence of the proposed curriculum, which utilized assistive tools tailored for

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the experimental group. The primary goal of this curriculum was to teach the two skills effectively to the students.

It is important to note the clarity of the impact on learning. "This clarity emerged from adhering to effective teaching methods, including slow and normal explanations, skill training, and providing the learner with feedback. These elements all contributed to increasing the learner's motivation and enthusiasm to perform accurately and with a desire to improve "(Dhafer, 2002, p. 102).

Ahmed Abdel Fattah (2001) confirmed that using educational tools within educational units enhances clarity regarding the educational tasks to be implemented during activities. This clarity leads to a better understanding of movements, along with improved efficiency in terms of time and effort, which is reflected in the level of motor performance (Ahmed Abdel Fattah, 2001, p. 152). Similarly, Lamia Hassan and Saad Laith (2013) emphasized that a curriculum incorporating a variety of tools that facilitate performance learning is crucial. Such a curriculum shows significant progress in learning through a focus on training attempts and their diversification. They noted that varied training distributions contribute to higher learning retention (Lamia Hassan & Saad Laith, 2013, p. 12).

Ali (2023) also highlighted the importance of considering methods that accelerate the learning process and skill development to align with the noticeable advancements in sports achievements across different disciplines (Ali, 2023, p. 183). Samer (2004) added two important points regarding learning: the diversity of skill forms and the use of appropriate learning methods for open skills. This is particularly relevant in the current study of forehand and backhand skills in tennis. He suggested employing a variable exercise method combined with a degree of randomness, where players perform successive repetitions that differ in distance, direction, and force (Samir, 2004, p. 16).

From the analysis presented, there are notable differences in the mastery of forehand and backhand skills post-results. Imad al-Din (2005) observed that regular, structured, and correctly executed continuous education and repetitions are essential for achieving the desired outcomes (Imad al-Din, 2005, p. 42).

The researchers confirm that several factors contributed to the increased learning and the superior performance of the experimental group compared to the control group in various fundamental tennis skills. One key reason is the diversity of methods employed to teach these skills. This includes the technique of fragmentation, which breaks down complex movements into manageable parts before unifying them for comprehensive execution. Additionally, skills are gradually advanced from easier to more difficult levels (Osama Kamel, 1995: 77).

For difficult skills, it is preferable to divide them into parts, as the partial method is more suitable for teaching beginners. Effective training and exercises should align with the learners' readiness levels and individual capabilities, taking into account their overall characteristics and incorporating appropriate repetitions in practical educational sessions. Difficult skills, which have specific requirements and are performed from various positions and with different movements (Naheda Abdel, 2019: 133), necessitate diverse practical exercises and various teaching methods. This approach allows learners to practice repetitions from multiple locations while ensuring educational adequacy.

Consequently, the experimental group, which employed a cooperative learning strategy in their instructional units, demonstrated superior outcomes. Students in this group benefited from the diversity, overlap, and variability in the performance locations of the exercises. "Variable or varied exercise is the best method during the learning stages, as it helps create training programs and motor principles that benefit the learner. It enables them to perform the skill under conditions that resemble actual gameplay, necessitating performance from different places, angles, and directions" (Tareq Amer, 2005: 78). This aligns with the assertion made by Amr Allah Al-Basati that "training on the skill itself aims to bring about a positive change in motor behavior through learning, mastering, and consolidating skill performances" (Amr Allah Al-Basati, 1997: 26).

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5- Conclusions and Recommendations:

5-1 Conclusions:

1. The teaching aid served as an effective guidance tool, significantly assisting learners in mastering the correct motor path for the striking arm.
2. The field experiment demonstrated that the teaching aid supported students in the primary aspects of the skill, serving as an alternative to manual assistance, and positively influenced both the speed and level of learning.
3. The integration of teaching aids into lessons enhances the skill acquisition process in tennis.
4. The teaching aid is well-suited for instructing students on forehand and backhand skills.

5-2 Recommendations:

1. Distribute this teaching aid to faculties of physical education and sports sciences to be used as an educational resource in tennis instruction.
2. The use of teaching aids can enhance students' ability to learn more quickly and effectively, fostering increased enthusiasm and engagement.
3. Develop additional educational units focused on mastering forehand and backhand skills within the racquet sports curriculum.
4. Incorporate assistive tools as essential components of the educational curriculum across all subjects.
5. Design educational programs that utilize assistive tools in sports and other activities.

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Appendix

Appendix (1) A list of the names of the experts and specialists who were interviewed and presented with the tests.

No.	Name	Specialization	Working place
1	Prof. Dr. Faleh Jaaz Shalash	Measurement and Evaluation	Soran University - College of Physical Education and Sports Sciences
2	Prof. Dr. Wissam Salah Abdul Hussein	Motor Learning - Racket Sports	Karbala University - College of Physical Education and Sports Sciences
3	Assistant Professor Dr. Luay Hussein Al-Bakri	Motor Learning - Racket Sports	Baghdad University - College of Physical Education and Sports Sciences
4	Assistant Professor Dr. Weam Amer Abdullah	Measurement and Evaluation	Kirkuk University - College of Physical Education and Sports Sciences
5	Assistant Professor Dr. Sinan Hashim Rashid	Injury Rehabilitation - Racket Sports	Kirkuk University - College of Physical Education and Sports Sciences

Appendix (2) Performance Evaluation Form

Name	attempts	Forehand			Total score	Backhand			Total score
		preparatory	Main	final		preparatory	Main	Final	

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Appendix (3) Model of the educational unit for the forehand and backhand skills in tennis

The first educational unit for the forehand skill

Experimental Group: **Number of Students: 15** **Week: First**

Teaching Unit Time: 90 minutes **Educational Objective: Learn the forehand skill**

Educational Unit Sections	Time	Activities and Motor Skills
preparatory Section	**20 min.**	Includes performing the sports salute, taking absences, preparing supplies and equipment, a brief explanation of the skill to be learned, a general warm-up, and physical exercises that support the skills.
Main Section	**60 min.**	
Educational Activity	**10 min.**	A general explanation of the basic skills, followed by a detailed and clear explanation of the tennis forehand.
Practical Activity	**50 min.**	-Learning the grip for the forehand with racket feel exercises. -Learning the forehand stance for tennis. - Ball and racket feel exercises. -Performing ball feel exercises for the forehand using the racket. -Performing forehand strokes on the court from the front using an assistive tool.
Final Section	**10 min.**	-Gathering the tools and supplies, then performing a recreational game that supports the skill. Then, performing the sports salute and leaving.