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The Effect of Exercises for the Smart Jacket Device (Smart Jacket) According to some Biokinematic Variables and Improving the Level of Accuracy of the Skill Performance of the May Giry Kick in Youth Karate

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Abstract: The study aimed to design and manufacture the smart jacket to improve some bio kinematic variables and improve the level of skill performance of the May Giry kick in karate. One of the hypotheses of the research is that the exercises for the smart jacket device have a significant impact on some bio kinematic variables and improve the level of skill performance of the May Giry kick in karate for young people. The researcher used the experimental approach by designing the experimental and control groups and the method of pre- and post-measurement for its suitability to the nature of the research, the study was conducted on a sample of the youth forum players at the age of (17-19) years in karate, and the number of (20) players, and the sample was selected randomly. The most important conclusions were that the exercises prepared by the coach and the exercises with the proposed device have a positive impact on the kick of May Giry in karate. The researchers also recommend circulating the device to clubs in the province and the country to be used as an auxiliary training device and to be included in the trainings.

Keywords: Smart Jacket, Biokinematic Variables, May Giry Kick, Karate, Skill Performance, Youth Karate Players

Introduction

Research Definition

Sport is the starting point that reflects the images of civilizational, cultural, social and economic progress for the development of countries, and these countries seek through their athletes to communicate their message to the rest of the world, this called for continuous support for the development of theoretical and applied aspects of sports and their link to other sciences in order to achieve the best achievements for athletes.

There is no doubt that the science of sports training and biomechanics had a clear impact on the development of achievement for various sports, including karate, this is done through the study of various movements and exercises and the development of motor performance in accordance with mechanical laws, as well as identifying weaknesses in performance and working to correct them and strengths and working to develop them

through the development of exercises dedicated to them, which work to develop them and achieve achievement, using the latest equipment and advanced scientific means, as well as modern technologies that helped to reach good achievement, which facilitated the task of trainers in choosing a work mechanism characterized by accuracy and objectivity in the right direction towards achievement.

The game of karate is one of the individual sports that are widely practiced in the world because it has a wide base, as it is the basis in martial arts through the number of its practitioners significantly, in addition, it is the first sport in terms of participants and the number of federations organized under the banner of the International Federation, as its importance is clearly shown due to the urgent human need for it to face threats without weapons.

As the importance of the research lies by entering into the experience of preparing exercises for the smart jacket device to find out the extent of improvement in the level of some bio kinematic variables and the level of skill performance of the May Giry kick in youth karate.

Research Problem

Attack in karate is the player's ability to use arms or legs to shoot various long or short offensive skills, whether directly or indirectly and at the right time, and with the least possible effort and without exaggeration in performance in order to reach its goal in areas authorized by law such as punching, kicking and disturbing the balance of the opponent's body.

Most trainers rely in their evaluation of the accuracy of the kick or punch on direct self-observation during exercises, which is a measure that is very weak when compared to the scales in which modern electronic devices are used, this is what the researcher noticed by being a karate player, which is the lack of scientific foundations and bio kinematics, therefore, the researchers decided to experiment with using the smart jacket device on some bio kinematic variables and improving the level of skill performance of the May Giry kick in youth karate to suit the skill performance of this game.

Research Objective

1. Design and manufacture of the smart jacket to improve some bio kinematic variables and improve the level of skill performance of the May Giry kick in karate.
2. Preparing special exercises for the smart jacket device to improve some bio kinematic variables and improve the level of skill performance of the May Giry kick in karate.
3. Identify the effects of the exercises of the smart jacket device according to some bio kinematic variables and improve the level of skill performance of the May Giry kick in karate

Research Hypotheses

1. The exercises for the smart jacket device have a significant impact on some bio kinematic variables and improve the level of skill performance of the May Giry kick in youth karate.

2. There are statistically significant differences between the pre- and post-test and in favor of the post-test.
3. There are statistically significant differences between the experimental group and the control group and in favor of the experimental group.

Research Field

1. Human Field : Players of the Youth Forum unity youth age (17-19) years and the number of (20) karate players.
2. Time Field : for the period from 20/10/2022 to 1/4/2023
3. Spatil Field : Unity Youth Forum in Al-Hussein Neighborhood, Holy Karbala

Methodology

The researcher used the experimental approach and the design of the experimental and control groups and the method of pre- and post-measurement to suit the nature of the research, the experimental design used by the researcher was as shown in Table 1.

