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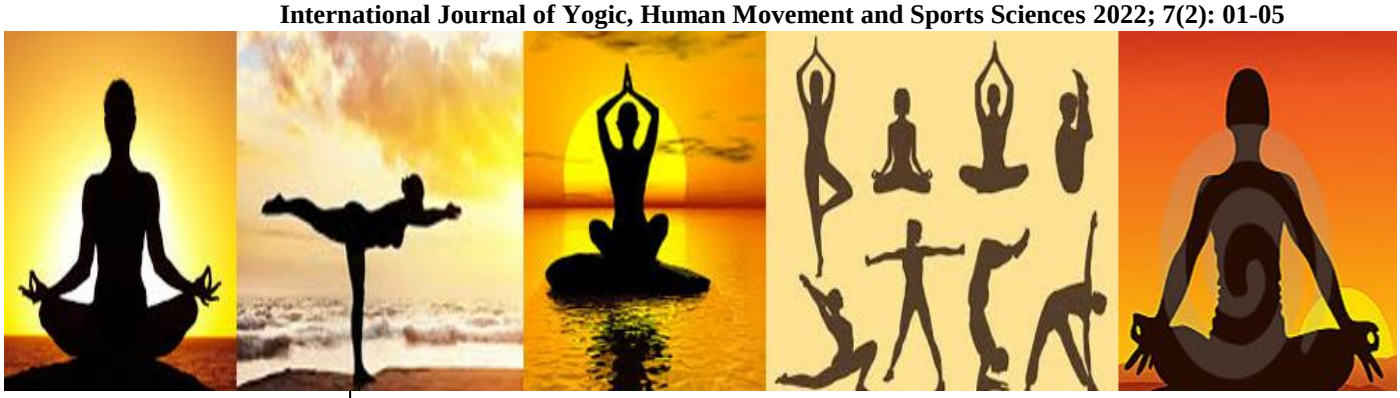

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Rehabilitation program for partial rupture of the external ankle ligament and its effect on balance and some physical characteristics of football players

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Abstract
The purpose of this paper is to preparing a rehabilitation program for the rupture of the external ankle ligaments for football players, knowing the moral differences between the pre and post-tests in balance and some physical attributes. The researcher used the experimental method for its suitability to the nature of the problem to be solved to control all the basic variables and factors. The researcher chose the research sample by the intentional method, which is from those with partial rupture of the external ligament of the ankle joint and from the Dhi Qar governorate football clubs, their ages ranged from (16-30) years, and one experimental group was measured before and after, and their number was (6). A group of specialist doctors and through resonance and sonar devices diagnosed the degree of injury. One of the most important results reached by the researcher is that: The rehabilitation program had clear effects on the return of the external ankle ligaments to function, and the rehabilitation program achieved an improvement in balance and researched physical attributes. One of the most important recommendations recommended by the researchers is that: Attention should be paid to the treatment and rehabilitation of the external ankle ligament rupture at the beginning of the injury, directly so that we can speed up treatment and rehabilitation to avoid complications, tt is possible to benefit from the steps of implementing the qualification method in the research.
The exercises should be given gradually, from easy to difficult.

Keywords: Rehabilitation program, external ankle ligament

Introduction
Recently, there has been a remarkable development in studies and research related to sports medicine and movement sciences, which has resulted in a huge amount of information and knowledge that has contributed greatly to the identification of the mechanism of injuries suffered by football players, the therapeutic procedures followed and appropriate rehabilitation, which led to a better understanding of physical performance and exercise in a safe way. The sport is currently characterized by an increase in intensity and volume in training loads, which necessitates the athlete's body to carry out high-level burdens, thus increasing the possibility of being subjected to various injuries (Abdul-Mabood. 2001) [2]. states that the correct diagnosis of the injury and the appropriate rehabilitation according to the program that suits the requirements of each sporting activity allows the player to quickly return to the normal state and continue to exert effort and maintain his physical and skill level, and the appropriate rehabilitation followed after the injury is the main reason for restoring the injured area to its full function ASAP (john. 2001) [8]. Scientific research in the field of sports injuries confirms that the foot is one of the places most exposed to injury in most sports activities due to the great pressure that falls on it, especially the injury of the ankle joint by a sprain or tear in football players, which leads to a rupture of the external ligaments in the ankle joint (Zaher. 2004) [1] The scientific and applied importance of the research is to identify the effect of rehabilitation and physical exercises to rehabilitate the ruptured external ligaments of the ankle joint on solid scientific foundations.

