

Design and Manufacture of the Electronic Device to Measure the Compatibility and Speed of Motor Response Lower Limbs Fencing

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ABSTRACT

To select players for the sport of fencing requires from the coaches characteristics of compatibility and responding motor speed. The coaches are working hard during the training period. They strive to develop them. The problem of the selection in the measurement of these two characteristics is made through some manual tests of time calculating by someone. This method does not give sufficient objectivity in measurement because there is a lag of time between, on one hand the player movement during the start and finish and on the other hand the speed of the movement of the manual timer (it coincides in pressing the timer during the starting or stopping time at the end of the movement). Study aimed to design a sensitive electronic device that works in two ways to measure the compatibility and agility to respond the lower limbs with high accuracy and through the movement of the player tested themselves and consistently high. Use descriptive approach to students in the third stage and studied fencing of their number (57) students for the academic year (2015-2016). After manufacturing and rationing device and tests performed it for the purpose of the statement of the efficiency and quality of the designer machine and the factory has been applied compatibility testing and the speed of the motor response to the sample of the research concluded:

1. The plant device is an electronic device is sensitive with precision high- quality, made for the first time in the sports field to measure (synergy+ kinetic speed of response).
2. The first works in a different ways to measure the synergy and the second to measure the kinetic response speed of the lower limbs.
3. The way to measure at the same time for training to develop those capabilities.
4. The mothed of manufacturing a simple, inexpensive, fast and raw materials available in the local markets and high quality, and sends a thrill of excitement through its use.

Keywords: Manufacturer-electronic device, Compatibility, Responding motor speed, Fencing

INTRODUCTION

Fencing is a sport of attack and defense and precedence touching an opponent so it requires from its practitioners

a lofty physical perform in order to reach the planned results. Fencing player needs to be good at using the movements of two feet's and arms in the attack, defense and coordination with the work of the nervous system to integrate and implement movements of different types of high speed, and in line with the performance skills, that means perform any number of compound movements at a time without work or additional complementary movements or restore the attack again. Because fencing movements are generally characterized by small and precise performance of kinetic range. Fencing player must take into his consideration the

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compatibility and speed of response of the kinetic parameters, that is one of the important factors to reach the goal of an opponent easily. Fencing player should work on the integration of different movements in the context characterized by streamline and consistency and good performance through consensus foot and arm and the goal of the opponent and the movement of a quick compromise.

The compatibility is the coordination and integration of parts in the movements which is reflecting the good performance and the beauty of the movement. The performance either consists a single movement or a chain of kinetic movements, it requires mainstreaming of many movements, this what (Williams) conforms, the compatibility is the ability to coordination and integration between the compound and an independent means of different methods of sensory patterns in the kinetics of elaborate systems, and the more the need for a level of coordination and integration has increased and this indicates a good performance and adequacy (7:42).

So to select players for the sport of fencing requires from the coaches characteristics of compatibility and responding motor speed. The coaches are working hard during the training period. They strive to develop them. The problem of the selection in the measurement of these two characteristics is made through some manual tests of time calculating by someone. This method does not give sufficient objectivity in measurement because there is a lag of time between, on one hand the player movement during the start and finish and on the other hand the speed of the movement of the manual timer (it coincides in pressing the timer during the starting or stopping time at the end of the movement).

So the two researchers strove through the design of a sensitive electronic device which works in two ways to calculate the compatibility and agility to respond the lower limbs with high accuracy and through the movement of the player tested herself and consistently high.

So the study aimed to design and manufacture an electronic device to measure the compatibility and the kinetic response speed of the lower limbs.

RESEARCH PROCEDURES

Research methodology

Use descriptive approach to solve the problem of the research.

Table 1: The specifications of the sample

Statistical methods	Chronological Age/year	Mass/Kg	Height/cm
Arithmetic mean	22.11	64.18	166.7
Medium	22	65	167
Aberration Standard	1.04	3.78	3.24
Coefficient of twisting	0.39	0.94	1.8

As the coefficient of twisting sandwiched between ± 3 , that means the research sample has a normal distribution

The Society and a Sample of the Research

The research community was limited and appointed by the students of the third stage, in the study of fencing, their number were about (57) students, for the academic year (2015-2016) and they were divided as follows.

