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Manufacturing an Innovative Device to Adjust the Distance between Female Fencing Players' Feet

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Abstract

In this research, the role of artificial intelligence and modern technology in the training process was discussed in a way that serves its goals and benefits from it through good outcomes, as employing technology in fencing training facilitates the training process for the coach and player and contributes to reducing the effort expended and the time spent. The study aimed to identify on the effect of the manufactured device in controlling the distance between the feet in the research sample, the experimental method was used by designing the experimental and control groups. The research sample consisted of female fencing team players in the College of Physical Education and Sports Sciences for Women, who numbered (16) players. They were divided into two experimental and control groups, the number of each group (7) female players, and their training was applied three training units per week over a period of two months, i.e. (24) training units. After conducting pre- and post-tests, the two researchers concluded that the device has a positive effect in controlling the distance between the feet. This is what we seek to achieve one of the sustainable development goals, the third goal is good health and well-being, and the fourth goal is good education.

Keywords

manufacture of an innovative device - jousting distance

Introduction:

Fencing is one of the sports that requires good preparation and continuous training, to achieve the best results. Both Marib and Fatimah believe that “training must be scientific and deliberate to reach the player’s goal, by refining and improving the player’s performance and mastering the defensive positions.” And offensive movements” (3), as well as forward and retreat movements while maintaining the distance between the players (the sparring distance) on the one hand and the distance between the front and back feet on the other hand, and each of them confirms (Ishraq, Bilal, and Fatimah) “The goal of the leg movement is to approach the opponent facing him

in order to attack him or move away from him to escape his attack.” (4)

Fatimah also confirms, “The distance between the feet in forward or backward movements must be precise and appropriate for the player’s height, so that it allows him to move freely on the field” (5) Here, there is an urgent need to use modern technology based on microcontrollers and computerized systems in the sports training environment to exploit and benefit from it to improve the distance between the feet and develop the offensive and defensive skills of fencers in order to understand the physical and mental effects of using technology in the training process.

Mohsen, Z.Z., & Maleh, F.A. believe that “the use of modern technology allows direct measurement of players’ performance and the development of training based on accurate data that enhances accurate scientific analysis of performance and contributes to improving results” (7). Moreover, it can Application of technology in (Zeina and Ftimah) “Designing advanced training exercises aimed at developing players’ skills and improving their performance, in accordance with the principles and foundations of modern sports training” (8)

The two researchers sought to manufacture an innovative device to provide a unique and distinct training experience by controlling the performance of the female players’ feet, as it helps to achieve training goals in a better and more effective way. Fatimah and Susan confirmed, “By using modern technology in fencing training, the quality of training can be significantly improved and players’ development enhanced, thus achieving better results in sports competitions.” (9)

The importance of research lies in investing modern technology and artificial intelligence in sports training, as Samiha, Baneen, Fatima Abid Malih believe that “artificial intelligence is changing the sports industry in several ways, and makes the training process more competitive and more efficient” (15)

Maleh & Benjamin also confirm that “introducing devices into the training program is intended to attract the trainees’ attention and increase their motivation to continue training, as well as saving time and effort for the player and coach.” (10)

The idea of the research is to use an innovative device to maintain the distance between the feet

during advance and retreat, thus facilitating the player’s movement in a smooth and smooth manner. The research problem lies in developing an electronic training device that adjusts the distance between the feet and thus maintains optimal performance among female fencing players. Therefore, the research problem was defined in the following question?

Does the innovative device adjust the distance between the feet during forward and backward movements?

Does performing exercises using the device lead to adjusting the distance between the feet?

The study aimed to identify the effect of the manufactured device in controlling the distance between the feet among the research sample.

Search procedure method:

Curriculum and sample:

The experimental method was used in a controlled manner, with two equal groups (the experimental group and the control group) with a pre-test and a post-test to solve the research problem. The research population was identified as 16 players for the College of Physical Education and Sports Sciences girls’ team for the academic year 2023-2024. The research sample was chosen using a comprehensive enumeration method and the sample was divided into two groups: the experimental group and the control group, with (7 players) for each group and with a normal distribution, with the exception of Two players for the exploratory experiment, and Table (1) shows the value of the skewness coefficient, which is limited to ± 1 , which indicates that the population is moderately distributed.