Research problem
The foot is one of the most important parts on which the body rests and bears the pressures

that fall on the ligaments of the ankle joint through running, stopping, jumping, changing direction and in many cases inside the field, in addition to the lack of interest in strengthening the muscles surrounding the joint factors that lead to partial rupture of the ligaments of the ankle joint and through the work of the researcher Being a specialist in the rehabilitation of sports injuries and physical fitness, he noticed that there was some shortcoming in the rehabilitation of the rupture of the external ankle ligaments and confining himself to the first stage in some research, so the researcher decided to put rehabilitative and physical exercises from the beginning of the injury until returning to play and competition, and from here the idea of the research arose.

Research objective
- Preparing a rehabilitation program for the rupture of the external ankle ligaments for football players.
- Knowing the significant differences between the pre and post-tests in balance and some physical attributes.

Research hypotheses
- Knowing the differences between the tribal and remote tests in the balance of partial rupture of the external ankle ligament of football players.
- Knowing the differences between the tribal and remote tests in some of the physical abilities of the partial rupture of the ligaments of the ankle joint for football players.

Research fields
- **Human field**: football players with torn ankle ligaments their ages ranged from (16-30) years old, males in Thi Qar Governorate – Iraq.
- **Time field**: (1/2/2021) to (1/7/2021).
- **Spatial field:** Clinic of Excellence for Radiology and Ultrasound, Hospital Al-Hussein Education, Water-City, Iron Hall, Dhi Qar – Iraq.

Research methodology and field procedures

Research Methodology

The researcher used the experimental method for its suitability to the nature of the problem to be solved to control all the basic variables and factors.

Community and sample research

The researcher chose the research sample by the intentional method, which is from those with partial rupture of the external. ligament of the ankle joint and from the Dhi Qar governorate football clubs, their ages ranged from (16-30) years, and one experimental group was measured before and after, and their number was (6). A group of specialist doctors and through resonance and sonar devices diagnosed the degree of injury.

Physical tests

Balance measurement (metatarsal standing test). (Hassanein. 1996) [15].
- Test name: Standing on the metatarsal.
- The purpose of the test: Is to measure balance.
- Description of performance: The casualty takes a standing position on the affected foot and the healthy leg is on the affected leg with the hands in the middle. When the whistle is heard, the patient lifts an obstacle off the ground and the patient must try to stay for a longer period and not move the instep.
- Registration: The injured person performs three attempts, and the best attempt is taken.

Explosive strength
- Test name: Vertical jump test
- The purpose of the test: To measure the ability of the muscles of the legs
- Equipment and tools: (registration form, pen, dashboard, tape recorder, whistle)
- Description of performance: The injured player warms up, then the injured player puts his hand in the water (middle finger) and stands next to the test board and raises his hand to the farthest possible blister so that this first point is the zero point. Then the injured player jumps vertically to the farthest point possible to make the second mark.
- Registration: The distance in centimeters between the first and second marks is calculated, and the best attempt is taken (Stafford-Brown and Tim Eldridge. 2020) [13].

Kinetic speed: (Šimonek and Horicka. 2020) [12]
- Test name: Kinetic speed.
- The purpose of the test: the kinetic speed of the legs.
- Devices and tools: (signs, whistle, agility ladder, length 15.9, registration form, registrar, pen, electronic gate).
- Performance description: The player stands at the beginning of the agility ladder and when the whistle is heard, the injured player runs on the agility ladder by placing one foot in the rectangle of the agility ladder without touching the boundaries until he reaches the end of the test.
- Registration: Three attempts are given and the best attempt in the least time is taken.

