Using technology to provide instant feedback and its impact on personal agility and learning some basic skills in foil fencing

Uso de la tecnología para proporcionar retroalimentación instantánea y su impacto en la agilidad personal y el aprendizaje de algunas habilidades básicas en esgrima con florete

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Abstract

Objective: Identify the impact of these technological means on the agility and basic skills of third-year fencing students.
Research methodology: The researchers used the experimental approach to suit the nature of the study, designing two groups: a control group and an experimental group. The study community and sample consisted of third-year morning study students at the University of Basrah/College of Physical Education and Sports Sciences for the 2024-2025 academic year. They were intentionally selected, with (60) students, representing (100%) of the total. They were randomly divided into two groups (lottery), with (30) students in each group. This ensured a normal distribution of participants and avoided bias.
Results: The results show that there is improvement in the learners' agility. This is attributed to the impact of using feedback during actual performance, which enabled learners to correct errors immediately by displaying their performance on the screen in front of them. This contributed to adjusting body position and enhancing proper performance, which positively affected agility development
Conclusions: It can be confirmed that the use of immediate feedback had a positive and effective impact on the development of motor skills and basic fencing skills among the research sample.

Keywords

Technology; feedback; basic skills; fencing.

Resumen

Objetivo: Identificar el impacto de estos medios tecnológicos en la agilidad y las habilidades básicas de los estudiantes de esgrima de tercer año.
Metodología de la investigación: Los investigadores utilizaron un enfoque experimental adaptado a la naturaleza del estudio, diseñando dos grupos: un grupo de control y un grupo experimental. La comunidad de estudio y la muestra estuvieron compuestas por estudiantes de tercer año de la modalidad matutina de la Universidad de Basora/Facultad de Educación Física y Ciencias del Deporte, durante el curso académico 2024-2025. Se seleccionaron intencionalmente (60) estudiantes, lo que representa el 100% del total. Se dividieron aleatoriamente en dos grupos (por sorteo), con 30 estudiantes en cada grupo. Esto garantizó una distribución normal de los participantes y evitó sesgos.
Resultados: Los resultados muestran una mejora en la agilidad de los estudiantes. Esto se atribuye al impacto del uso de la retroalimentación durante la práctica, lo que permitió a los estudiantes corregir errores inmediatamente al mostrar su rendimiento en la pantalla. Esto contribuyó a ajustar la posición corporal y a mejorar el rendimiento adecuado, lo que afectó positivamente al desarrollo de la agilidad.
Conclusiones: Se puede confirmar que el uso de retroalimentación inmediata tuvo un impacto positivo y efectivo en el desarrollo de las habilidades motoras y las habilidades básicas de esgrima en la muestra de investigación.

Palabras clave

Tecnología; retroalimentación; habilidades básicas; esgrima.

Introduction

The sport of fencing is witnessing a rapid development in adopting modern methods and methods of education and training, in line with the accelerated technological progress in the current era. Digital and technical applications have become an essential pillar within the educational curricula, as the diversification of the use of these methods is the necessity of contributing to the success of educational programs and training units in various sports. (Schimdt & Lee, 2019: Abdullateef AbdulJabbar et al., 2025: Hasan et al., 2020)

Feedback is a fundamental factor in the learning process, whether at the cognitive, motor or skill level, as it allows the trainees to obtain immediate corrective information about their performance, which helps them to improve it quickly and effectively (Mödinger et al., 2022), and contributes positively to developing their skills. Through feedback, learners get information about their performance, corrected their mistakes, and they will establish the correct performance through practice and repetition, (Sigrist et al., 2013: Hadjarati et al., 2025: Malawski, 2022: Di Martino et al., 2024: Balkó et al., 2017)

The fencing is a sports that requires a continuous guidance for the trainees in order to enhance the correct motor behaviors and modify the wrong behaviors as indicates that (Adel, 2022) as it is an accurate sport that requires quick motor responses, it requires the use of the latest methods and technologies that support the learning process. Among these methods, immediate feedback is necessary, where the trainees receive corrective information during performance Actual, which enables them to modify their performance independently by comparing what they actually accomplished and what should be accomplished, after providing them with the necessary cognitive and motor information (Wulf & Shea, 2002: Kamaruddin et al.,2024: Ahmed et al., 2009)

In addition, recent studies dealt with technology -backed immediate feedback in developing fencing skills specifically, as a study (Khanfar, 2010) showed late visual feedback to motivate learners to perform and correct and then identify errors. The (Omar & Ahmed, 2010) study demonstrated a clear impact on the use of feedback on learning skills in both sexes. The study (Duidar, 2020: Mariana Lolowang et al., 2025) also confirmed that the feedback approach contributed to improving several skill variables between learners.

