

The effect of MAXEX exercises in developing some of the biokinematic variables, physical abilities and scoring accuracy for football players

Amir Fahim Mohsen, Prof. Dr Diaa Jaber Mohamed and Prof. Dr. Alia Hussein Daham

Faculty of Physical Education and Sports Science, University of Babylon, Iraq

Email address:

Abstract. The importance of the research lies in preparing MAXEX exercises and knowing their impact on some biomechanical variables and physical abilities that are directly involved in the performance of the scoring skill on the goal in football. The research problem is that players did not use the correct motor paths represented by the biomechanical rules and the physical abilities through which the player can implement the scoring skill successfully with a high accuracy towards the goal. The researchers believe that the reason for this is the lack of using exercises commensurate with the football scoring skill by coaches. The research aimed to know the effect of MAXEX training on some physical abilities and the values of some of biomechanical variables that contribute to the speed and accuracy of scoring for football players. The researcher used the experimental method, the one-group design, to solve the research problem. The research community is determined by the (18) players of Naft Al-Wasat Football Club, which participates in the Iraqi league, for the youth category. The most important conclusions were MAXEX exercises contributed to the development of the physical abilities (explosive ability, strength characteristic of speed) and some of the biokinetic variables that contribute to the speed and accuracy of scoring. The most important recommendations included the interest in using MAXEX training on the basis of scientific training method to raise the physical ability and skill efficiency of young football players.

Keywords: maxex training, angle of starting, explosive speed, offensive ability and scoring.

1. Introduction to the research and its importance

Nowadays, the rapid scientific development is one of the most important features of the modern life. It includes all fields of science, including the sciences of physical education such as (sports training science, sports biomechanics, physiology, ... etc.). There is no doubt that adopting the results of research and studies is considered the basis of every work that is intended to be succeeded and developed.

The follower of the national and international football matches finds that these matches is characterized by strength, speed and excitement. These advantages are the result of a high level of physical abilities and skill capabilities that the player possesses in those matches. However, local player lake to these capabilities, which requires a serious thinking for those who are in charge of developing the football game, to work actively and rapidly and based on scientific thoughtful research at the same time. This could try to find quick and innovative solutions that help reducing the difference between the local and global levels on the one hand and keep pace with the development in the football game of on the other hand.

The physical abilities are one of the basic aspect that any football player must possess in order to be able to implement the requirements of the game. The development of those physical abilities according to modern training methods will certainly reflect on the skillful performance to be better. Therefore, benefiting from the sciences that related to the sports training science, including the (biomechanics) sport science, which is of great importance, due to it gives solutions to the problems facing the development of the training process by defining the correct mechanical rules for skillful performance.

The player's possession of physical and skill capabilities is not sufficient to perform the requirements of the game in the best way, so it is necessary of training process to focus on the correct biokinematic rules, whether (kinetic or kinematic), which helps to develop the skill performance in better way.

By using the researchers' knowledge and observations to the training process, they noticed that trainers' rarely use the physical abilities training sessions according to the biokinematic rules that are directly involved in the performance of the player's scoring skill. As well as the lack of optimal investment of the correct biokinematic variables in the skill performance.

Therefore, the researchers considered preparing MAXEX training, which would affect the most important physical abilities and the biokinematic variables that contribute to improve the speed and the accuracy of scoring in football

The aim of the research is to:-

1. Preparing MAXEX exercises to develop some physical abilities and biokinematic variables that affect to improve the speed and accuracy of scoring among football players.
 2. Knowing the effect of these training on the most important physical abilities of football players.
 3. Knowing the effect of MAXEX training on the values of some biokinematic variables that affect the speed and accuracy of scoring among football players.
2. The Research methodology and field procedures
 - 2.1. The Research methodology:

The researchers used the experimental method to solve the research problem in a one-group style with two pre and post-tests.

- 2.2. The research community and its sample

The research community was determined in an intentional way for the youth players of Naft Al Wasat Football Club for the season 2020-2021, which numbered (18) players, and the researchers chose (5) players as an exploratory experimental sample, which constituted (27,77%). The researcher chose (10) players for the main experiment, at a rate of (55.55%) and they excluded (3) players with a proportion of (16,66%) because they were not suitable for the research sample.

- 2.3. The field procedures:

After reviewing many scientific sources, conducting some personal interviews, and consulting with the two supervisors, the research variables were determined.

