# Effects of a Rehabilitation Exercises Program (dry land / in-water) with Massage on the Calf Partial Rupture in Soccer Players

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**Abstract:**

The current research aims to design a rehabilitating exercises program with dry-land and in-water exercises and massage for partially ruptured calf in soccer players and to identify its effects on: Degree of pain accompanying the injury - Muscular strength of the injured muscle - The range of motion of the affected joint - Muscle circumference of the injured muscle. The researcher used the experimental approach (one-group design) with pre- and post-measurements. Sample included (8) players purposefully chosen from soccer players (18-28 years) with partial rupture of the calf muscle from Asyut sports clubs. Results indicated that:

1. In-water rehabilitation exercises with massage improved pain significantly.
2. In-water rehabilitation exercises with massage improved muscle strength of the calf significantly in participants.
3. In-water rehabilitation exercises with massage improved the functional efficiency of the affected ankle in participants with partial rupture of the calf through improving muscular strength of the working muscles on this joint.

**Keywords: Dry land / in-water exercises, Massage, Rehabilitation, Calf**

**Introduction and Research Problem:**

Elite performance of soccer players is related to physiological and physical efficiency as a response to physical activity requirements. If the player sustains an injury, he will lose the relation among his/her different body parts. This leads the player to lose energy required for correct motor performance and to lose motor fluency and poor performance. This increased authors' interest in sports rehab through using new innovations to improve players' efficiency and prevent them from sustaining field injuries in

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addition to rehabilitating them to return to play in full physical and technical fitness.

Dan Atherw (1993: P157) and Bergamin M. et al (2013) indicated that training focuses on muscle groups required for the specific activity, like training quadriceps while ignoring adductor longos and calf. This makes such muscles more vulnerable to injuries.

Calf is more vulnerable to injuries due its location between the knee and foot joints. Injuries occurs while performing a quick adduction/abduction muscular work during running, jumping and landing. It appears more among tennis, squash, soccer, basketball and handball players. It suddenly appears as a sharp stroke in the abdomen with sharp pain (Ibrahim, W. 2001 P: 349).

This is consistent with Riad, O. (1998 P: 47-48), Yousef, M. (1998 P: 89) and Khalil, S. (2008 P: 122) as muscles that are most vulnerable to ruptures among athletes are quadriceps, calf, abductor, calf, and biceps.

Rehab exercises are important for two reasons. Theses are to allow the player's return to play with the same physical and technical efficiency before injury as soon as possible and top prevent injuries (Al-Kashef, E. 1990: P: 15)

Al-Sokkary, K. & Berequa, M. (1999 P: 10) indicated that aquatic medium is suitable for rehabilitating injuries as it leads to quick healing through decreasing pressures over the body. It can also treat postural problems as in-water exercises are effective for providing a wide range of health benefits compared to other types of physical activity.

Abd Al-Haleem, G. (2000 P: 15) indicated that aquatic therapy has mechanical and thermal factors affecting the injured limp as water displacement, temperature, floatation and resistance all play a major role in therapy. Therapists can use these characteristics in treatment and rehab. He also indicated that aquatic therapy affects the psychological status of the injured as they feel able to continue performance without pain in a better way compared to dry-land rehab.

Aquatic therapy aims to improve motor and functional abilities for the inured limp or

the whole body. It is used for different purposes and with many injuries as it depends on pushing cold and tepid water flows to activate blood circulation and strengthen the body. Swimming is another characteristic as body weight decreases to 90% and this decreases pressure over joints, bones and the whole body. It also supports performing movements in water. Water is denser than air and this means muscle construction is faster in water.

The ability of water to carry the body in a floating position with decreased effect of gravity is another factor that helps relaxation and pain relief. Feeling light helps the injured to move freely with minimum effort compared to dry-land. With thermal release from working muscles and floatation, the range of motion increases for limps and joints. Heavy-weight injured persons find it hard to move on dry land while it is easy for them to perform several movements comfortably in water (Khater, A. 1996 P: 22).

Hanafy, M.; Ali, D. & Hasan, R. (2009 P: 212) indicated that massage is an effective rehab tool after intense training loads. It is widespread in sports. It is also used in injuries and illnesses. Massage is part of recovery plan for athletes inside the daily, weekly and annual training plan. It is an effective tool for eliminating fatigue and improving physical and athletic efficiency.

Quantification of musculoskeletal injuries among soccer players indicated that 70% of total injures are musculoskeletal while severe musculoskeletal injuries among soccer players represent 80% of total injuries (Galal El-Din, A. 2005: 127).

As part of this research, the researcher reviewed related literature. In his study on rehabilitating the ruptured calf muscle, Ibrahim, W. (2001) indicated that massage and electric stimulation had positive effects on improving muscular strength, joint range of motion and muscle circumference in addition to decreasing skin folds and fats and increasing muscle elasticity.

Shalan, A. (2006) designed a test for hamstrings efficiency after healing of rupture. The test uncovered

several degrees of efficiency for the affected muscles.

Al-Showky, M. (2006) designed a rehabilitation program for partially ruptured exterior ligaments of the ankle joint for basketball players. The program proved positive effects on degree of pain, muscle strength of abductors/adductors of the ankle in addition to the the ankle range of motion.