Despite these important studies, most research focuses on the use of feedback in general contexts or in other sports such as swimming and basketball, with a clear shortage of studies that discuss the effect of using immediately supported technology feedback on basic skills in fencing, especially in early educational stages. The theoretical frameworks linking motor learning with modern technologies still need to be clarified and detailed in the context of the duel.

The integration of augmented reality technologies into physical education represents a qualitative shift in learning and training methods. This technology provides an interactive environment that enhances motor skill acquisition and accelerates the learning process compared to traditional methods, enhancing the efficiency and effectiveness of training in various sports, including fencing (Festiawan et al., 2025: Omarov et al., 2024: Varesco et al., 2024 : Haddari et al., 2024)

Accordingly, the importance of this research is evident in the use of immediate feedback using modern educational methods to develop basic skills and kinetic speed in fencing sport. The research aims to enhance learning and develop motor performance by transferring the image directly to the learner during performance, identifying errors and working to correct it immediately, whether by explaining the teacher or displaying video models to compare the actual and required performance.

Research problem

Advanced technological aspects are an important element in supporting the educational process, as they play an effective role in addressing many of the obstacles faced by learners, especially when employed systematically, in line with the objectives of educational units, and contributing to addressing mental, motor, and other aspects. Based on the researchers' experience in the field of fencing, and as a result of their practical teaching of this subject, they saw the importance of employing modern technological means that provide learners with immediate feedback, helping them identify and correct errors in performance, and confirming correct performance during actual live implementation.

The introduction of advanced educational means, characterized by modernity and effectiveness, contributes significantly to overcoming many of the difficulties faced by learners during the learning stages. One of the primary motivations that prompted the researchers to conduct this research was the difficulty of providing advanced educational devices and tools due to their high cost. This prompted them to search for alternative methods and realistic solutions that could be implemented within the classroom to address the problems that hinder the learning of skills.

In addition, traditional teaching methods based on explanation and presentation without providing adequate opportunity for learners to try to correct their performance themselves limit the development of their skill capabilities and slow down the learning process. Hence, the need to search for modern technological alternatives emerged in an educational environment rich in audiovisual stimuli, which contributes to facilitating the process of perception, understanding, and motivating learners to active learning, which reflects positively on the development of special fitness and learning basic skills in the foil weapon.

Research objective

- Identify the impact of these technological means on the agility and basic skills of third-year fencing students.

Research hypotheses

- The study assumes that the employment of technological means in providing immediate feedback will lead to greater improvements in agility and basic skills in fencing compared to traditional training among fencing sports students

Research fields

- Human field: Students in their third year at the University of Basrah's College of Physical Education
- Time field: (2/11/2024) to (19/1/2025)
- Spatial field: College fencing hall

Method

Research Methodology

The study used an experimental design that includes two groups: an experimental group and a control group, to study the impact of the use of immediate feedback supported by modern technology on the development of some motor capabilities and basic skills in the fencing.

Research on communities and samples

The study community is one of the third stage students in the Faculty of Physical Education and Sports Science, Basra University, for the academic year 2024-2025. The sample included 60 students chosen in a convenient way Statistical significance between the two groups in these variables before the start of the study, which confirms the equality of the two groups.

Description of intervention

- The control group: It received the usual traditional program in the fencing without using any immediate technical feedback.
- Experimental group: It received the same tutorial with the addition of immediate feedback through a screen showing the performance of the trainee in real time with direct corrections, as the experimental group sessions included providing immediate visible feedback through a screen related to the educational system, where performance indicators were presented as soon as the movement is implemented, with clarification of the number of repetitions and time allocated to each part of the educational unit.