Table (1) shows the normal distribution of the research sample

Variables	Measuring Unit	Arithmetic mean	Mediator	Standard deviation	Torsion coefficient
length	meter	165,3	165	1,03	0,114
weight	kg	58,5	58	1,34	0,632
Age	year	19,9	20	1,26	0,391

Devices, tools and means of collecting information:

- Arabic and foreign sources and references.
- Casio electronic stopwatch.
- Legal fencing stadium.
- Fencing weapons (Foil, Epee, Saber), 16 weapons.
- Leather measuring tape (20 m).
- Personal mobile device (HP laptop).
- A measuring device for height and weight.
- A manufactured device for adjusting the fencing distance.

Field research procedures:

-The basic idea for designing and manufacturing the innovative electronic device:

The basic idea of designing and manufacturing an innovative electronic device is to measure the distance between the feet during performance and to know the weak points resulting from not setting the appropriate distance to perform at and then training on it, which gives important information and feedback to the player about the level of distance required for the best performance between the feet when advancing and retreating, as well as To support the trainer’s capabilities in correcting errors with the required distance level and reducing errors resulting from not adjusting the distance by selling the feet.

Stages of manufacturing an innovative electronic device:

After identifying the basic purpose of designing and manufacturing the device in the fencing game, the qualitative analysis of the performance of the feet in various fencing competitions and

access to the Internet information network were taken into consideration. Discussions took place with some specialists in the field of information and communications engineering and consultation was provided about the possibility of design and manufacturing locally. Several experiments lasted for more than (6) consecutive months from Wednesday (1-3-2023 until 3-9-2023), and in cooperation with an engineer specialized in these microcontrollers, a result was reached to manufacture this device, as the nature of the work of this device differs. The device differs from the rest of the devices for the distance between the feet during performance, given that most of the means of measuring this distance are through video motor analysis of the fencing, and in some of these researches, these methods do not give the accurate result for measuring this distance, which is an indicator of weakness in inferring this distance, which is As an important indicator for training, this innovative device provides accurate results for the distance between the feet with an error rate of (0.03) and the sensor used is highly accurate in measuring distance according to the data of the sensor used. As in Figure (2-1)

The basic parts that make up the innovative electronic device and their details:

- The device consists of two main parts:
- The first part: The data recording piece: which consists of two parts from the following materials:**
- A plastic box with a width of (15) cm, a length of (10) cm, and a height of (5) cm.**
- Ultrasonic distance sensor: The distance sensor measures distance, using ultrasonic reflection

Electric Parameter

Working Voltage	DC 5 V
Working Current	15mA
Working Frequency	40Hz
Max Range	4m
Min Range	2cm
Measuring Angle	15 degree
Trigger Input Signal	10uS TTL pulse
Echo Output Signal	Input TTL lever signal and the range in proportion
Dimension	45*20*15mm

technology. The device sends out an ultrasonic sound signal (known as a ping), and waits to receive the echo signal (known as an echo) after it is bounced and reflected back. Using the value of the speed of sound in the medium, the distance the sound wave has traveled back and forth between the device and the barrier

can be calculated. By measuring the time it takes for sound to reflect and return, the device can calculate distance with high accuracy, allowing the user to accurately determine locations and effectively interact with the surrounding environment.



Figure (2-1) shows an image of the distance measuring sensor (HC-SR04 Ultrasonic Sensor)

(Loudspeaker 1W and 8 Ohm Small Trumpet



14x20mm)
-Cables for connection
One operation switch.-
Two LED lights to indicate the operation of the device.-
-Two Buttons to start and stop the measurement and to operate the device on the computer:
laptop-
RAM memory to store device data.-
Lithium battery (9 volts) to power the device.-
The second part: which is connected with the computer to receive data:
- Ard Wino Micro Controller: It has a USB port and a power button. It can be easily connected to various projects that need a small controller with high capabilities and specifications.