Community and Sample Research:

The research community is karate players in Karbala province for the youth category for the year (2022_2023), which consists of (20) players, the community was identified in Karbala province clubs with karate and the players of the Unity Youth Forum were selected as a sample, as the sample included 35% of the community, and this is a record percentage and the players are all males.

Homogeneity of the Research Sample

The homogeneity of the sample members in the extraneous variables and research variables was verified using the second torsion coefficient law (Pearson) as shown in Table (2).

Variables	Unit of measurement	Statistics			
		Median	Arithmetic mean	Standard deviation	Torsion coefficient
Mass	kg	57	56,42	8,12	0,21-
Length	Centimeter	165	165,14	4,79	0,08
Training age	year	5	5,14	2,19	0,19

Table (2) shows that the research sample is homogeneous in all variables as the value of the torsion coefficient for all variables is confined between (-1) and (1) this indicates the moderate distribution of the sample members and thus indicates the homogeneity of the variables.

Methods, devices and tools used in research:

Means of collecting information:

1. Observation and experimentation.
2. Personal interview.*
3. Testing and measurement.
4. Skill performance evaluation form.**

* Appendix (1).

** Appendix (2).

Devices and tools used in research:

1. The Proposed devide to perform exercises on it
2. Mobile holder for photography
3. Electronic scale to measure mas number
4. a Laptop type (Dell) number (1)
5. Karate hall in the unity Youth Forum located Al-Hussein Neighborhood
6. 5 Lizian tablets
7. Tracker Program

Field Research Procedures:

Proposed Organ:

- Proposed Device Design:
  After the idea was formed and completed for the researcher and supervisor, the proposed device was designed by drawing it on paper and putting the correct measurements and develop the means that make the device suitable for everyone to measure the accuracy of kick performance.

Components of the Proposed Device:

- Jacket: It is a jacket worn by the player on which sensors have been placed that capture the kick signal, where the value of each kick is calculated according to the location and accuracy of the skill performance of the kick as shown in Figure (2):

Figure (2)

- Display Screen : It is a screen that receives electrical signals from the programmer and operates the numbers inside it and contains a meter in which the accuracy of the kick is calculated, where it was programmed to give kick values starting from (1-5) degrees

and the display continues on the screen for 3 seconds and then the counter is zeroed self-as shown in Figure (3):

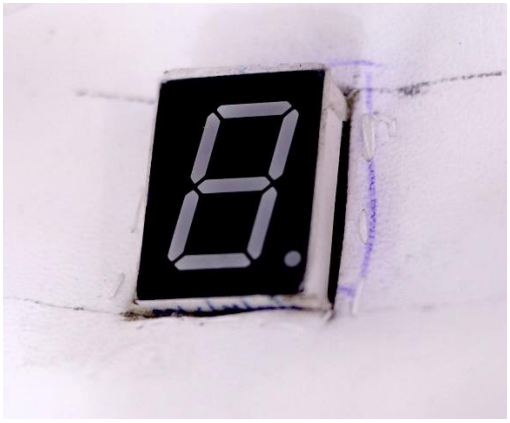

Figure (3)

- Battery: It is a voltage source for the voltages equipped for energy, which is responsible for operating the entire system and consists of 4 batteries, as shown in Figure 4:

Figure (4)

- Sensors: The touch sensor sends an electrical signal when touching to the programmer, where the programmer sends signals to the screen by operating a specific number according to the location and accuracy of the kick to the opposite player as shown in Figure (5):

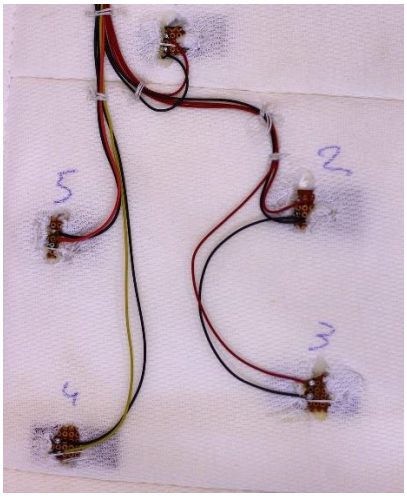

Figure (5)

- Programmer: It is a device that receives electrical signals to the screen without interference between the signals as shown in Figure (6):

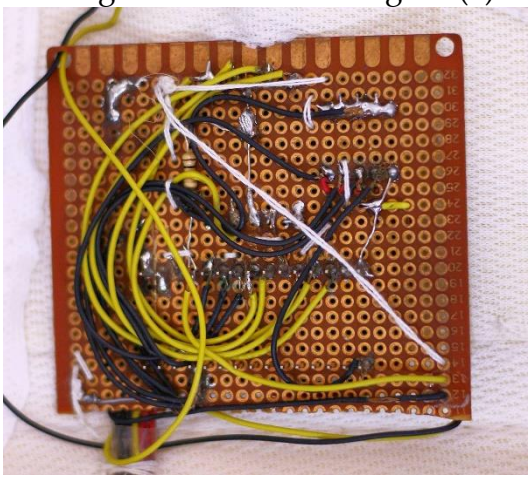

Figure (6)

Connecting Wires.

a set of electronic parts required by the work, such as resistances.