2.3.1. Description of the physical tests used in the research:

Test 1: The long jump from stability

- **The aim of the test:**

To measure the explosive ability of the two legs. (Mohammed Sobhi Hassanein and Hamdi Abdel Moneim, 1996, p.116-119).

- **Tools used:** A metric measuring tape and a drawing starting line.

- **Description of the test:**

The player takes the standby position on the edge of the starting line so that the feet are joined. Then he bends his legs down and opens the arms to the side from this position. After the whistle signal is given, the player starts horizontal jumping with a maximum force to cover the largest possible distance.



Figure (1) shows the explosive capacity test

Test 2: Bending and extending the knees in 20 seconds test: (Mohammed Sobhi Hassanein, 2003, p. 65)

The purpose of the test: To measure the characteristic speed ability of the muscles that bend and extend the knees.

Tools used: A stopwatch

Description of the test: bending and extending the knees completely from a standing position in a time of 20 seconds with no part of the body should be touching or depending on anything.

Measurement: The number of bending and extending times in 20 seconds.

Repetition: The number of bending and extending times in 20 second is an indicator of ability. The test is taken after repeating test.

Ability indicator: The test is repeated and the best result is taken.



Figure (2) shows the characteristic speed strength of the legs muscles test

2.3.2. Description of the skill tests used in the research:

The aim of the test: To measure the scoring accuracy (Diaa Jaber Muhammad, 2006, p. 95)

The test requirements: a football field, (10) balls, tape to designate the shooting area for the test, and measuring tape.

Description of the test:

The (10) balls placed in different places on a line inside the penalty area, as shown in the figure below. The player shoots in the marked areas of the test according to their importance and difficulty, in a sequence one after the other. The test should be performed in terms of running. The test starts from ball number (1) and ends by shouting ball number (10). The attempt is not valid in the case that none of the four targets where hit in each side.

Scoring: The number of balls that enter or touch the four specified goals on each side of the goal and on any of the feet, so that the scores for each of the ten balls are calculated as follows:

(3 Marks) are giving if the player score in the field number (3), (2 Marks) in the field number (2), (1 Mark) for the field number (1), and (0 Mark) for the rest the goal. The player is given only one attempt.