Microcontroller ATmega32U4
Operating Voltage5V
Input Voltage (recommended) : 7-12V
Input Voltage (limit) : 6-20V
Digital I/O Pins : 20
PWM Channels : 7
Analog Input Channels : 12
DC Current per I/O Pin : 20 mA
DC Current for 3.3V Pin : 50 mA
Flash Memory : 32 KB (ATmega32U4)of which 4 KB used by bootloader
(SRAM : 2.5 KB (ATmega32U4
(EEPROM : 1 KB (ATmega32U4
Clock Speed : 16 MHz
LED_BUILTIN : 13
Length : 48 mm

Width : 18 mm

Weight : 13 g

Figure (2-2) shows an Arduino image

Micro Memory measurement card (SD card): The SD card unit is particularly useful for projects that require recording data, as the Arduino can create a file on the memory card to write and save the data using a special software library. There are

different models of this unit that vary from company to company. To another, but they all work in the same way, using the communication protocol, and this one is compatible with micro SD cards, as data is recorded on the memory.



Figure (2-3) shows an image of a memory card (SD card).

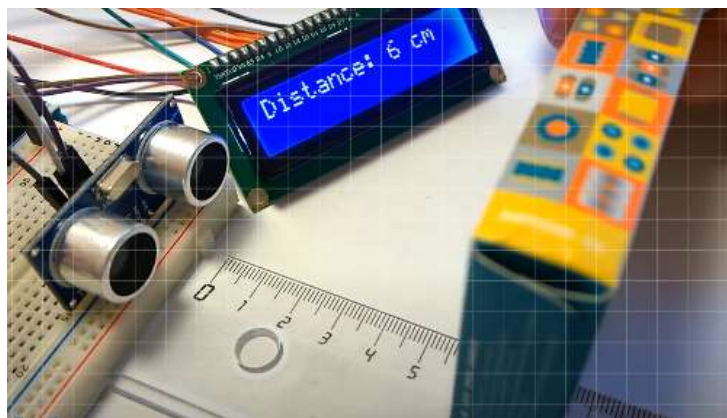


Figure (2-4) shows the process of calibration and ensuring the correct value of the measurement.

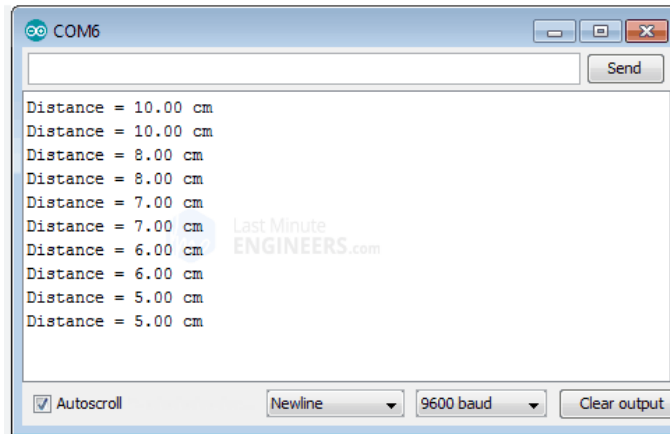


Figure (2-5) shows an image of the data stored in memory

Specifications of the innovative electronic device and its features:

-The weight of the first piece is (110) grams without the batteries + the weight of the batteries is (25) grams.

The weight of the second piece, the piece placed on the player’s foot, is (33) grams.-

Jehar dimensions: length (10) cm, width (8) cm, and height (6) cm.-

Operating voltage (9) volts.-

-The device operates on a (9) volt power supply for approximately (6) continuous hours.

-Controlling the device by pressing the start button, then pressing the start measurement button, and after completing the work, pressing the stop data recording button, then turning off the device and removing the memory from the device on the one hand, and on the other hand, the data is recorded directly on the computer by transferring it from the sending device to the device. The recipient, and it is stored in the form of an Excel file to deal with it statistically. Therefore, we relied on saving the data in two ways. The first is through RAM and the second method is the method of sending the data to the electronic calculator, as explained previously, and saving it in an Excel file to deal with it statistically.