(28) students as a rationing sample (the experience of an exploratory) to make the scientific foundations of the device.

(26) students as an application sample.

(3) students have been excluded for the lack of their presence in the tests.

(absence); thus the sample ratio of the society will be (rationing sample + application) (94.7%) The table (1) shows the specifications of the sample.

Devices, tools and the means of gathering information

- A device is made to measure the compatibility and responding motor speed.
- Notebook, pens to write down the data and notes.
- Photographic camera.
- Arabic and foreign sources and references.
- International information network, internet.
- Observations and experimentation.
- Personal interviews.
- Assistant team.
- Fence arm.
- Timer.
- Pieces of chalk + adhesive tape + one color cards.

Design and manufacture the device

The two researchers worked on design and manufacture a device to measure the compatibility and speed of

motor response of the lower limbs for the fencing players. Following are the details of the device.

Device components

The device name: It is an electronic device to measure the compatibility and speed of motor response lower limbs fencing, the device consists of:

- 1) The main mother board: (123 cm length – 123 cm width – 15 cm height). As it is shown in Figure (1).
- 2) A square accessory connected with the motherboard, in separated from it: (61 cm length – 33 cm width – 15 cm height).As it is shown in Figure (2).
- 3) The beginning base (start):
 - a. Fiberglass board: (32 cm length – 30 cm width – 2 mm height).
 - b. A square wooden piece: Its measurements are the same as the fiberglass measurements a bore.
 - c. Platinum 2 pieces.
 - d. Spring: 30 cm length – 15 cm the diameter – 1 kg the compressive strength.

- e. A lamp: 220 volt lamp is fixed inside the spring.
- 4) Spring: They are (10),distributed on the tenth circles,that each circle has one spring 30 cm length 15 cm diameter – its compressive strength is 1 kg. As it is illustrated in figure (3).
- 5) Lamp: (10) lamps are distributed on the tenth circles, that each circle has a lamp 220 v, they are fixed inside the spring, they are numbered (1-10),

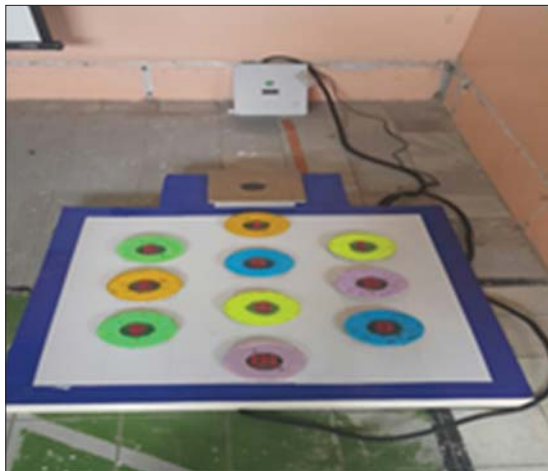


Figure 1: Shows the main motherboard

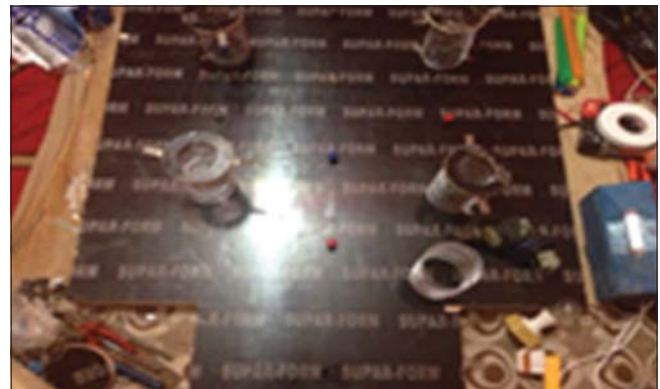


Figure 3: Illustrates the spring



Figure 2: Shows the motherboard accessory and the beginning base (start)



