The effect of qualitative exercises with an assistive device in developing the speed of the motor response of tennis players

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Abstract:

The use of various exercises and the involvement of sports equipment and tools in raising the bio-kinetic capabilities and capabilities had a positive and economic impact on improving the athlete’s efficiency to reach higher levels. It is related to learning and training as it diagnoses and compares movements because it adopts accurate measurement to show the technical details of performance in its proper form.

Through the researcher’s experience being one of the tennis players and a coach now, as well as observing many official matches inside and outside Iraq, he noticed that there is an apparent slowness in reaching the ball at the right time in the skill of volley, which leads to losing many points and thus losing the match. The researcher believes The reason for this is that the majority of coaches do not use innovative modern equipment during their training for that skill, in addition to that, the lack of sufficient focus on the speed of the motor response to reach the ball in the right time, which makes the player play in the backline and not climb into the net to avoid losing the point, which allows the opposing player to return the ball without any difficulty. The research objectives were to prepare qualitative exercises with a device designed to develop the speed of the motor response and to identify the effect of qualitative exercises with a device designed to develop the speed of the motor response.

Conclusions:

The researchers concluded that there is an effect of the exercises accompanying the proposed device in developing the speed of the motor response for tennis players, that the proposed device helps in the process of measuring the speed of the motor response and helps in training to develop the speed of the motor response.
**Introduction:**

The use of various exercises and the involvement of sports equipment and tools in raising the biomechanical capabilities and capabilities had a positive and economic impact on improving the athlete’s efficiency to reach higher levels. It is related to learning and training as it diagnoses and compares movements because it adopts accurate measurement to show the technical details of performance in its proper form.\(^{(1)}\)

Through the researcher’s experience being one of the tennis players and a coach now, as well as observing many official matches inside and outside Iraq, he noticed that there is an apparent slowness in reaching the ball at the right time in the skill of volley, which leads to losing many points and thus losing the match. The researcher believes the reason for this is that the majority of coaches do not use innovative modern equipment during their training for that skill, in addition to that, the lack of sufficient focus on the speed of the motor response to reach the ball in the right time, which makes the player play in the backline and not climb into the net to avoid losing the point, which allows the opposing player to return the ball without any difficulty.\(^{(2)}\) The research objectives were to prepare qualitative exercises with a device designed to develop the speed of the motor response and identify the effect of qualitative exercises with a device designed to develop the speed of the motor response.\(^{(3)}\)

**practical part:**

The researchers used the experimental method on the advanced players for the tennis team of Najaf Governorate, in a comprehensive inventory method, and they are (5) players, and thus the percentage of the sample is (100%), and the researcher gave five attempts to each player and thus the research sample is a sample of attempts consisting of (25). An attempt for each sample, which conducts the main experiment on them.

**Sample homogeneity:**

To ensure the homogeneity of the research sample members, and motivated by adjusting the variables that affect the accuracy of the research results, the researcher verified the homogeneity of the sample members through the variables related to physical and morphological measurements that represent (mass, length, torso length, thigh length, leg length, humeral length, forearm length, training age), the researcher used the torsion coefficient, as shown in Table (1):

Table (1)
The statistical parameters show the arithmetic mean, standard deviation, median, and torsion coefficient for the variables (mass, length, torso length, thigh length, leg length, humerus length, forearm length, and training age).