-The most important feature of how the device works is measuring the distance during skill

performance and sending a distinctive sound with a limited frequency to indicate the target distance during training.

-Ease of use by the coach, as the manufactured device has proven its ability and efficiency in measuring the distance between the feet. When the distance increases beyond the specified limit, an alert sound is issued to the player immediately. Also, if the distance decreases, another sound is issued with another vibration, informing the player that the distance between the feet is small in the sport of fencing.

- Low financial cost.

-Abundance of raw materials for manufacturing and installing the device in local markets.

-Through that, there is a clear difference in the movement distance of the feet during advancement and retreat can be demonstrated, as it allows the trainer to prepare specialized exercises for improving the distance in accordance with the determinants of proper performance.

Procedures followed before performance begins:

The memory is first prepared by formatting it and then inserting the memory into the place designated for it in the device. After that, distance sensors are installed on the player’s front foot, and then the fencer stands up straight to calibrate and

zero the values using this button to perform the calibration process before starting the skill. This is called (calibrating the device for the purpose of accurately drawing results and setting the correct distance for each athlete). The athlete's performance of advance and retreat movements and their speed are recorded according to what the coach needs. The person measuring the device turns on the device by pressing the start button, and then pressing the start measurement button, and after completing Performing skill movements: Press the stop data recording button, Unit of measurement: centimeter-

then turn off the device, remove the memory from the device, and insert it into the computer for statistical processing.

Recording:

- Readings are taken from the memory card for both offensive and defensive skills during performance.
- Recording the results of the distance between the feet and determining the number of errors during the performance.

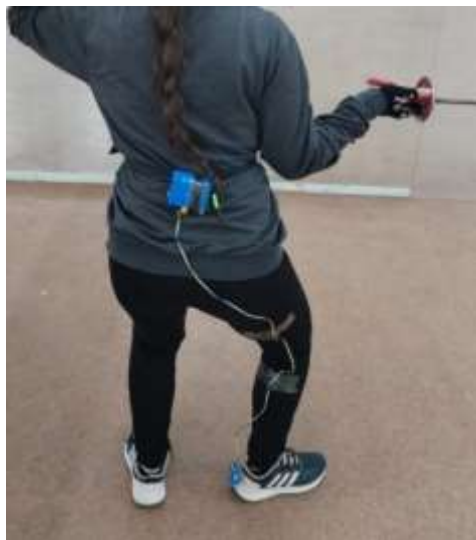


Figure (2-6) shows how to use the device

Exploratory experience:

Two exploratory experiments were conducted, one of which was to design and manufacture the device, on November 3, 2023, at ten in the morning, on the exploratory research sample, which consisted of (2) female players, in order to find out the obstacles that the two researchers face when applying the device in training and testing. The second experiment with how the device works in testing and training took place on (10-11-2023) at ten in the morning on the exploratory research sample, in order to find out the obstacles that may appear when applying the tests and addressing them.

The main experiment included:

Pre-test: The pre-test was conducted on the experimental and control research samples on November 14, 2023 at ten in the morning in the fencing hall, College of Physical Education and Sports Sciences for Women, University of Baghdad, after a warm-up was conducted for the members of the two research samples, and all temporal and spatial conditions were fixed for the purpose of unifying them with the tests. Dimensionality. After randomly distributing the research sample, the experimental and control groups were equal in the pre-test, as shown in Table (2), which indicates the equality and homogeneity of the two research samples.