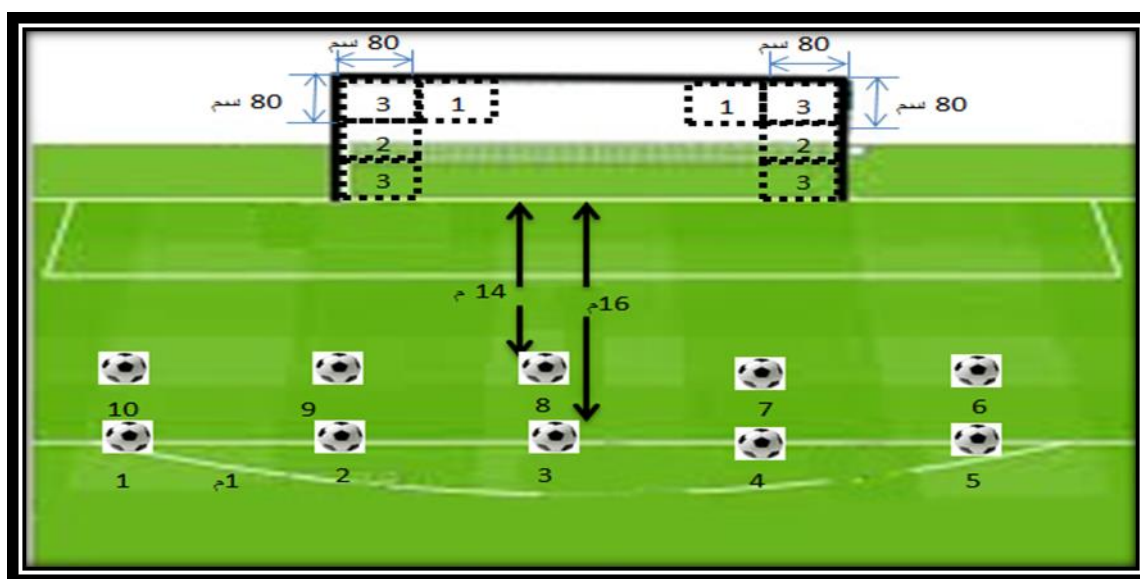


Figure (3) explains football scoring

2.3.3. Videography:

For the purpose of identifying the kinematic variables of football scoring skill, obtaining a scientific formula for studying these variables, and verifying the implementation of the research sample and the variables under the study objectively, the researcher used video photography as one of the tools of analysis in which player movements can be studied and described. Videography is an appropriate method in which the required accuracy of the players movements at a high speed is determined, when they cannot be known through observation because it is possible to photograph large numbers of images in small units of time. The cameras are operated by giving a signal to the photography team to operate them before starting the performance. is was placed next to the man kicking the ball, and this was done by specifying ten points for scoring (5) times for near-distance scoring (20) yards, and (5) times for long-distance scoring (25) yards. The location of the camera was determined at a distance of (3.5 meters) perpendicular to the middle of the distance (the last steps with the execution of the full kick). The height of the camera was (1.11 meter) from the ground perpendicular to the player while kicking the ball, taking into account the implementation of the left or right leg, where two cameras were used for the same purpose. A drawing scale with a length of (1 meter) was used, as it was photographed on the ten scoring points before the implementation process in the pre and post-tests photography to indicate the real distances and dimensions during videography. As shown in Figure (4), ten footballs were prepared near the ten scoring points. the body description was marked by placing indication points on the description of the sample member bodies to appear clearly in the video image when analyzing. The method of performance was explained to the research sample who have high skills in the implementation of near-distance and far-distance scoring with the inside of the foot. Then the adequate warming-up process took place for (15) minutes and the test was

carried out, as each of the players performs (10) attempts with the foot from the inside onto the goal, and the scores are recorded for them as explained previously in the test specifications. All of the players' attempts are visualized and then the best attempt on the goal was analyzed. Then the results was analysis by using (Kenuvia) software.

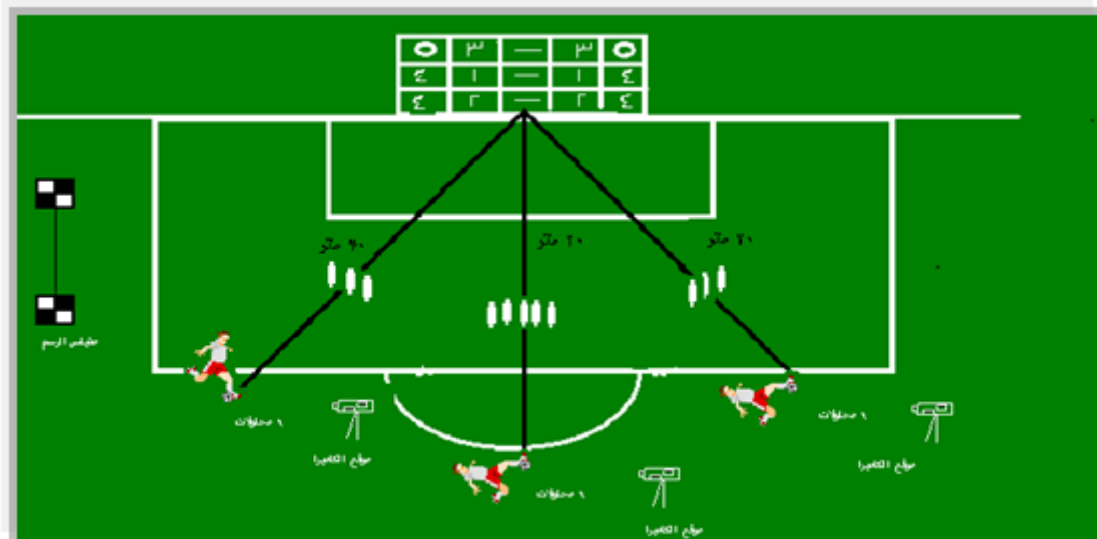


Figure (4) shows the location of the camera while performing the scoring accuracy test

2.3.4. The exploratory experiment:

The researchers conducted the exploratory experiment on June Thursday June 17th, 2021, on a sample of the players of Naft Al Wasat Sports Club, which numbered (4) players out of (18) players, to identify the difficulties facing the researchers' work. it aims for

- 1- Ensuring the validity of the playing field, the tools and equipment used, and the research requirements, and their suitability.
- 2- Organizing the assistance work team, and the required instructions.
- 3- Knowing the readiness of the research sample to perform the tests.
- 4- Knowing the time taken for the experiment.
- 5- Identifying the maximum intensity of MAXEX exercises and the possibility of applying them to the research sample.

2.3.5. Pre-tests:

The researchers conducted pre-tests on the research sample of the study variables on Friday July 7th, 2021. They tried to write down the conditions associated with the tests, such as place, time, and results.