Features of the Proposed Device:

1. Helps in performing exercises similar to the fighting situations in karate.
2. Freedom to apply exercises and the amplitude of space allowed by the proposed device due to the distance between the sensors on the jacket.
3. The device can be divided into parts and any part can be replaced in case of damage.
4. It can be moved from one place to another.
5. The device is characterized by the fact that all its parts are coated with packaging sponges and durable and smooth leather, which ensures the principle of safety and security for the karate player when performing exercises.
6. Can be used for all ages and groups.
7. It can be made of simple and available materials.

Safety and Security of the Proposed Device:

The researcher provided the means of safety and security in the proposed device by covering all parts of the device with smooth sponge free of obstacles during the performance of exercises, the device was presented and explained how it works to a group of specialists in (karate, and sports biomechanics)* who confirmed the possibility of using the proposed device without harming the safety of the players and this was confirmed through the exploratory experiment of the proposed exercises on the proposed device.

Preparation of Exercises for the Kick of May Giry:

The researcher prepared special exercises for the kick of May Giry in line with the characteristics and features of the innovative device to be a catalyst in increasing the accuracy of kick performance, the element of suspense will also add real-time feedback by the designed device.

* Appendix (1).

Identification of Measurements and Tests Used in Research:

The success of scientific research depends primarily on the appropriate tests and measurements to measure the research variables, so the researcher accurately selected the appropriate tests and measurements after reviewing previous research and theses and after conducting a personal interview and consulting some professors specialized in the field of karate and sports biomechanics*.

Description of the May Giry Kick Test:

- Test Name:
  Test to measure the accuracy of the skill performance of the kick of May Giry (Yasser, 2014).
- Test Objective:
  Measuring the accuracy of the skill performance of the May Giry kick.
- Tools Used:
  The device prepared by the researcher.
- Performance Method:
  The player stands in the position of (Zinko Daji) opens the arms to the side and then raises the knee to the leg that will kick and extends the leg forward with a height commensurate with the place of kicking on the jacket, the kicking is with the sole of the foot (the kidney of the foot) and then the rapid withdrawal of the leg and return to the previous position as in Figure (7):

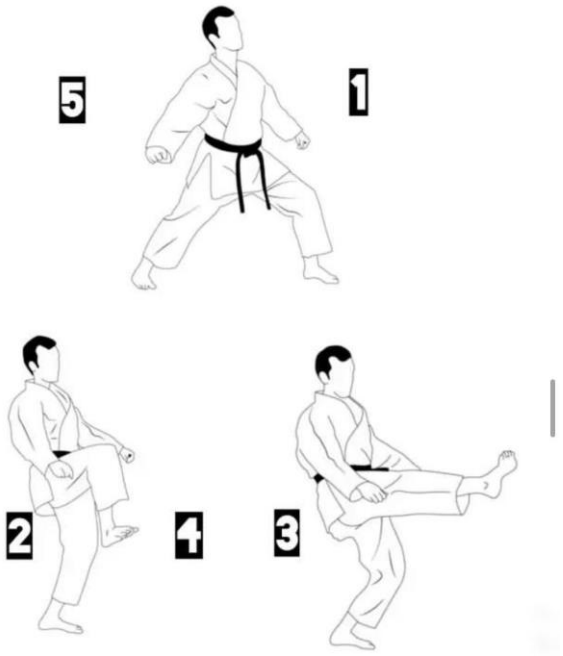

Figure (7)

- Register Method

* Appendix (2).

Each player is given only one kick and the value of this kick is recorded through the device prepared by the researcher and the grades have been divided to match the authorized place for kicking with degrees starting from (5) degrees, it is the highest value to (1) degree and is the lowest value obtained by the player during the performance of the kick.