Table (2) shows the equality of the two research samples is shown in the T-test and their homogeneity is shown by Levene's coefficient in the pre-test

The distance between feet	measuring unit	Experimental group		Control group		Levene's Test	Sig	T- Test	Sig	Significance level	Significance of differences
		Mean	Std. D	Mean	Std. D						
cm		15.14	1.77	15.14	1.67	0.006	0.938	0.775	0.454	0.05	Insignificant

Apply leg movements according to the manufactured device:

After the device was manufactured, the forward and backward leg movements in the sport of fencing were carried out according to the manufactured device and were implemented using the interval training method, on the experimental research sample, two training units per week over a period of two months, i.e. (16) training units. The training was carried out in the main section of the training unit, adopting the principle of gradation and undulation between exercises, between units and between training weeks, and alternating the work of muscle groups between one exercise and another.

(Hadeer, Fatimah, & Nevzat), "The formation of the training load was based on the schedule of Fox and Matthews" (14) for interval training. The foundations of forming the training load depending on the performance time in this system are explained.

The research sample implemented training in the main section of the training unit at the beginning of the main section.

The time of the training unit is 60 minutes, divided into (20 minutes for the preparatory section and 10 minutes for the final section) and 30 minutes for the main section, including (10) minutes according to the goal of the training to implement the experiment (the independent

variable) and the rest of the time to implement the components of the training unit from psychological, planning, and skill preparation. The control group performs its normal exercises, with the same time as the training unit and the same exercises, but without the device. The experiment began on November 17, 2023 and ended on February 8, 2024.

Post tests:

After completing the implementation of the main experiment, the post-tests were conducted on the experimental and control research samples on 2/11/2024 at ten in the morning after a warm-up was conducted for the members of the two research samples. All temporal and spatial conditions were fixed for the purpose of unifying them with the pre-tests.

Statistical methods:

The results were processed statistically using the spss system and using the following laws:

- Arithmetic mean.-
- standard deviation.-
- Simple torsion coefficient.
- Percentage law.
- Levene's test for homogeneity.
- T-test for two unrelated means.
- T-test for two related means.

Showing results:

Table (3) shows the statistical parameters between the pre-test and post-test for the two research groups in the test of controlling the distance between the feet.

Statistical methods		Mean	Std. D	The arithmetic mean of difference of means	Its standard deviation	Samples Test	Sig	Significance level	Significance differences
		Pre	15.85						
Experimental group	Pre	15.14	1.67	15	2.08	19.06	0.000	0.05	moral
Control group	post	20.71	1.7	5.57	2.29	6.41	0.001	0.05	moral

Table (4) shows the statistical features between the two research groups in the post-test adjusting the distance between the feet.

Test adjusting the distance between the feet	measuring unit	Experimental group		Control group		T- Test	Sig	Significance level	significance of differences
		Mean	Std. D	Mean	Std. D				
	degree	30.85	0.89	20.71	1.70	13.92	0.000	0.05	moral

It was shown from Tables (3) and (4) that the experimental research sample improved better in the sparring distance control test than the control group. This is due to the use of training according to the manufactured device that was implemented by the experimental group.

Results Discussing:

Through the presentation of the results, it was shown that the experimental group had improved in the test of adjusting the distance between the feet better than the control group, and the reason is due to the use of forward and backward movements using the manufactured device that the experimental group implemented to adjust the distance between the feet.

Both (Iman and Fatima) confirm that “training with the help of innovative and modern equipment contributes to increasing the athlete’s response as a result of the direct influence of sensory and moral stimuli” (1) (Wajdan, Fatimah) “and it has an effectiveness and impact on all muscles of the body in various ways” (12) In addition to the information given to the coach about the abilities and capabilities of the fencing player, analyzing and diagnosing errors in skill

and physical performance, and the coach’s ability to correct those errors.