The application of the tutorial (12) weeks continued every week (2) two educational units, whose time is from (30-35) minutes, applied in the main part of the lesson, which is the total time (90) minutes. To be the total total of the educational program (24) educational units along the study period.

Ethical considerations

"The study obtained the approval of the Committee for the Ethics of Scientific Research in the College of Physical Education and Sports Science, and a written, written approval was obtained by all participants before the start of the experiment and maintaining the confidentiality of data, and that these data are not used for the purposes of scientific research."

Table 1. Homogeneity, members of the search sample of Height, age and weight

Variables	Measuring unit	Mean	Std. Deviations	Median	Skewness
Age	Year	22.09	0.85	22	0.38
weight	Kg	65.28	5.38	65.77	0.12
Height	Cm	169.95	5.45	168	0.31

The data shows that the two groups are homogeneous in age, weight and Height before the execution of the experiment

Tools and equipment utilized in the study

A screen, camera, fencing equipment (weapons, clothing, and mask), indicators, a stopwatch, and a measuring tape.

Investigative Test

Five members of the research sample were used in the exploratory experiment community on Sunday, November 3, 2024, at 10:00 AM, inside the fencing lesson hall. This experiment aimed to identify the most prominent potential challenges and barriers that the researcher might encounter When the primary experiment and testing are being conducted, in addition to creating all appropriate conditions for the experiment. Its most important objectives were:

- Verify the validity of the tools used.
- Identify any technical or logistical challenges.
- Evaluate participants' responses to the immediate feedback method using technology, and ensure that students are receiving information effectively and can benefit from it.
- Identify the tools required for the tests and experiment.
- Identify the number of support staff.

Research Tests (Abdul Karim et al., 2022)

Agility Test

- Test Name: Shuttle Run
- Test Objective: To determine the test subject's agility time in fencing.
- Equipment: A flat surface with the fencing field drawn on it, a sticker, a whistle and a stopwatch.
- Test Details: The test taker is positioned at the starting line, point (A). At the referee's signal, they move toward point (B), which is (5) meters away, then return to point (A). They then move to point (C), which is (9) meters away from point (A). They then return to point (B). They then proceed to point (D), which is the end of the field. They then retreat to point (C), and then proceed to the end of the field.
- Recording: The time taken from the start to the end of the test is calculated.

Advance and Retreat Test

- The learner stands behind the starting line, which is fourteen meters long in a ready position. At the judge's signal, the examinee proceeds normally to the end of the field. Upon arrival, they

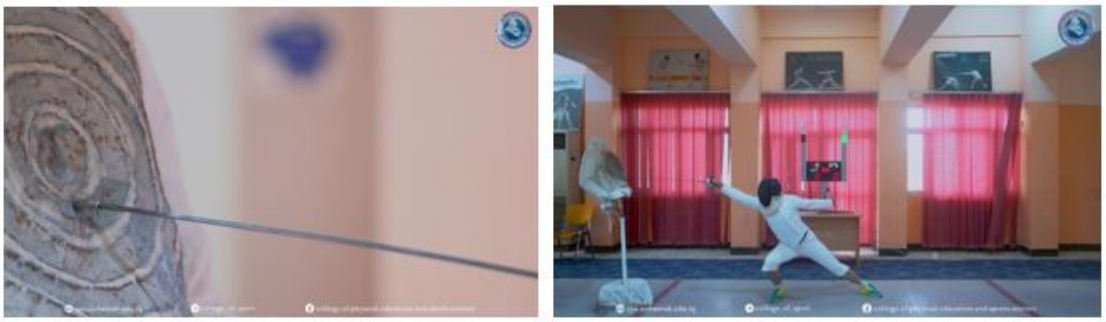
retreat and return to the starting point, maintaining the ready position during both advance and retreat operations.

- Based on the score: The time taken to travel back and forth for the total distance covered is (28) meters.