- Performance Method:

  The movement begins early in the trunk joint, then the force is displaced to the thigh, then to the knee joint, then the foot, then the striking area, which is the kidney of the foot under the toes, this sequence helps in the absence of injury and in the optimal performance because it leads to a correct transfer of force in the normal direction of the joint work, any error in the movement transfers may lead to the player being punished in the matches or the player's injury occurs as if the player's knee collides with the other player's knee due to the inaccuracy of the strike.

Exploratory Experiments:

The exploratory experiment is an important procedure that must be carried out by the researcher in order to identify the difficulties and obstacles that the researcher may face in the Mayn experiment, which enables the researcher to get rid of these difficulties and obstacles and also to identify the possibility and readiness of the assistant team and the readiness of the sample to apply the Mayn experiment procedures and the appropriateness of the exercises in terms of difficulty and ease and the possibility of applying them and also to ensure the suitability of the tests that have been identified, the researcher has conducted two exploratory experiments, as will be explained later.

First Exploratory Experiment:

This exploratory experiment was regarding the proposed device and the exercises prepared by the researcher and was conducted on Thursday (1/12/2022), in which the following objectives were confirmed:

1. Identify the readiness of the proposed device and the possibility of applying exercises to it.
2. Ensure that the proposed device is suitable for the sample and their physical measurements.
3. Ensure that the principle of safety and security that must be provided by the proposed device is ensured.
4. Identify the time required to prepare the device and according to the exercise to be performed.
5. Identify the most important difficulties that may face the researcher during the course of the Mayn experiment.
6. Identify the time of each exercise as well as the time of the exercises complete with breaks during the training unit.

Results of the First Exploratory Experiment:

1. It was ensured that the exercises can be applied to the proposed device.

2. The principle of safety and security provided by the proposed device was ensured during the performance of exercises on it.
3. The time required to equip the device to suit the exercise to be performed was identified the most important difficulties that the researcher may face during the course of the Mayn experiment were identified.

The Second Exploratory Experiment:

This exploratory experiment was regarding the bio kinematic measurements that were identified and conducted on Sunday, 4/12/2022, in which the following objectives were confirmed:

1. Ensure the readiness of the assistant work team* and the extent of its ability to apply the measurements correctly.
2. Ensure that the sample members can perform the tests correctly.
3. Make sure to choose the right place to conduct tests.
4. Identify the most important difficulties and obstacles that may hinder the conduct of tests to the fullest.
5. Identify the tools and means needed by the tests and measurements that have been identified.

Results of the Second Exploratory Experiment:

1. The readiness of the assistant work team, its efficiency and its ability to apply tests and measurements correctly was ensured.
2. It was ensured that the sample members can perform tests and measurements correctly.
3. The appropriate place was chosen to conduct tests and measurements.
4. The most important difficulties and obstacles that may hinder the conduct of tests were identified to get rid of them in the Mayn experiment.

Tribal Measurements:

The test for the bio kinematic variables of the May Giry kick was conducted on Thursday (8/12/2022) in the Karate Hall of the Unity Youth Forum located in Al-Hussein district of holy Karbala, the skill test was conducted for the kick of May Giry.

Implementation of exercises:

After the completion of the tests and pre-measurements, the exercises were carried out, and enter it within the training program for the sample members in the Mayn part of the training unit* and the exercises were carried out according to the following:

1. The implementation of the exercises began on Sunday (25/12/2022).
2. The exercises are applied within the Mayn part (part of the Mayn section) in the training unit.
3. The application of the exercises continued for a period of (6) weeks from (25/12/2022) until (9/1/2023) at a rate of (3) training units per week, meaning that the number of training units is (18) training units, and these exercises are changed in the following week, and so on for the rest of the weeks, see an appendix ().

* Appendix (3).
* Appendix (4).

4. The exercises were carried out in the period of special preparation for the players.
5. 5- The last exercise was completed in the last week on Thursday (9/1/2023).

Dimensional Measurements:

The test for the bio kinematic variables and the May Giry kick was conducted on Sunday (12/1/2023) in the Karate Hall of the Unity Youth Forum located in the holy neighborhood of Al-Hussein Karbala.