As Malih & Hassan see, “The distance between the front and back feet determines the extent of the correct flexion of the legs at the knee joint and the stable balance of the body’s center of gravity, and thus the optimal performance during the stabbing movement to perform any simple or complex attack” (11) Adjust the distance between the feet from the position Unguarded advances and retreats in the sport of fencing require a long period of training and many repetitions to reach the exact distance, which allows the fencing player to perform offensive and defensive movements without delaying the movement, so both (Maarib & Fatima) found that “exercises using the manufactured device worked to adjust That distance during the training period.” (6) Increasing the distance between the feet will lead to the athlete’s inability to perform the stabbing movement. Fatimah and Wafa also confirmed, “If the distance between the feet is small, the athlete will move to a standing position and move away from the correct position to prepare and prepare for the attack.” The sport of fencing, which is unguarded” (13) , and (Fatima and others) saw

that “the athlete’s performance of many repetitions will reduce his motivation to continue training and he will feel bored in addition to the time and effort expended” (2). Therefore, we find that the innovative device achieved its goal and worked. To adjust the distance to achieve exemplary performance during advance and retreat.

Conclusions:

- 1-The device used has a positive and clear effect in adjusting the distance between the feet.
- 2-The principle of repetition and repetition in leg movements using the device had an effective and positive role in controlling the distance between the feet in the forward and retreat movements of female fencing players.

Recommendations:

- 1-The necessity of using the innovative device by the two researchers to adjust the distance between the feet in the forward and backward movements of female fencing players.
- 2-Conducting studies using modern devices and tools because of their importance in quickly acquiring skills.
- 3-The necessity of using devices because of their psychological effect that contributes to breaking boredom among female players.
- 4-The necessity of using devices to develop the skills-related abilities of female players
- 5-Conduct similar research on different samples and different games and activities.

Author’s declaration:

Conflicts of interest: None

We confirm that all tables and figures in this article are ours and written by the researchers themselves.

Ethical-Clearance: this manuscript approved by local ethical committee of physical education and sport sciences college for women on (May /2024)

Author’s contributions:

All contributions of this study were done by the researchers (R.M. and F.A.) who get the main idea and work on writing and concluding also with number of experts, Fatimah Abed Malih in Statistics, Stuart Biddle in revision, Taj Al-deen Alaa Al-deen in translating, Urska Dobersek in proofreading

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References:

- 1-Fatimah Abed Maleh & Eman Benjamin Youssef. (2020). The Effect of Mobile Balance Exercises in Developing Speed and Accuracy of Front and Rear Spiral Strike Table Tennis for Specialized School Players. Journal of Studies and Researches of Sport Education. Vol. 30 No. 1.
<https://jsrse.edu.iq/index.php/home/article/view/189>
- 2-Fatima Abdel Maleh and others (2017): Sports preparation for fencers. Baghdad, Iraq, Dar Al-Arqam Press.
- 3-Fatimah Abed Malih, and Marib Jawad Kadhim. (2016). Design and manufacture of the electronic device to measure the compatibility and speed of motor response lower limbs fencing. The Swedish Journal of Scientific Research, 7. Retrieved from.
- 4-Odeh, Ishraq Ghaleb, Bilal Ali Ahmed, and Fatimah Abed Maleh. 2021. The effect of special training based on a manufactured electronic device in controlling the balance of force of the front and rear leg during the advance and return in the sport of fencing. International Sports Science Journal, vol. 3, p. 10, p. 5-12.
- 5-Fatimah abed Malih. (2008). The effect of vehicle exercises on the development of the cognitive harmonic ability of the arm and leg armed with fencing. Journal of Physical Education Studies and Research, pp. 109-125. Retrieved from
<https://www.iasj.net/iasj/article/54050>

6-Maarib Jawad Kadhum, & Fatima Abid Malih. (2022). The effect of mental speed drills on some visual abilities in shish weapon players. *Modern Sport*, 21(4), 0051-0058. <https://doi.org/10.54702/ms.2022.21.4.0051>

7-Mohsen, Z. Z., & Maleh, F. A. (2020). Test design to measure the cognitive processing speed of table tennis players. *Journal of Human Sport and Exercise - 2020 - Winter Conferences of Sports Science*. <https://doi.org/10.14198/jhse.2020.15.proc2.05>

8-Zena Abdulkareem Abbas, Prof.Dr. Fatimah AbedMalih. (2021). The Speed and Direction of the Ball's Rotation and its Relationship to the Accuracy of the Front and Rear Side Longitudinal Blow in Wheelchair Tennis Players. *Annals of the Romanian Society for Cell Biology*, 25(6), 9987–9993. Retrieved from <http://www.annalsofscb.ro/index.php/journal/article/view/7332>

9- Fatimah Abed Malih, and Susan Sadeq. (2015). DESIGNING AND MAKING DEVICE RUBBER ROPES TO DEVELOP THE SPECIAL STRENGTH FOR FENCING PLAYERS. *The Swedish Journal of Scientific Research*, 7, p. 26.