Test of the stabbing accuracy (Nima, 2014)

- Description and procedures: The participant stands in front of the person (the targeted painting) equipped with three circular targets in size, holding the foil weapon, and a distance that allows him to take two full steps before the person's appeal is carried out. When the arbitrator gives the reference, the participant implements the appeal towards the department determined by the testimony.
- Goals specifications: The person is designed to contain three circles focused with diameters: 10 cm, 5 cm, 2.5 cm, and the goals were installed 3 meters from the position of the duel.
- Where these dimensions were determined to achieve a graduation in the level of difficulty and ensure stability of measurement in accordance with the recommendations of the Experts and Literature Committee specializing in fencing accuracy tests.
- Method of registration: Each participant is granted (10) attempts within (15) seconds, and one point is calculated for each correct injury to the specified goal.

Figure 1. Shows the Stabbing Accuracy Test



Pre-tests

At 10:30 a.m. on Monday, November 11, 2024, the pre-tests were administered. Every test was carried out using the designated study variables.

Main Experiment

After completing the provision of all requirements and conducting the initial tests, and preparing devices (screen, cameras, and support tools) and putting them in the sites designated for them, the researchers began implementing the main field experience on 11/11/2024 and lasted until 1/25/2025, with a total period of 12 weeks.

The experiment was designed to provide immediate feedback for learners by displaying their performance directly on a screen on the level of consideration and an appropriate rise, which allowed them to see their instant performance during the implementation of the skills, and to identify the mistakes and correct them immediately, after the learners are provided with the correct performance through the presentation, explanation and application by a student who is fluent Form and direct correction when seeing a performance from on the screen, which reduces the possibility of consolidating the wrong motor patterns and the difficulty of adjusting them later.

The experiment included the application of 24 educational units at a rate of two units per week, the time of each unit ranges between 30-35 minutes of the total time of the lesson (90) minutes, and it was implemented after the warm -up and in the main section of the lesson, using a set of exercises supported

by technological means, with the aim of developing motor capabilities and basic skills in dueling and improving performance levels for learners.

Post-tests

The post-tests were conducted on 1/25/2025, corresponding to Saturday, as part of the same conditions and capabilities in which pre tests were implemented, in terms of time, place, tools and procedures. These tests aimed to measure the extent of development in the performance of the participants after the implementation of the tutorial, and to compare the results with what was achieved in pre tests to determine the effectiveness of the methods used.

Statistical Methods

The statistical program SPSS (Statistical Package for the Social Sciences) was utilized by the researchers to examine the information gleaned from the pre- and post-test findings. This was done in order to process the findings statistically and extract significant differences between the two measurements, thus contributing to a scientific and objective interpretation of the results.

Findings

Presentation, analysis of the results:

Table 2. shows the computational circles, standard deviations, mathematical circles teams, their standard deviations, and the value of (T) and (SIG.) Test (T) test results for the associated samples of the experimental group (N = 30)

Variables	Unit of Measurement	Pre-test		Post-test		Arithmetic mean of difference	Standard deviation of differences	T value	Level Sig	Type Sig
		Arithmetic mean	Standard deviation	Arithmetic mean	Standard deviation					
Agility	Second	32.1	3.08	30.7	2.77	-1.4	0.91	4.92	0.0002	Sig
Progress	Second	24.6	1.88	22.87	1.88	-1.73	1.22	5.39	0.0001	Sig
Stab	Degree	4.87	0.92	6.4	0.99	1.53	0.64	7.07	0.0001	Sig

It is clear from Table (2) above mathematical averages, standard deviations, and (T) test for the samples related to the variables of the study (fitness, progress and retreat, the accuracy of the appeal) which are (4.92.5.39.7.07) and when compared to its lineage (0.05) it is clear that it is its morals with all the variables of the experimental group and in favor of the dimension test.