2.3.6. Applying the MAXEX exercises:

The researchers prepared and organized the maxex exercises based on their personal experience. The appropriate exercises began to be applied within the skill requirements on the experimental group on Wednesday July 7th, 2021 for the period 8 weeks with 3 training units per week. In the special preparation stage, the ripple in the training load was (2: 1).

2.3.7. Post-tests:

The researchers, with the help of the assistant working staff, conducted the post-tests of the research sample after completing the maxex exercises. On Sunday September 5th, 2021 the post-test were started with the same sequence of the pre-test, as the researcher took into account the same conditions in which the pre-tests were conducted.

2.3.8. The statistical methods used in the research:

The researchers used the statistical software (SPSS) to analyze the results of the research, including:

- Arithmetic mean.
- Standard deviation.
- T-Test for connected samples.

3. Presentation and discussion of the results:

3.1. Presenting the results of the pre and post-tests of the experimental group for the physical ability and scoring skills for youth in football

Table (1) shows the results of the pre and post-tests of the experimental group for the physical ability and scoring skills for youth in football.

| Statistical tools | Measure unit | Control group | | Experimental group | | T-value | Sig level | Sig type |
|-------------------------------|--------------|---------------|-------------|--------------------|-------------|---------|-----------|-------------|
| | | A. means | S. aviation | A. means | S. aviation | | | |
| Explosive ability | Meter | 1.635 | 0.034 | 1.905 | 0.031 | 29.577 | 0.00 | significant |
| Speed distinguishing strength | Degree | 25.75 | 1.707 | 29.25 | 0.957 | 7 | 0.006 | Significant |
| Scoring skill | Degree | 11.75 | 1.258 | 19.5 | 2.081 | 16.189 | 0.001 | significant |

3.2. Discussing the results of the pre and post-tests of the experimental group for the explosive ability and some offensive skills for youth in football

The results in Table (1) for the explosive ability test showed that there were significant differences between the pre and the post-tests, and in favor of the post-tests. The researchers attribute the reason for these differences in the experimental group to the use of the maxex exercises prepared by them. It was codified according to a scientific basis, which are suitable to the principles of energy expenditure and appropriate for this muscular work that takes only a few seconds. In training the explosive ability of the legs muscles, the researchers mainly used various exercises using body weight, deep jumping, as well as the use obstacles and

boxes due to their impact in developing this ability. This is what was indicated by (Qasim Hassan Hussein and Mansour Jamil Al-Anbaki, 1988, 113) who states that “The exercises that use great resistance are one of the appropriate tools for developing the components of explosive power”. The researchers also attribute the reason for these differences of the research sample to the quality of the maxex exercises that used in the training program which applied by the research sample members because it focused on producing the maximum strength in the least possible time. The opinions of experts, no matter how different the sources of their scientific and practical cultures are, confirm that “the training program leads to develop the achievement, provided that the curriculum should be prepared on a solid and organized scientific basis (Dick. W. Frank, 1997, 192-214).

The results presented in Table (1) for testing the speed-distinguishing strength of the legs muscles for the pre and post tests showed that the results were significant in favor of the post test. The researchers believe that the effectiveness of the prepared maxex exercises for the research sample members, which is characterized by high intensity and specific fast repetitions, helped to make a significant difference in the speed-distinguishing strength of the two legs muscles, as the football players need, during the performance of the various motor skills, rapid and repeated muscle contractions that serve the specialized activity, so the correlation of strength with speed and the resulting force is distinguished by speed. If this connection is at the highest intensity, whether it is strength or speed, then it will affect the player’s motor performance effectively, and what helped in that was the use of the maxex exercises in the training units, which worked to develop the strength characteristic of speed, such as the exercises of barriers and ground ladder with partridge exercises with height and distances. The researchers also attribute this difference to the selection of appropriate exercises similar to the playing in match cases, where these exercises permeated a kind of special strength in which body weight was used. This was confirmed by (Abu Al-Ula Ahmed) who states that “the strength characterized by speed is related to the degree of skill performance. The higher the degree of skill performance, the higher the level of compatibility between fibers and muscles and the dynamical distribution of motor performance improved (Abu Al-Ula Ahmed Abdel-Fattah, 1997, p. 133).