<table>
<thead>
<tr>
<th>Variables</th>
<th>Unit of measure</th>
<th>mean</th>
<th>Standard deviation</th>
<th>Median</th>
<th>skewness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mass</td>
<td>kg</td>
<td>76.40</td>
<td>9.65</td>
<td>78</td>
<td>0.497-</td>
</tr>
<tr>
<td>Height</td>
<td>cm</td>
<td>179.40</td>
<td>4.22</td>
<td>179</td>
<td>0.284</td>
</tr>
<tr>
<td>Stem length</td>
<td>cm</td>
<td>54.40</td>
<td>3.93</td>
<td>55</td>
<td>0.458-</td>
</tr>
<tr>
<td>Thigh length</td>
<td>cm</td>
<td>44.00</td>
<td>3.46</td>
<td>45</td>
<td>0.867-</td>
</tr>
<tr>
<td>Leg length</td>
<td>cm</td>
<td>45.20</td>
<td>1.72</td>
<td>45</td>
<td>0.348</td>
</tr>
<tr>
<td>Length of the humerus</td>
<td>cm</td>
<td>30.20</td>
<td>1.60</td>
<td>30</td>
<td>0.375</td>
</tr>
<tr>
<td>Length of the forearm</td>
<td>cm</td>
<td>28.80</td>
<td>1.17</td>
<td>29</td>
<td>0.512-</td>
</tr>
<tr>
<td>Training</td>
<td>year</td>
<td>6.20</td>
<td>0.75</td>
<td>6</td>
<td>0.8</td>
</tr>
</tbody>
</table>

* because the results of the skew coefficient are all between (±1), the research sample members are homogeneous with the mentioned variables.

**Designing a device to develop the speed of the motor response, some biokinetic variables, and the skill of flying strike (volley):**

The design of the device relied mainly on the technical performance of the volley in all its primary stages because this strike is distinguished from all other strikes in that the process of hitting the ball takes place before it touches the ground, either with the front strike or the backstroke, and it is also characterized as the fastest of all strikes. It takes less time than the rest of the other strikes when it is executed, and I took into account the angles and heights to hit the ball, as I took three heights for the blow, which are similar to the height of the ball paths coming from the opponent, in addition to the device being installed inside the stadium to give the player the same conditions that he is exposed to in the competition, as well as away from the laboratories to which most researchers resort, where this device has been programmed according to mathematical equations calculated scientifically in terms of intensity and repetition to develop the speed of the motor response and some biokinetic variables and the skill of the volley, as shown in Figure (1).
Figure number (1)

Demonstrates a device for developing the speed of the motor response, some biokinetic variables, and the skill of flying strike (volley)

**device specifications**:

**First / the goal of designing the device:**

The goal of designing the device is to develop the motor response speed, some biokinetic variables, and the skill of flying strike (volley).

**Second / device details:**

**A- The electrical system:** The electrical system includes a fibre-class box measuring (10*28) cm. The box contains the electrical system that regulates the work of the lamps alternately randomly in the right and left columns

This system consists of:-

1- A switch to operate the system and shut it off-on.

2- Electrical transformer: This transformer works by converting electrical current from 220 volts to 12 volts
3- Arduino (1) Mega: It is an electronic development board consisting of an open-source electronic circuit with a microcontroller programmed by a computer, designed to facilitate interactive electronics in multidisciplinary projects.

4- Circuit board relays: It consists of 8 relays and is controlled by a potential difference of 5 volts to operate the loads that operate with constant or alternating current. It can be used with Arduino or Raspberry Pi. The circuit also contains an LED lamp to indicate the operational status of the relay.

Specifications

- Number of relays: 8 relays
- Operating voltage difference: 5 volts (constant current)
- Operating current: 15-20 mA
- The maximum potential difference that the relay can withstand (alternating current): 250 volts - 10 amps
- The maximum potential difference that the relay can withstand (constant current): 30 volts - 10 amps

Operating Instructions:

- Quick click to display the entry and exit voltage.

Medium pressure to enter the model of filtering and purifying the output voltage.

Long press to enter the power saving mode for the display screen and LED lights.

Using a small ordinary screwdriver, the output voltage can be increased or decreased as desired.

- Features of the completed device:

1. It does not require a considerable material cost.
2. Easy to carry and transfer from one place to another.
3. It can be placed in any outdoor playground.
4. It can be used in many sports.

E - How the device works:

1- The player stands in front of the device in a standby position.
2- When the device is turned on, the device will give an audible alarm signal (intermittent sound) descending to prepare and start the test.

3- At the start of the test, the visual stimuli (the previously explained lights) work randomly for one second for each of the six lights.