Strength characteristic speed
- The name of the test: speed characteristic of the legs.
- Purpose of the test: To measure the speed characteristic of the injured leg.
- Tools used: (an area of not less than (35) meters and a width of not less than (1) meters, signs, stopwatch, registration form, whistle, pen).
- Description of the test: The injured player warms up, then we put the signs at a distance of (25) meters, and when the injured person hears the whistle, he jumps on the injured leg from the beginning of the person to the finish line.
- Registration: The injured player is given two attempts to the injured leg, and the best attempt is taken time/second. (Mackenzie. 2005) [6]

Endurance speed
- Test name: RAST (Running Based Anaerobic Sprint) (European Society of Sports Traumatology, Knee Surgery & Arthroscopy (ESSKA). 2018) [7]
- Purpose of the test: To measure the speed endurance.
- Devices and tools: (electronic time gate, tape measure, signs, an area of not less than (45 m) in length and (2 m) in width, a recorder, a pen registration form)
- Description of the test: We draw the test path by defining it with signs with a length of (35 m) and a width of not less than (1) m, with drawing the two comfort zones after the starting line (A) and the end line (B) and they are 5 m long. The injured player stands behind the starting line (A), and when the player is ready for the test, he starts running to the finish line (B), and after taking a rest

period of (10) seconds, the injured player runs again from line (B) and at full speed to line (A), The victim repeats this procedure until he completes six consecutive starts.
- Registration: Records the total time of the six starts.

Agility test
- Test name: Balsom Agility Test.
- Purpose of the test: to measure agility.
- Devices and tools: (stopwatch, tape measure, number of signs (10), recorder, form.
- Description of the test: The patient stands in the starting line, and when he hears the whistle, he runs from line (A) to line (B) and then makes a rotation and back to cross line (A) heading from line (C) to line (D) to make a round and back to cross line (C). Heading through line (B) to the finish line (E).
- Registration: Three attempts are given and the best attempt is taken. (Jarmr *et al*. 2020) [11].

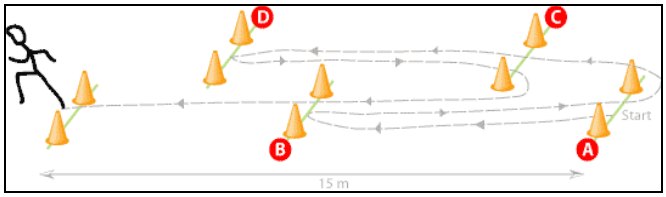

Fig 1: Shows the Balsom Agility Test.

Measurement of the constant strength of the flexors of the ankle joint
- Purpose: Consistent strength of the flexor muscles of the ankle joint.
- Equipment and tools used: (dynamometer, form, pen).
- Description of the performance: The player is taken from a long sitting position on the ground while holding the ground with both hands, and the injured man grips the foot joint (the golf muscles) forward gradually until the onset of pain.
- Registration: The injured player is given two attempts, and the amount of force is taken in kilograms (Zaher. 2004) [1].

Rehabilitation program details

The proposed rehabilitation program was designed based on references, scientific studies and the opinions of experts in the field of rehabilitation specialists in the field of physical education and sports sciences. The opinions of doctors of sports medicine and joints were taken on the content of the rehabilitation program in terms of the number of rehabilitation units and their time. Develop rehabilitation exercises and exercises for the specialized activity of football. The first stage included fixed exercises and the goal was to get rid of the tumor and pain through the use of some home exercises in addition to the use of ice 4-5 times a day for a period of 15 minutes, in addition to not walking. The first stage lasted 10 days, the second stage was aimed at It is the balance and strengthening of the muscles surrounding the ankle joint and other muscles. The number of training units per week was four rehabilitation units, and the time of each unit was (65-90) minutes. The total rehabilitation units in the rehabilitation program were (36) units inside the Iron Hall, where the second phase took 6 weeks. The researcher used the pre-test for balance and fixed muscular strength in the second stage. Then we moved to the last third stage, and the goal was to develop physical fitness, in which the researcher used endurance exercises and build the basic base on which we build the rest of the other physical attributes and abilities such as explosive strength training, strength characterized by speed, speed endurance, agility. Where the number of training units in it was (36) training units in the stadium. The researcher also used physical tests at the beginning of the last stage of the qualifying curriculum. The period of the qualifying program lasted (14) weeks.
- Arithmetic mean.
- Standard deviation.
- For cross- correlation samples (t –test).
- Difference of arithmetic means.