Statistical Methods:

The researcher resorted to choosing statistical means related to comparing the results of pre- and post-measurements as follows:

1. Mediator.
2. Arithmetic mean.
3. Standard deviation.
4. Torsion coefficient (II).
5. T-Test for correlated samples.

Result and Discussion

Presentation and analysis of the results of pre- and post-tests of the research variables of the control group

Table shows the arithmetic means, standard deviations and percentage of development of the control group

Table (3)

Processors Variables	Measurement unit	Pre		Post	
		S	P	S	P
Knee angle at maximum flexion	Degree	119.000	2.000	120.000	3.927
Trunk angle with vertical plane at the moment of kicking	Degree	1.000	9.258	5.250	3.370
Accuracy	Degree	13.250	1.982	15.000	1.309

The results presented in Table (3) showed that the median for the pre-test of the knee angle at maximum flexion (119,000) and standard deviation (2000), while the mean value of the post-test was (120.00) and standard deviation (3,927), the median value in the pre-test of the angle of the trunk from the vertical plane at the moment of kicking is (1,000) and a standard deviation (9,258), while in the post-test, the value of the median is (5,250) and a standard deviation is (3,370), the accuracy was the median value (13,250) and standard deviation (1,982), while in the post-test the median was (15,000) and deviation (1,309).

Table (4) shows the difference in media, deviation of differences and calculated t-value of the control group

The table shows the difference of media, deviation of differences and the calculated value of (t) for the control group

Processors Variables	Measurement unit	S F	P F	Calculated t	Tabular t	Significance
Knee angle at maximum flexion	Degree	1.000	5.014	0.564	2.365	Non-significant
Trunk angle with vertical plane at the moment of kicking	Degree	4.250	6.860	1.752		Non-significant
Accuracy	Degree	1.750	1.281	3.862		Significant

Through Table (4), which shows the differences in the arithmetic mean and standard deviations of the results of the pre- and post-tests of the control group, as the calculated t-value was respectively (0.564, 1,752, 3,862) the differences appeared only significant in the accuracy test, while the rest of the results all appeared non-significant for the rest of the variables

Presentation and Analysis of the Results of Pre- and Post-Tests of the Research Variables of the Experimental Group

Table (5) shows the mean and standard deviation of the experimental group

Processors Variables	Measurement unit	Pre		Post	
		S	P	S	P
Knee angle at maximum flexion	Degree	132.500	21.186	125.000	3.927
Trunk angle with vertical plane at the moment of kicking	Degree	1.250	9.765	8.625	1.505
Accuracy	Degree	13.750	2.492	21.750	2.815

As for the results of the experimental group, it appeared from Table 5 that the median for the pre-test of the knee angle in the maximum flexion is (132,500) and with a standard deviation (21,186), while the results of the median for the post-test of the knee angle were from the maximum flexion (125,000) and standard deviation (3,927) the median value of the angle of the trunk at the moment of kicking was in the pre-test (1,250) and the deviation (9,765), the results in the median post-test were (8,625) and a deviation (1,505), the median value for the accuracy variable in the pre-test was (13,750) with a deviation of (2,492), while in the post-tests, the value of the median was (21,750) and a deviation of (2,812).

Table (6) shows the difference in media, deviation of differences and calculated t-value for the experimental group

Processors Variables	Measurement unit	S F	P F	Calculated t	Tabular t	Significance
Knee angle at maximum flexion	Degree	7.500	18.958	1.119	2.365	Non-significant
Trunk angle with vertical plane at the moment of kicking	Degree	7.375	8.749	2.384		Significant
Accuracy	Degree	8.000	1.195	18.931		Significant

The differences appeared statistically between the results of the pre- and post-tests of the experimental group in the angle of the trunk with the vertical plane at the moment of kicking and accuracy, the calculated t-values respectively are (2,384, 18,931), these values were all in front of significant levels less than the level of error (0.05), while the angle of the knee in the maximum flexion was not statistically significant.

Presentation and Analysis of the Results of the Post-Tests of both Groups

Table (7) Shows the Results of the Differences between the Experimental and Control Post-Tests

Processors Variables	Measurement unit	Pre		Post		T-value		Significance
		S	P	S	P	Calculated-t	Tabular-t	
Knee angle at maximum flexion	Degree	125.000	3.927	120.000	3.927	2.546	2.145	Significant
Trunk angle with vertical plane at the moment of kicking	Degree	8.625	1.505	5.250	3.370	2.512		Significant
Accuracy	Degree	21.750	2.815	15.000	1.309	4.605		Significant

It is clear from the results of the t tests shown in Table (6) that there are significant statistical differences between the pre- and post-measurements on all research variables and in favor of the post-measurement of the experimental group compared to the control group.

Discussion

Through the presentation and analysis of the results of the test between the pre- and post-knee angle in the maximum bend and angle of the trunk from the vertical plane at the moment of kicking and the accuracy test, it appeared that there are significant differences between the pre- and post-test and in favor of the post-test, the researchers attribute this development in the results of post-tests and special exercises by the smart jacket, which included stomach exercises by the researchers, to the effective effect of reducing the effort.