4- After that, the player moves quickly towards the ball adjacent to the incandescent lamp to hit it with the skill of the flying strike.

5- If the player hits the ball within the allotted time while the lamp flashes, it is considered a valid injury, a point is recorded for him, and another lamp is lit directly, chosen by the device at random.

6- If the trained player cannot hit the target within the necessary time, it is considered an incorrect injury and faults are recorded.

7- The total exercise time and the number of touches within the exercise can be controlled through the data entry panel (Keypad).

8- At the end of the test, the device emits a distinctive sound indicating the end of the test.

9- Correct and incorrect results are taken via the LCD screen.

**• The exploratory experience of the device used:**

The exploratory experiment is one of the essential steps in implementing scientific research, through which the researcher receives information and notes regarding criticism of research procedures. This experiment was conducted on (Saturday) corresponding to (4/1/2020) at two o'clock in the afternoon at the University of Kufa Stadium, and the sample of this experiment was formed from (6) players from the original research community sample who did not participate in the primary research experiment.

**• Scientific bases of the device used in the research:**

The scientific foundations of the kinetic response speed device, represented by the coefficient of honesty, stability and objectivity, plays a vital role in determining the validity of the device and the possibility of its good application. And who did not participate in the direct research experience?

**First, the validity of the test:**

The device was presented to a group of experts and specialists through personal interviews in this field to determine its suitability for the research sample.

**Second: Test reliability:**

[www.turkphysiotherrehab.org](http://www.turkphysiotherrehab.org)
The researchers applied the test in question to a group of (6) players from the sample of the original research community who did not participate in the primary research experiment on Saturday 4/1/2020, and the tests were re-applied again on Saturday 11/1/2020 With an attempt to provide the same conditions for the first test in terms of time, place and test administration. After collecting the results of the two tests, the researcher found the simple correlation coefficient (Pearson), and extracted the value (TR) to show the significance of the correlation coefficient between the two tests. The reliability coefficient reached (0.80), indicating that the device has a high stability coefficient.

**First, the speed of the motor response.**

**Pretest:**

The researchers conducted tribal tests for the research sample before starting the main experiment, with all variables controlled

**Implementation of specific exercises with an assistant designer device:**

The researchers prepared qualitative exercises with the help of a designed device, as these exercises will include the skill and physical aspects of the skill of the flying strike in the game of tennis. They will be consistently distributed in the training units, taking into account the components of the training load (intensity, repetitions, appropriate rest periods) and will be codified. His exercises are based on a scientific basis, as well as the biokinetic ability of the research sample and the tools used, to be able to develop the speed of the motor response, as well as to improve the biokinetic variables and the performance of the tennis strike to achieve the purposes and objectives of the training process. (5)

The details of specific exercises with an assistive device will be as follows:

1- The total number of training units The exercises will include (24) units.

2- The number of weekly training units that will include (3) units for (8) weeks.

3- The specific exercises in one training unit (30-35) minutes (the main section only).

4- Training days during the week will be (Saturday, Monday, Wednesday).

5- The goal of specific exercises with an assistive device is to develop the motor response speed.

6- The goal of specific exercises with an assistive device is to improve biokinetic variables.

7- The goal of qualitative exercises with an assistive device is to develop the front and backplane strike skill.

8- Taking into account the exchange of work between muscle groups.
9- Planning specific exercises with an assistant device during the daily and weekly units are (2-1).

Post-tests:

The post-tests were conducted, and the same conditions, conditions, and instructions were used in Pretest.