Results and Discussion

Table 1: Shows the difference of the arithmetic means, its standard deviation, and the calculated t-value between the pre and post-tests for the variables investigated.

Variables	Pre-test		Post-test		difference mean	T value calculated	Sig level
	Mean	standard deviation	Mean	standard deviation			
Ankle static muscle strength/kg	9.000	2.788	24.000	3.577	- 15	- 17.516	0.000
Kinetic speed/sec	5.215	1.517	3.733	0.441	1.482	2.812	0.037
Strength speed	14.163	2.613	16.618	5.088	-2.455	-0.929	0.395
Explosive strength /sec	26.666	4.926	38.166	1.940	-11.5	- 7. 449	0.001
agility / sec	13.506	4.593	18.616	3.833	-5.11	3- 529	0.017
Endurance speed /sec	62.666	3.502	55.333	3.502	7.333	11.931	0.000
balance	13.166	2.316	42,000	3.847	28.834	- 20834	0.000

Through Table (1), the researcher attributes the reasons for the moral differences between the results of the pre-and post-tests for the physical variable (balance) and in favor of the post-test for the members of the research sample.

Discussing

To the exercises used in the rehabilitation curriculum and the method of diversification in balance exercises for the injured, by using fixed surfaces such as the exercise of standing on one leg and stability, or standing on one leg with the arms outstretched to the side, and gradient to unstable surfaces such as the exercise of standing on the hemisphere of balance and these exercises target developing the work of sensory systems such as the balance system, the visual system and the internal sensory receptors, the proprioceptors, which are in the ligaments, muscles, tendons and joints. The researcher also agrees with (Haider Abdel Qader Nehme) that the training procedures used to improve balance simultaneously target several sensory organs and not a single sensory system. (Nehme. 2010) [10].

Through Table No. (1), the researcher attributes the reasons for the significant differences between the results of the pre and post-test for the physical variables (fixed muscle strength, explosive strength, Strength speed) and in favor of the post-test for the research sample. In the exercises used in the rehabilitation program, where the researcher aimed to develop

fixed muscular strength, rapid strength and explosive strength to strengthen ligaments, tendons and muscles surrounding the ankle joint with three different training methods according to each stage in the rehabilitation program. The researcher used static exercises in the first stage, which is the method of fixed muscular contraction. This is "that training fixed muscular contraction leads to the development of muscular strength and can be in tools and devices simple" (Al-Busati. 2015) [3]. also mentions that "the isometric constant muscle contraction exercises lead to the strengthening of ligaments, muscles and tendons with no pressure applied to the joint" (Davies. 2014) [17]. Where the researcher used this method in the qualifying curriculum and it was in repetitions, many groups, and lightweights, and it was gradual from easy to difficult according to the improvement of the player's injury.

The researcher also used the moving muscle training method (Isotonic) in the second stage of the rehabilitation program, such as the Al-Dabni exercise for the muscles of the legs and the jumping exercises over the box to develop strength characterized speed and explosive strength, and this was confirmed " that the kinetic muscle contraction exercises in which the muscles work by shortening and lengthening It is the most exercise that aims to develop types of muscle strength, such as strength characterized by speed and explosive power, in addition to developing the rest of the abilities" (Ahmed. 2014). The researcher also attributes the development of strength characterized speed and explosive strength to the use of plyometric exercises in the qualifying program and in the last stage, where the researcher used the intensity gradient. This was stated by the American College of Sports Medicine 2012, which divided plyometric exercises into light intensity, medium intensity and high intensity. (Ratamess. 2012)

The importance of plyometric exercises leads to the development of explosive strength and strength characterized speed, and this is what the researcher's mechanism was used in the rehabilitation program for the rupture of the external ligaments of the ankle joint.