Figure 4: Is illustrated that the lamps are illuminated

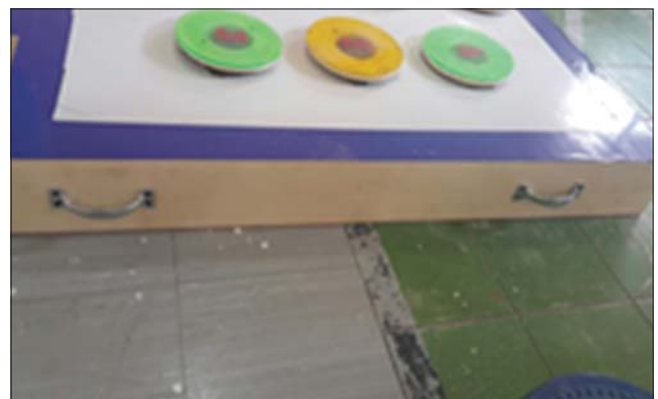


Figure 5: Illustrated the handles

so these lamps have different colors, that each two lamps has one color, series linkage lamps. 1+2 lamps have orange color, 3+4 lamps have green color, 5+6 lamps have blue color, 7+8 lamps have yellow color, 9+10 lamps have pink color, As it is illustrated in figure (4).

- 6) The wooden pieces: these wooden pieces are round and pierced from the middle, the measurement of its diameter is (15 cm), they are (10) wooden pieces, distributed on a number of the lamps and the springs, each wooden piece has its own number, and fixed on the motherboard, the spring and the lamp are fixed under it and the fiberglass is fixed on it.
- 7) Glasses boards (fiberglass):- Their shapes are round, each one its diameter(15cm), they are (10) and they are distributed and fixed on the wooden boards, they are numbered from (1-10), these glasses boards (fiberglass). However, they are unbreakable and bear high pressure and weight up to (150 kg).
- 8) Handles: The device has four steel handles to facilitate carry and move the device from one place to another, as it is illustrated in figure (5).
- 9) Platinum: They are (20), distributed to the tenth lamps, that each lamp has (2) pieces of platinum.
- 10) The control board (The board):- It is a box with a

door and a lock, it is (40cm) length – (30 cm) width – (17 cm) height + (220 v), as it is illustrated in figure (6), it has four hangers for hanging it on the wall.

- 11) Switch in order to turn on and off.
- 12) Electronic counter calculates seconds and parts of seconds.
- 13) Circuit breaker (1).
- 14) Relay (11) they are numbered, each relay belongs to the lamp which is numbered the same.
- 15) Connecting cable: To connect the power into the device, 1.5m length.
- 16) Stran connection cable: It's a group of stran wires, its size 0.25 mm, they are (11) wires, they connect from one side to the device that they are distributed and connected to the lamps and from another side they are connected to the board that stretching inside the board so each wire connect to a relay, the length of these wires (5 m) and they are preserved inside (5 m) long cover.

How the device works

The device works in two ways:-

The first way:

In case of measuring the kinetic compatibility for the lower limbs, the device is connected to the power so the electronic counter starts to countdown to the zero degree and when the tester goes up to the beginning point, then all the lamps will be illuminated and when the start signal is given, the tester will be moved from the starting board so that the right foot is placed on the odd numbers and the left foot on the even numbers, knowing each two numbers with one color is connected with series connection.

When the feet are lifted from the start board, the time counter (the timer) will begin to operate it electronically and automatically, and here the tester should be moved among the circles with numerical sequence and succession that the right foot is placed on the odd numbers and the left foot is placed on the even numbers, that when the right foot is placed on the number (1) the light of the limp is still on until the foot is placed on the number (2) and after that is moved into (3+4) so (1+2) lamps are off, thus until the tester reach to the number (10) and then dismantling from the device that all the lamps are off and the time is stopped from the moment of learing the device by the tester, when the testing is repeated on another tester, the device should be rested to start once again.



Figure 6: Illustrates the control board and the counter.



Figure 7: illustrates the cover that contains the wires inside it.

Thus the time is calculated from the moment of leaving the start point to the moment of leaving the circle number (10), so whenever time is less this indicates that the tester has a high nervous and muscular compatibility between the lower limbs and the eyes and vice versa, whenever the time of the moving among the circles is more this indicates that the tester has a weak nervous and muscular compatibility.