The statistical methods:

The researcher uses the statistical package (spss) to analyze the results of the research:

Results:

Presentation and analysis of the results of the pre and post-tests for the variables under study and discussion:

Presentation and analysis of the results of the pre and post-tests Testing the speed of the motor response of tennis players:

Table (2)

It shows the arithmetic mean, standard deviation, the calculated (t) value, and the level of significance to test the motor response speed of the tribal and remote tennis players.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Pre-test</th>
<th>Post test</th>
<th>(t) calculate</th>
<th>Significant</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>STD.EV</td>
<td>Mean</td>
<td>STD.EV</td>
</tr>
<tr>
<td>Motor response</td>
<td>8.4</td>
<td>0.678</td>
<td>10.64</td>
<td>0.887</td>
</tr>
</tbody>
</table>

Table (2) for description and statistical inference shows the motor response speed test results in the pre and post-tests. Its arithmetic mean values came in the pretest (8.4), with a standard deviation of (0.678), while their arithmetic means came in the post-test (10.64), with a standard deviation (0.887), and to know the differences between the tribal and remote tests of the experimental group, the researcher used the (T. test) test for the interconnected samples, so the calculated values of this test came to (8.745), and the (SIG) value was (0.000), which is a value less than (0.05), and this confirms the significance of The differences are in favour of the post-test results.

Discussing the results of the pre and post-tests, the test speed of the motor response of tennis players:
Through the previous results in the table (2), we see that the differences were significant between the pre and posttest to test the speed of the motor response and in favor of the post test, and given the specificity of the game of tennis, which depends on quick movements and reactions, (6) especially the skill of the plane strike, and therefore a device was designed to measure the speed of the motor response and with giving qualitative exercises with and without a device for the purpose of developing that biokinetic ability for the skill of flying strike for the players, as these exercises depended on the stages of the speed of the motor response for the appropriate time periods for training that fall within the phosphagenic energy system, and the researcher attributes the reason for the moral differences in the speed of the motor response to the diversity of these specific exercises which relied on the random visual stimulus and in many ways, including with the designed device (7) and others without the device to improve visual input and develop reaction and response, especially that the game of tennis depends on the reaction and response speed to a moving thing because the launch of the stimulus is (the ball) at a high speed and this speed needs a high reaction and response Therefore, the researcher used qualitative exercises with a motor response speed device as a means of Several distances less than the ball's launch effect, as well as increasing the speed and complexity of the stimulus for a few periods not exceeding (15 seconds) to avoid fatigue of the central nervous system, and thus the use of training methods and tools played an important role in the training process through the actual contribution to improving the efficiency of the biokinetic capabilities that gain the player. The speed of a kinetic response, (8) which in turn leads to reaching the optimum motor path in the implementation of duties during play, and this is what the researcher did and confirmed by (Mohamed Al-Daysti) "The use of modern devices and tools is one of the most important methods or alternatives to increase the effectiveness of the training process, which contributes to the development of shortcomings." (9), as well as the researcher’s observance of the principle of repetition and repetition in addition to the principle of diversification and the complexity of the appropriate training loads to create a state of adaptation to develop the speed of the motor response of the players, was the application of qualitative exercises on a regular and scientific basis, taking into account the components of the training load, and this was confirmed by (Mohammed Reda Ibrahim) as It indicates that “all components of the training load must increase relative to the total improvement achieved by the athlete, that is, the higher the level of the player’s improvement, the more The need to increase the components of the training load more” ( ), and also those exercises included the stages in which the speed of the motor response takes place, which is seeing the stimulus and getting used to following it from the moment of its launch and knowing the direction that the stimulus takes and its speed and the appropriate decision for the motor response, which agrees with the opinion of (Zatsursky) The player receiving the ball must see the ball first, know its direction, speed, and choose a plan for the
movement of receiving the ball and performing it.\(^{(10)}\) From the rest of the other three elements, especially if the thing (the ball) is not expected by the receiving player, the sensory time, which is the time required to perform the other three elements, is much shorter than the time of the first element, and does not exceed (0.05) a fraction of a second. 

The researcher was keen to improve the first element, the ball's vision, in qualitative exercises with the kinetic response of its importance to tennis players—post-test.

**Conclusions:**

The researchers concluded that there is an effect of the exercises accompanying the proposed device in developing the speed of the motor response for tennis players, that the proposed device helps in the process of measuring the speed of the motor response and helps in training to develop the speed of the motor response

**References:**

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