10-Abdel Maleh F., & Benjamin A. . (2021). The Effect of Mobile Balance Exercises in Developing Speed and Accuracy of Front and Rear Spiral Strike Table Tennis for Specialized School Players. *Journal of Physical Education Studies and Research*, 30 (1), 371–381. Retrieved at from

<https://jsrse.edu.iq/index.php/home/article/view/189>

11-Malih.fatimah. A. & Hassan Hashem A. (2023). The effect of interactive speed training on the performance of some dynamic actions in the fencing players in the foil weapon. *Journal of Studies and Researches of Sport Education* , 33 (2), 52–68. <https://doi.org/10.55998/jsrse.v33i2.440>

12-Saeed, W., Abed-Maleh, F., & Jary, H. S. (2019). Effect of Sponge Cylinder Exercises on The Rubber of Working Muscles to Perform Human Wheel Skill in Technical Gymnastics. *Indian Journal of Public Health Research & Development*, 10(6), 650. <https://doi.org/10.5958/0976-5506.2019.01350.0>

13-Fatimah Abed Malih, Wafa Faiq Hamoudi. (2012). Precision tracking and visual animation and its relationship to the results of the competition with the Sabre Players. *Modern Sport*, 11(18).

14-Hadeer Falah Abed Saheb, Fatimah Abed Malih, & Nevzat Demirci. (2024). The Impact of a High-Fitness Program on Developing Performance Endurance for Players of the Basketball Skills Challenge Competition. *Modern Sport*, 23(1), 0157-0166. <https://doi.org/10.54702/57p92f77>

15-Baneen Mukhif Hamzah, Fatima Abid Malih, & Samiha Amara. (2023). The effect of interactive speed exercises on developing some skills Women's futsal. *Modern Sport*, 22(4), 0155-0164. <https://doi.org/10.54702/ms.v22i4.1216>

تصنيع جهاز مبتكر لضبط المسافة بين القدمين لدى لاعبات المبارزة
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مستخلص البحث

تم التطرق في هذا البحث الى دور الذكاء الاصطناعي والتكنولوجيا الحديثة في العملية التدريبية بما يخدم أهدافه والاستفادة منه من خلال المخرجات الجيدة، حيث ان توظيف التكنولوجيا في تدريب رياضة المبارزة يسهل العملية التدريبية على المدرب واللاعب ويساهم في تقليل الجهد المبذول والوقت المستغرق ، وهدفت الدراسة الى التعرف على تأثير الجهاز المصنع في ضبط المسافة بين القدمين لدى عينة البحث ،استخدم المنهج التجريبي بتصميم المجموعتين التجريبية والضابطة وتكونت عينة البحث من لاعبات منتخب المبارزة في كلية التربية البدنية وعلوم الرياضة للبنات البالغ عددهن (16) لاعبة ، قسموا الى مجموعتين تجريبية وضابطة بلغ عدد كل مجموعة (7) لاعبات وتم تطبيق تدريباتهم ثلاث وحدات تدريبية في الأسبوع على مدى شهرين أي (24) وحدة تدريبية، وبعد اجراء الاختبارات القبليّة والبعدية توصلت الباحثتان الى ان للجهاز تأثير ايجابي في ضبط المسافة بين القدمين. وهذا ما نسعى له لتحقيق احد اهداف التنمية المستدامة الهدف الثالث الصحة الجيدة والرفاه والهدف الرابع التعليم الحيد.

الكلمات المفتاحية | تصنيع جهاز مبتكر ، مسافة التبارز