The second way

In case of measuring the speed of motor response, here the tester stand on the start point and the lamps are manually illuminated arbitrary by the counter or the assistant who is operating the device, here time is calculated to turn off ten lamps from the moment of leaving the foot of the tester the start point to the moment of pushing on the lamp, then time is calculated automatically from the moment of leaving the lamp up to leaving the device platform and that is made after finishing the pushing on all the lamps.

The scientific foundations of rationing the device and the method of using it

Honesty

After the completion of the designing and manufacturing the device, the procedure of testing the honesty had been made to it through:

First: The honesty of the content

It has been presented on a group of experts and specialists in the field of tests measurement and fencing sport, they confirmed its validity to measure the compatibility and the speed of kinetic response of the lower limbs in the fencing sport with (100%) harmonic ratio.

Second: The discriminatory power:

It is the ability of the device to discriminate individuals who have high compatibility and speed of response from those who have low compatibility and speed

of response (28) students from the third stage had been chosen arbitrary in the fencing lesson and after discharging the results and arranging them by counting them down from the highest degree to the lowest degree, (27%) ratio from the highest degrees had been chosen in the test of the compatibility and the speed of kinetic response, and (27%) from the lowest degrees, thus, the number of each group(7) students, i.e. that the number of the results of the students who are subject to the analysis are (14) students. The second test had been used for two independent samples for knowing the differences between the averages of the high group and the low group. In the tests of the compatibility and the speed of kinetic response. The (T) value that was calculated according to the level of the error that was prepared as a mark to distinguish the test by comparing it by the level of an indication (0.05), obviously the test of the compatibility and the test of speed response were distinguished, that the value of the level of error was less than the level of an indication (0,05). As it is illustrated in the table (2).

Stability

(28) students from the third stage had been tested in the fencing lesson on the device to measure the compatibility and the speed of kinetic response, seven days later the test had been repeated once again. After making the coefficient of stability between the two tests that illustrate the value of the coefficient of stability was very high, i.e, the device has the high accuracy, objectivity and quality to measure the compatibility and the speed of kinetic response for the lower limbs in the fencing. Table (3) illustrates that.

objectivity

It is meant there is no disagreement of the coaches to estimate something, since the method of registering the results of the compatibility and the speed of kinetic response had been subjectively made by the device depending on the movement of the tester on the device.

Table 2: The discriminatory power to test the compatibility and the speed of the kinetic response of the manufactured device

Tests	Group	Arithmetic mean	The standard of deviation	The (T) measured value	Level of error	Indication of the difference
Compatibility	High group	5.24	0.48	6.1	0.000	Moral
	Low group	8.42	1.2			
Speed of kinetic response	High group	5	0.81	5.3	0.000	Moral
	Low group	7.14	0.69			

Moral at a level of indication ≤ 0.05

Table 3: The stability to test the compatibility and the speed of kinetic response for the manufactured device

Test	Coefficient of connection	Level of the error	Indication
Compatibility	0.97	0.000	Moral
Speed of kinetic response	0.91	0.000	Moral

Moral at the level of indication ≤ 0.05

Timing starts from the beginning of her movement and end at the end of her movement. There is no subjective factors affecting the way of registering, i.e. the two tests which designed on the device have a high objectivity, this is what the experts proved about the validity of designing the device to measure the compatibility and the speed of kinetic response for the lower limbs.

Tests of the research

After identifying and rationing the device and the tests that was conducted on it. The two researchers identified the following tests for the main experiment:

- The compatibility test on the manufactured device which had been illustrated in the way of device operation.
- Testing of the speed of responding on the manufactured device that was illustrated in the way of device operation.
- Testing of the kinetic compatibility of the lower limbs in the fencing(31:1).

Goal of the test: To measure the kinetic compatibility of the feet.

The description of the performance

Ten circles are painted on the ground, the diameter of each circle is (10 cm) and the distance between the odd numbered circle and the even numbered circle which would follow the odd circle is (30 cm) and they are numbered from (1-10). The tester stand in front of the painted circles on the ground with an appropriate distance, at the beginning, the feet would be on the guard position. The tester begin to set the feet to jumping quickly on the circles with a compatible position, i.e. the right foot on the odd numbered circles and the left foot on the even numbered circles with a serial and sequential position, forward and backward and the tester is given two attempts and the best one is calculated.