Table 3. shows the computational circles, standard deviations, mathematical circles teams, their standard deviations, and the value of (T) and (Sig.) And the significance of differences between the results of pre and dimensional tests in the search variables of the group control results (T) test (T) of the species related to the control group (N = 30)

Variables	Unit of Measurement	Pre-test		Post-test		Arithmetic mean of difference	Standard deviation of differences	T value	Level Sig	Type Sig
		Arithmetic mean	Standard deviation	Arithmetic mean	Standard deviation					
Agility	Second	33.1	2.12	31.4	2.41	-1.67	2.92	3.67	0.002	Sig
Progress	Second	26.7	3.2	25.8	3.3	-0.93	0.59	2.45	0.029	Sig
Stab	Degree	4.47	0.92	5.47	0.83	1	0.53	3.16	0.007	Sig

Table (3) shows the results of the control group. Although there are statistically significant differences between pre and post measurements in fitness, progress, retreat and stabbing), which are (3.67.2.45.3.16), the values of the size of the effect were small, when compared (P <0.05), which indicates that the improvement is due to factors such as repeated learning or traditional training effect, and not to strong intervention as in the experimental group.

Table (4) shows the computational circles, standard deviations, mathematical circles teams, their standard deviations, and the value of (T) and (Sig.) , test (T) test results for independent samples to compare the two groups (n = 60)

Variables	Unit of Measurement	Experimental group		Control group		Arithmetic mean of difference	Standard deviation of differences	T value	Level Sig	Type Sig	Effect size
		Arithmetic mean	Standard deviation	Arithmetic mean	Standard deviation						
Agility	Second	30.7	2.77	31.4	2.41	0.73	4.28	2.81	0.037	Sig	0.27
Progress	Second	22.87	1.88	25.8	3.3	2.93	3.13	5.07	0.0001	Sig	1.09
Stab	Degree	6.4	0.99	5.47	0.83	-0.93	1.1	3.72	0.001	Sig	1.02

It is clear that the variables are significant, which are (2.81, 5.07, 3.72), and when compared ($p < 0.05$), the improvement is shown in favor of the experimental group in all variables, and the effect size was (0.27, 1.09, 1.02), which enhances the effectiveness of using immediate technical feedback in developing agility and basic skills in fencing. From Table (4), there are differences in the results recorded between the experimental and control groups in the post-tests.

Discussion

The results of the current study showed a significant improvement in the performance of the experimental group members across all variables under study: agility, advancing and retreating skills, and lunging accuracy. This improvement is largely attributed to the use of immediate feedback during performance, accompanied by modern technological means. This approach enabled learners to directly observe their performance and correct errors in real time, which helped modify postures and enhance proper motor performance. This is consistent with what (Schimdt & Lee, 2019) stated about the role of immediate information in correcting motor errors. The significant improvement in agility resulted from learners' reliance on immediate visual feedback, which contributed to modifying movements, increasing response speed, and efficiently changing directions. This result is consistent with the findings of this study (Khanfar, 2010: Duidar, 2020: Teteris et al., 2025), which stated that direct feedback is one of the most effective educational strategies for correcting errors and enhancing proper performance. Recent studies support this, demonstrating that immediate feedback accompanied by visual presentations leads to immediate and long-term improvements in physical abilities and motor skills (Keller et al., 2014: Yarayan et al., 2025: Turna ,2020) found that active, interactive agility training to improve fencers' reaction time produced statistically significant differences in simple and multiple reaction speeds. In the same vein, (Saad et al. ,2023) confirmed that agility is a crucial element in fencing because it reflects a player's ability to move lightly and fluidly, changing directions according to the demands of the game. Regarding the skill of advancing and retreating, the noticeable improvement in this skill is attributed to the provision of immediate feedback during performance, which prevents errors from being embedded in motor memory and facilitates the acquisition of correct positioning. This result is consistent with what (Hamad et al. ,2022) asserted, stating that continuous movement and correct postures are the foundation for mastering defensive and offensive skills. This is also supported by a recent study (Niță & Magyar, 2023), which demonstrated that intelligent feedback systems increase movement accuracy by approximately 15% in a short period.

Jumping Accuracy

The results also showed significant improvement in the accuracy of the jab in the experimental group. This is attributed to the clarity of the skill presentation, repetition accompanied by immediate feedback, and error correction using technological means. (Hamad ,2021) indicated that the integration of modern educational methods contributes to improving motor perception and the quality of learning, in addition to motivating learners and increasing their motivation.