Through Table (1), the researcher attributes the reasons for the significant differences between the results of the pre and post-test for the physical variable (kinetic speed of the two legs) and in favor of the post-test for the members of the research sample the exercises used in the curriculum can be attributed to a group of reasons, including central strength training, and this is mentioned "that weak trunk muscles cause weak support in the work of the muscles of the legs and arms, and getting strong trunk muscles leads to more work and development in kinetic speed by (Bomba and Carrera. 2015) [20]. The researcher also attributes the development of kinetic speed to the exercises of explosive power, rapid strength and endurance of speed, and this is what the researcher put in the last stage of the qualifying curriculum. Indicates that improving "the kinetic speed of the muscles of the legs through the development of explosive strength exercises, endurance of speed and strength speed". (Davies. 2014) [17].

The researcher also used plyometric training exercises in the rehabilitation program, and this is mentioned "that plyometric exercises such as jumping exercises contribute to improving the running mechanics and the strength of the muscles of the legs and upper body muscles, while the ankle rebound training has contributed to strengthening the ankle ligaments and tendons. (Brenes and Bryant, 2012) [4].

Through Table (1), the researcher attributes the reasons for the significant differences between the results of the pre and post-test for the physical variable (endurance of speed) and in favor of the post-test for the sample members.

The training that the researcher put in speed endurance training is in making fast repetitions with high intensity and in a very short period of time in the first phosphate system, as the ratio of exercise to rest is (1-2) or (1-3), where the injured player performs quick runs with Take a little rest between repetitions. This training is similar to the speed training method, but the difference in endurance is the lack of complete rest. This is what was mentioned by "when you repeat the speed exercises in the first phosphate system more than once with an incomplete rest, the goal of the exercise is to withstand speed" (El-Gamal. 2019) [19]. And training in performing repetitions and not giving complete rest and this "note that repeating the speeds that have a time of 6 seconds with taking a little rest between these speeds, the training is in the short tactical ability this training allows the participation of the aerobic capacity strongly in the time of rest leads to the return of phosphate and its replacement in air phosphorylation, and from this direction in training, the researcher used the training methods in the rehabilitation curriculum for the injury of the external ankle ligament rupture of the ankle joint, which are varied sprinting, fast interval sprinting, in addition to sprinting". (Bomba and Carrera, 2015) [20].

The researcher also put exercises similar to the cases that are in the match in order to avoid injury a second time, which the researcher used to develop the physical fitness of the injured in the rehabilitation curriculum in repetitions that reached (25-30) repetitions and more according to the condition of the injured and gradual in it to reach (40) a breakthrough and this What FIFA demonstrated in (2017) in the World Youth Cup matches in South Korea is that the running distance in the match is (10-12) kilometres within 90 minutes, but it is not continuous, it is in intermittent forms and at high speeds, and the analysis data found that football players Football performs (30-40) kicks during the match (FIFA Technical Report. FIFA U-20 World Cup Korea Republic 2017)

Rehabilitation specialists should make the last part of the rehabilitation program dedicated to development of physical fitness, and this was confirmed by attention should be paid to developing physical exercises aimed at improving physical fitness in the rehabilitation curriculum. (Polyvios and *et al*., 2016) [18].

Through Table No. (1), the researcher attributes the reasons for the significant differences between the results of the pre- and post-test of the physical variable (agility) and in favor of the post-test for the members of the research sample to the exercises used in the qualifying program. Multiple movements whose main title is the sudden change: such as the change in running speed (acceleration-deceleration), and the change in the direction of running or running in an interactive and non-reactive manner, with or without the ball. The researcher used several forms of exercises to apply this training method, including zigzag exercises, agility ladder exercises, catching exercises to change direction, and running and jumping exercises. (Nehme, 2010) [10].

Conclusions and Recommendations

Within the limits of the research sample, objectives, hypotheses, and results of the variables, the following conclusions were reached:

- The rehabilitation program had clear effects on the return of the external ankle ligaments to function.
- The rehabilitation program achieved an improvement in balance and researched physical attributes.

Recommendations

- Attention should be paid to the treatment and rehabilitation of the external ankle ligament rupture at the beginning of the injury.
- Directly so that we can speed up treatment and rehabilitation to avoid complications.
- It is possible to benefit from the steps of implementing the qualification method in the research.
- The exercises should be given gradually, from easy to difficult.
- Taking into account the psychological state of the injured player during the rehabilitation exercises.
- Conducting more research on how to return to competition and play.

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