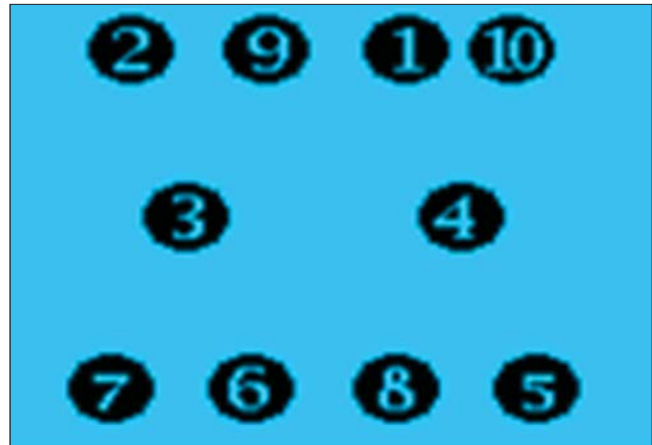


Figure 8: Illustrates drawing the test of muscular compatibility of the feet

The method of registration

The time that the tester takes in the performance of this test is calculated as it is illustrated in the figure (8).

The test of Nelson for the speed of kinetic responding of the lower limbs(3:149)

The goal of the test

It is the ability of responding and moving quickly and accurately in accordance with the choice of exciting.

The description of the test

The test area is painted with three lines, the distance between each line and the other(6.40 m) and length of each line is (1 m).

- The tester stops at the two ends of the halfway line that facing the coach who stands at the other end of the line.
- The tester takes a standby position that the middle line will be between the feet so that her body bends forward slightly.
- The coach hold timer with one hand and lift it up then he moves his arm either to the left or to the right and at the same time he gets the time running.
- The tester respond to the sign of the hand and she tries to run as possible in the specified direction to get to the sideway line that the distance is far from the halfway line with (6.40 m). And when the tester finishes the correct sideline so the coach would stop the timer and if the tester began to run in the wrong direction, the coach would continue in running the timer until the tester changes its direction and gets to the line of the correct side.
- The tester is given (10) consecutive attempts

(20 sec.) between each attempt and the other, five attempts for each side.

- The attempts are chosen in an arbitrary and successive way in each side and to achieve that, ten cardboard pieces (cards) are prepared with unified size and color and it is written on the five of which a word (left) and on the other five cards a word (right), then they are turned upside down in a good manner and are put in a bag and are pulled without seeing them.

The registration

The time of each attempt is calculated, and the passing score is the average of the ten attempts. And the figure (9) illustrates that.

The statistical means

The two testers used the ready- statistical bag (spss) according to the following rules:

- The arithmetic mean.
- The standard of deviation.
- The coefficient of the simple correlation.

Table 4: The relationship of the correlation of the tests that designed on the manufactured device with other tests to show the efficiency of the device

Tests	Coefficient of correlation	Level of error	Indication
The tests of the kinetic compatibility on the device	0.91	0.000	Moral
The tests of the kinetic responding of the lower limbs			
The test of the speed of kinetic responding on the device	0.89	0.000	Moral
The test of the speed of kinetic responding without device			

Moral at the level of indication ≤ 0.05

Table 5: The results of the research sample in the tests

The tests	Arithmetic mean	The standard deviation
The test of the kinetic compatibility on the device	4.76	0.53
The test of the kinetic responding of the lower limbs	4.89	0.83
The test of the speed of kinetic responding on the device	3.94	0.62
The test of the speed of kinetic responding without device	4.85	0.71

- The law of the centigrade ratio.
- The test of the independent samples of (T).

DISPLAY AND DISCUSSION THE RESULTS

The purpose to show the efficiency and the quality of the designed and manufactured device a test of the compatibility and the speed of responding of the lower limbs had been made on the device to an application sample which (26 students), and a relationship, of these two tests with the test of the compatibility of the lower limbs and (Bass test) to modify the speed of kinetic responding without using the device, had been done. And as its illustrated in the table (4).