The results of Table (2) for the arithmetic mean values, standard deviations, and (T-values) calculated in the pre and post-tests of football scoring skill, showed that there were significant differences between the pre and post-tests in favor of the post-test, and the researchers believe the reason for the development of accuracy for the members of the research sample that applied maxex exercises. The reason for the significant difference, in the opinion of the researchers, was due to the quality of the exercises that focused on the skill performance similar to the matches and competition and their accurate implementation, which created a state of parity between the training load and the development of the physical abilities of the player, which was reflected in the level of skill performance, as well as the state of repetition and focus on correcting errors accompanying the performance, thus, it acquired the quality of accuracy in the skillful performance of scoring on the goal through the accuracy of estimating the distance, which led to the development of this skill because successful scoring depends on the presence of two main factors: speed and accuracy. Fast

scoring and high accuracy in hitting the target will surprise the opponent and prevent him from acting to prevent scoring. A large proportion of exercises are performed with tools that make the player fall under the influence of competition, such as the artificial wall (blocking wall). Achieving the greatest possible accuracy in good scoring in training and competition requires the football player to have a high level of physical performance and mastery of containing skills with its three parts (preparatory, basic, and final) to be able to reach the goal and achieve the required level in the competitions, as well as the number of appropriate repetitions that accompanied the training units and the careful selection of exercises, taking into account their suitability to the research sample and their capabilities, taking into account the repetition of the exercises on an ongoing basis as well as the gradation in a level of difficulty that ensures performance by everyone. This is what was stated by (Mufti Ibrahim Hamada, 1988, 113) who states that “the coach’s choice of difficult exercises will increase the experiences of some players”.

3.3. Presenting the results of the pre and post-tests of the biokinematic variables of football scoring skills for the research sample

Table (2) shows the results of the pre and post-tests for the biokinematic variables

| Statistical tools | Measure unit | Control group | | Experimental group | | T-value | Sig level | Sig type |
|-------------------|--------------|---------------|-------------|--------------------|-------------|---------|-----------|-------------|
| | | A. means | S. aviation | A. means | S. aviation | | | |
| Scoring angle | Degree | 28.75 | 0.957 | 26.25 | 0.957 | 3.693 | 0.01 | significant |
| Scoring speed | M/sec | 14.525 | 0.793 | 16.550 | 0.251 | 6.043 | 0.009 | Significant |
| The hieght | Cm | 0.91 | 0.031 | 0.945 | 0.012 | 2.049 | 0.086 | significant |

3.3.1. Discussing the pre and post results of the biokinematic variables and the scoring skill in football tests for the research sample

It is noted from the above tables that all the biomechanical variables that were studied are of importance to the appearance of the performance level of the research sample through what was achieved for the values of the arithmetic means, standard deviations and variables that represented the specifications of the sample. The researchers believe that this biomechanical variables will contribute in the development the skilful performance in the case they will be adapted by players, coaches and those interested in the skillful performance of the scoring kick. Thus promoting what is appropriate according to the mechanical foundations and principles that determine the movement.

The results presented in Table (2) for the studied biokinematic variables also showed that there were significant differences between the pre and post-test, for the members of the research sample and in favor of the post tests, where most of the biokinematic variables have improved, including the shooting angle. This variable is considered to be one of the most

important variables affecting the achievement of the goal throughout “the flight time of the thrown ball, which depends on the starting speed, the starting shooting angle and the ground acceleration” (Mohammed Sobhi Hassanein, Hamdi Abdel Moneim, 1996, P. 114). This improvement in the working angles of the body, especially the torso and legs, led to an improvement in the mechanical conditions of the players’ movement during the implementation of the skill in all its sections (preparatory, main, and final), and this improvement in the biokinematic variables resulted from the improvement of physical abilities through the implementation of the maxex exercises that were prepared by the researchers and applied during the training curriculum on the sample members, because these exercises were according to the performance requirements of the skill (scoring skill on the goal) in terms of physical abilities, which contributed significantly to improve the conditions of the body by increasing the amounts of force exerted by the player during the implementation. Therefore some of physical attributes and abilities within the requirements of the performance of the skill were improved, which was positively reflected in the control and balance in the lack of significant energy expenditure during performance within the units of the training curriculum.

As for the starting speed variable, a level of improvement also appeared due to the maxex exercises prepared by the researchers, which were applied in the training curriculum to the members of the research sample, which effectively contributed to the development of the physical abilities, which in turn was positively reflected on the correct motor paths during the performance of the scoring skill on goal, where one of the skill requirements and the researchers’ idea is to hit the goal. Moreover, as much as increasing the starting speed, as much as the time will never be enough to block the ball by the goalkeeper, so that the proportion between speed and time is an inverse proportion. Hence, it is a very important variable for accuracy and goal scoring. Furthermore, this variable is related to the ball, and the more the player could collect the forces of the body parts and use them in favor of performing the skill while kicking the ball, the faster the ball is directed to the goal.