The use of the smart jacket and the application of the exercises prepared on it made the players more accurate in shooting various offensive skills, whether direct or indirect at the right time and with the least effort and not to exaggerate the performance, such exercises that range between very high motor speed and high production of muscle strength impose greater demands on the target muscle groups.

In addition, these exercises have played a major role in developing the angle of the knee in the maximum flexion and the angle of the torso in the vertical plane at the moment of kicking, the help of using the smart jacket appeared through the ability of players to feel the movement in its correct form and how to guide the man in the right path.

Discussion of the results of the post-tests of the research variables for the control and experimental groups

It is clear from Table (7) that there is a significant difference for both control and experimental groups and in favor of the post-test, but compared to the rate of development and the two groups, we note that the ratio is higher for the experimental group compared to the control group.

The researcher attributes that the differences that appeared in the results of the post-tests of the control group to the effectiveness of the exercises prepared by the trainer and applied by the group.

As for the differences that appeared in the results of the experimental group tests, the researcher attributed them to the effectiveness of using the device in the exercises prepared by the researcher, which was applied to the proposed device through skill training doses that were applied to the players, and when the device has the following advantages:

- The speed of determining the accuracy of the kick of the device by determining the basic kicking point on the suit and giving it a high value compared to the rest of the other areas of the body, unlike what is done through training from the trainer, where when he wants to train the player on the types of kicks, the trainee is monitored for the coach's leg in full and then the player takes the appropriate basic position (i.e. the performance of the kick is relatively inaccurate). While through the device, the accuracy of kick performance is determined quickly with the presence of the effects element to obtain the highest value for kick performance, thus, the accuracy of the player's performance increases and develops it, and this was done by putting a visual signal, this is confirmed by Hara: "The reaction takes place at the right moment according to duty and quickly, and the signal can be audio, visual or the totality of motor behaviors." (Hara, 1990).

- This is what (Abdul Karim Fadhel and Abdul Hadi Hamid, 2008) stated that "the counter-response movements that constitute the essential and basic pillar of karate, especially in front kicks...which gives the player the ability to follow the player's movement continuously, which must be available to players who find the way to perform the response in a correct manner, at the right time and in the right place." (National Library, 2008).
- Works to develop neuromuscular compatibility by linking the focus mediated by the eye to take the appropriate offensive position and the application of the type of defense "Good compatibility comes through a homogeneous motor relationship based on the correct and precise timing between a certain part of the body, such as the compatibility of man and eye... to reach the legal goal of the competitor as soon as possible and achieve a touch" (Maleh, 2009).
- Where the device contributed to developing the level of accuracy of the technical performance of the May Giry kick, and the exercises contributed to raising the level of skill performance of the players, which led to the development of motor compatibility between technical performance and accuracy of kick performance.

(The accuracy of motor performance and the accuracy of kick performance are closely related to each other, and complement one another as the accuracy of the performance of defenses a good indicator of the accuracy of successful motor performance, the accuracy of the performance of the defense expression of the control of the movement (Mainel, 1987).

Conclusion

In the light of the results reached by the researcher through the field experiment and using appropriate statistical means, the researcher concluded the following:

1. Exercises prepared by the trainer and exercises with the proposed device have a positive impact on the kick of May Giry in karate.
2. The percentage of development of the accuracy of the May Giry kick using the proposed device in exercises was greater for the experimental group compared to the control group.
3. The performance of the skill perfectly according to the bio kinematic variables accelerates the accuracy of the performance of the skill and does not allow technical errors in the performance, and this is what the device worked on by determining the place of the kick for the feet.
4. The device prepared by the researcher contributed effectively to giving immediate feedback, as the device was the source of this feedback.
5. The device prepared by the researcher gave high self-confidence in addition to the elements of excitement and suspense.

Recommendation

In light of the previous conclusions, the researcher recommends the following:

1. Clubs in the province and the country to be used as a device circulating the device on training assistant and enter it within the training.
2. Experimenting with the device on different age groups.
3. Modifying the device to be able to use it in kicks and other skills.
4. Designing and manufacturing assistive devices from simple materials available in the local markets to teach various mathematical skills.
5. The need to pay attention to sensory, visual and auditory perceptions when training young players
6. The need to prepare new exercises that suit the requirements of karate and the level of development in it
7. The need to pay attention to complex exercises between the perception of stimuli and respond to them in different environments because most of the karate skills of closed skills that need to provide accurate responses.

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