It is obvious from the table(4) that there is a high correlation relationship between the compatibility test and the speed of kinetic responding of the lower limbs with the device and without it. This proves that the testers results in the two tests of the compatibility ant the speed responding of the lower limbs are stable, i, e, the device has the high ability of measuring the compatibility and speed of kinetic responding, the researchers attribute that for the non- intervention of the registered or the rectifier in registering the test results gives a high stability and the objectivity of the way of doing the test.

As the manufacturing of the devices and the adoption of modern technology in doing the tests gives high indicators of accuracy and calculating the results are far from the bias and self- errors (38:6).

The sport devices which appeared to the word today according to the scientific and technical concepts which is sophisticated that express the level of the

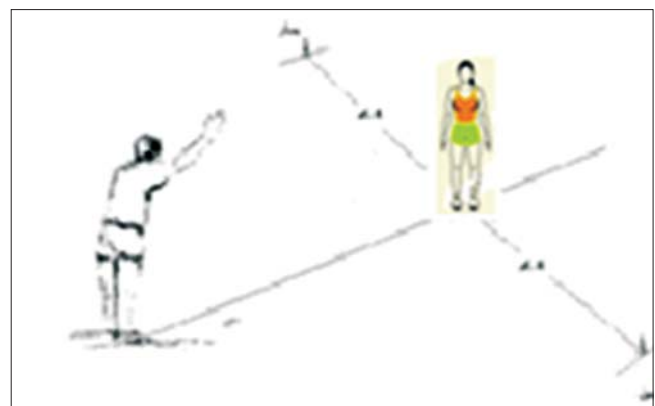


Figure 9: illustrates The Nelsontest for the kinetic responding.

technology of the modern era, that there is now a huge number of the diverse innovations and inventions which serve the various sport fields and contribute to developing the tests and measurements in the sport training and the kinetic performance (12:5).

The sport coach can take the full advantage of the modern and sophisticated technology in the measuring and testing devices or the other technological devices indirectly in the presses of train in to upgrade the capabilities of the players to the high levels and that through looking forward at all the era developments and to exploit them for develop of cognitive capabilities, so the technology in the field of the sport training in the continuous change (46:2).

Table (5) shows convergence in the results of testing the compatibility and the speed of kinetic responding to the research sample on the device and without it. So the results apparently better on the device from those tests without the device for the absence of the manual registration factor by the registerer and the adoption of the electronic registration by the device. So that gives an accurate and reliable indicator for the validity and the quality of the tests on the manufactured device. (Muktar Salim) adds about disappearing of the traditional suspension watch (Timer) and the ribbon of the end-line of the running competitions in the racetrack, (the line that the runner used to cut by his chest) the contemporary technology exchanged it by an imaginary electronic line so we find on the starting line the referee uses a pistol connected with a special electronic circle with a timer, where it starts to measure the time from the moment that the gas leaves the nozzle of the pistol until the electronic end line in the form of special televising cameras, they have placed in various places and corners that reveal the end line to score (12 pictures) for the runner with the time that is measured with a second and part of the one hundred of the second and identify his arrangement among the rest of the end of the race becomes ready to be read in a time no more than only (10 sec.) from the end of the racetrack. (23:4).

THE CONCLUSION

1. The manufactured electronic device is sensitive and with high accuracy and quality, it is manufactured for the first time in the sport field to measure two capabilities of the lower limbs (kinetic

compatibility + kinetic responding speed).

2. It works in two different ways, the first is to measure the kinetic compatibility and the second is to measure the speed of kinetic responding of the lower limbs.
3. It is prepared a mean of measurement and at the same time a mean for training and for developing of those capacities.
4. The way of its manufacture is simple, inexpensive, fast with available initial materials (spare parts) in the local markets with a high quality.
5. It is easy to carry it and transfer it from one place to another.
6. It is easy of using it by any person.
7. It suits most of the sport events and games.
8. It is appropriate with the different ages and weights. As bears (150 kg) weight.
9. It is easy to work and perform on it and it provides the security and the safety to its users.
10. It is a matter of thrilling and exciting during its use.

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