The researchers believe that the increase in the speed of the ball’s shooting is related to the increase in the force, whether it is the maximum or medium force, or the rest of the other biokinematic variables associated with an increase in the amount of force. As a result, obtaining the maximum high force will turn into a high speed of the body's movement, with the change of time and related to the movement of the center of gravity, “the greater the exerted force, the greater the speed of the movement according to it” (Sulaiman Ali Hassan and Awatef Muhammad Labib, 1979, p. 27).

The results that were presented in Table (2) for the variable (high m k g) showed that there were significant differences between the pre and post-test for the members of the research sample and in favor of the post test. Increasing the height of the center of mass of the body in the last step while kicking the ball has a positive effect, as it works to increase the amounts of forces (explosive power, the force characteristic of speed) and this increase in the amounts of forces leads in turn to an increase in the kinematic ranges (weighted by the kicking man). This is done due to the length of the distance of the last step, which is very necessary to facilitate the process of stopping and restraining the movement during the contact of the

player's foot with the ball. Thus, this height works to reduce the flexion of the kicking knee during its weighting. Taking advantage of it when executing the skill in gathering the forces and speed required for the player to perform the skill, and this is confirmed by (Muhammad Othman, 1990, p. 231). Provided that the decrease or height of the center of the body mass is not exaggerated, because this will never give a correct movement path for the ball and therefore will affect the level of skill performance of the player. So that the farther the distance from the goal, the more necessary to maintain or a slight elevation of the center of body mass in order to allow greater ranges of movement (weighted by the kicker of the ball). Thus, the force and thrust of the ball are shed in a manner consistent with the skill requirements, and this is what we have noticed in the above-mentioned table from a small change in the rate of the center of mass of the body.

Conclusions and Recommendations

3.4. Conclusions

- 1- Maxex exercises contributed to the development of physical abilities and accuracy in scoring the goal.
- 2- The physical abilities developed more and more and had an impact on the improvement of the kinematic conditions during the performance stages, especially the preparatory situation.
- 3- The improvement of the kinematic conditions contributed to obtaining the best suitable angles for the torso and legs during the preparatory situation, which contributed to give the weighted appropriate range (better kinetic speed) to kick the ball in the appropriate place.

3.5. Recommendations:

- 1) Paying attention to the use of maxex exercises according to scientific training bases to raise the physical efficiency of young football players.
- 2) Paying attention to the biokinetic variables when training the players on the skill of scoring because of their impact on the success of the skill in the correct manner.
- 3) The necessity of emphasizing the development of the physical abilities of the muscles of the two legs because of its importance in achieving the correct mechanical conditions for performing the football scoring skill.

References

1. Abu Al-Ula Ahmed Abdel-Fattah: Physical training, the physiological foundations, Cairo, Dar Al-Fikr Al-Arabi, 1997.
2. Diao Jaber Muhammad: The effect of exercise during the two phases of the physical biorhythm cycle in developing and teaching some physical traits and basic skills among junior footballers, PhD thesis, Babylon University, College of Physical Education.
3. Dick. W. Frank. Sport Training principles. 3rd Ed. London. A-C Black, 1997.

4. Muhammad Othman: Encyclopedia of Athletics, Training Technique, Learning Arbitration, 1st Edition, Kuwait, Dar Al-Ilm, 1990.
5. Muhammad Sobhi Hassanein, Hamdi Abdel Moneim: The Scientific Foundations of Volleyball and Measurement Methods, 1st Edition, Dar Al Fikr Al Arabi, Cairo, 1996.
6. Muhammad Sobhi Hassanein: Measurement and Evaluation in Physical Education and Sports, 4th edition, Arab Thought House, 2003
7. Mufti Ibrahim Hamadeh: Modern Sports Training, Planning, Application, Leadership, 1st Edition, Cairo, Arab Thought House, 1988.
8. Qassem Hassan Hussein and Mansour Jamil Al-Anbaki: Physical fitness and ways to achieve it, Higher Education Press, Baghdad, 1988.
9. Suleiman Ali Hassan and Awatef Muhammad Labib: Developing Muscular Strength, Cairo, Dar Al Fikr Al Contemporary, 1979.