These results confirm that the integration of modern technological means that provide immediate feedback within fencing training programs is an effective option for developing learners' motor abilities and basic skills. They also highlight the need to revisit traditional training curricula and introduce educational methods that rely on interaction and immediate correction to improve performance and advance the level of learning. With training outcomes. This level of development may be due to other factors, such as motor or physical factors. Alternatively, the use of the motor skills (motor programs) and their generalization to the variables of this study constitute an additional cognitive-motor support that helped accelerate the learning of these skills. In addition, technological means provide support in understanding the content of the skills and correctly applying them on the ground.

When comparison of this study with previous studies

The results achieved in this study indicate the development of all variables related to the use of technological means and the provision of feedback during performance. These results are consistent with previous studies (Omar & Ahmed, 2010; Saad et al., 2023), which confirmed that feedback contributes to improving skill performance, especially in sports that require high precision, such as fencing. Failure to

allow sufficient time for errors will lead to the formation of sound motor programs in the central nervous system, which can be generalized in the future and utilized to learn other skills and benefit from the process of properly building those skills.

This study differed from previous studies in that it featured an immediate feedback method via a live display screen. Previous studies, however, provided feedback immediately after performance or delayed feedback, which previous research had not addressed.

Our study was unique in terms of sample size, intervention period, and the technological nature of feedback compared to previous studies. The current study included 60 students, while the Alexandria University study included 50 students divided into experimental, control, and differentiated groups (Ahmed & Hossam, 2022). The Baghdad University study included third-year students without specifying the sample size (Adel, 2002). Furthermore, the implementation period in our study extended to 24 training units (two units per week over 12 weeks), whereas previous studies did not precisely specify the length of the intervention. Furthermore, our study relied on immediate feedback supported by live demonstration techniques, unlike the Alexandria study, which used video-supported feedback (Ahmed & Hossam, 2022) and the Baghdad study, which provided feedback immediately after performance (Adel, 2002). These methodological differences in sample size, nature of feedback, and intervention period enhance the rhetorical distinction and practical application of our study and help explain the variance in results when comparing the effectiveness of training programs.

The results of this study are consistent with those of (Turna, 2020), which examined the effect of agility training on reaction time in fencers. This study showed that physical training directed at improving agility significantly reduces motor response time, which positively affects performance speed in competitive situations. The results of this study are consistent with those of (Balkó et al., 2016), which examined the effect of integrating sensory and sensory feedback technologies on fencers' motor performance. This study demonstrated that the use of technological tools provides immediate data that contributes to improving motor control and reducing reaction time, which positively affects fencing performance. This agreement is attributed to the fact that both studies relied on the integration of technology into the training process, providing participants with immediate feedback on their performance, which helped improve motor response and skill execution with greater accuracy. However, the current study focused on developing specific agility and learning some basic fencing skills through technological means that provide immediate feedback. The study by (Balkó et al.,2016) and others focused on analyzing simple and complex response times according to fencers' performance levels. The results of this study are consistent with those of (Guo et al., 2025), who designed a training program that combined precision, speed, and agility training with the aim of improving technical performance in young fencers. This study demonstrated that the systematic integration of these motor abilities contributes to improving the quality of technical performance and increasing the efficiency of responding to competitive situations. This agreement is attributed to the fact that both studies aimed to improve agility as a fundamental component of fencing performance. However, the current study was distinguished by its use of technological means that provide immediate feedback, which may add a more interactive educational and training dimension compared to the traditional method used in (Guo et al. 2025: Aresta et al. 2023).

Conclusions

The results of this study indicate that the use of immediate feedback is an effective tool for developing agility and basic skills in fencing. It contributed to the immediate correction of errors and improved performance quality, which positively impacted the level of mastery of the targeted skills. The integration of modern technological means in providing feedback also proved its role in motivating learners and increasing their engagement, which enhances the effectiveness of the educational process and ensures correct performance.

Recommendations

The study recommends the use of multiple forms of feedback within educational units, the adoption of innovative technological tools to accelerate learning and improve outcomes, further studies on diverse samples and environments, and encouraging trainers to integrate these methods into their training programs to achieve the best results.

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