Hani, M. (2011) measured the effects of dry-land and in-water rehab exercises and ultra-sonic waves on decreasing ankle pain after injuries in women between 35 and 45 years. Results indicated that the recommended program had positive effects on all research variables in favor of in-water group.

Dahi, H. (2012) measured the effects of game-like rehabilitation exercises on recovering the functional capacity of partially ruptured hamstrings in soccer players. The rehabilitation exercises had positive effects on the degree of pain and other physical fitness and technical performance variables in addition to helping players to recover their muscle elasticity and functional capacity.

The problem of this research is clear in the widespread of partial rupture injuries in calf and calf muscles in soccer players with no standardized rehab programs to treat them. they may not lead to full recovery. Ignoring treatment procedures after injury leads to injury relapse and may turn to a chronic injury that induces chronic muscle inflammation. In this case, treatment takes too long and may lead to early retirement of the player.

According to field experience in several clubs as a rehab specialist, the researcher noticed the high percentages of calf rupture among soccer players. This is an acute injury that forces players to stop training and competitions for a long time due to insufficient warm-up and stretches. Soccer depends on high speed, and even sudden quick moves, with high training loads repeatedly. This led the researcher to try to used dry-land and in-water rehab exercises with massage through a rehabilitation program to restore the injured muscle to normal condition at the end of the program.

**Aim:**

The current research aims to design a rehabilitating exercises program with dry-land and in-water exercises and massage for partially ruptured calf in soccer players and to identify its effects on:

- Degree of pain accompanying the injury
- Muscular strength of the injured muscle
- The range of motion of the affected joint
- Muscle circumference of the injured muscle

**Hypotheses:**

1. There are statistically significant differences between pre- and post-measurements of participants on decreasing the degree of pain in favor of post-measurements.
2. There are statistically significant differences between pre- and post-measurements of participants on muscular strength of the partially ruptured calf muscle in favor of post-measurements.
3. There are statistically significant differences between pre- and post-measurements of participants on the range of motion of affected joint in favor of post-measurements.
4. There are statistically significant differences between pre- and post-measurements of participants on muscle circumference if injured muscle in favor of post-measurements.

**Methods:**

Approach:

The researcher used the experimental approach (one-group design) with pre- and post-measurements.

Participants:

Sample included (8) players purposefully chosen from soccer players (18-28 years) with partial rupture of the calf muscle from Asyut sports clubs. All sample gave their written consent prior to the study, which was approved by the local Ethics Committee. This study meets the ethical standards in sport and exercise science research. Table (1) shows sample homogeneity

**Table (1)**
**Equality of the distribution in the Pre- and Post-measurements of the research sample in the variables (Characterization - pain degree - muscle strength – range of motion (n = 8)**

| Variables | | Description Variables | Measure unit | Measures | Subjects | | Kolmogorov – Smirnov Test | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | X | ± Z | KOL-S | P. value | f |
| Characterization | | Age | Year | ——— | 22.71 | 3.90 | 0.185 | 0.200 * | f |
| | | Height | M | ——— | 175.14 | 5.64 | 0.182 | 0.200 * | f |
| | | Weight | KG | ——— | 74.29 | 6.47 | 0.150 | 0.200 * | f |
| | | Program's Date | Day | ——— | 3.57 | 1.72 | 0.170 | 0.200 * | f |
| Pain | | Pain Degree | Ability degree | Pre- | 64.88 | 7.75 | 0.130 | 0.200 * | f |
| | | | | Post- | 4.25 | 1.38 | 0.196 | 0.200 * | f |
| Strength | The strength of injured calf muscle and the muscles affected by the injury, from positions | Sitting on a bench. All angels of leg 90. ankle flexion | Kg | Pre- | 2.35 | 0.767 | 0.177 | 0.200 * | f |
| | | | | Post- | 8.58 | 0.887 | 0.256 | 0.133 * | f |
| | | Sitting on a bench. All angels of leg 90. ankle extension | | Pre- | 3.58 | 0.608 | 0.181 | 0.200 * | f |
| | | | | Post- | 12.41 | 1.32 | 0.276 | 0.073 * | f |
| | | Sitting on a bench. All angels of leg 90. ankle abduction | | Pre- | 2.68 | 0.533 | 0.205 | 0.200 * | f |
| | | | | Post- | 5.36 | 0.785 | 0.244 | 0.178 * | f |
| | | Sitting on a bench. All angels of leg 90. ankle adduction | | Pre- | 2.25 | 0.462 | 0.150 | 0.200 * | f |
| | | | | Post- | 4.83 | 1.19 | 0.170 | 0.200 * | f |
| Range of motion | The range of motion of the affected ankle joint by injury, from positions | Sitting on a bench. All angels of leg 90. ankle flexion | Angle Degree | Pre- | 74.00 | 4.03 | 0.152 | 0.200 * | f |
| | | | | Post- | 38.88 | 3.68 | 0.139 | 0.200 * | f |
| | | Sitting on a bench. All angels of leg 90. ankle extension | | Pre- | 15.88 | 3.04 | 0.113 | 0.200 * | f |
| | | | | Post- | 37.75 | 5.25 | 0.166 | 0.200 * | f |
| | | Sitting on a bench. All angels of leg 90. ankle abduction | | Pre- | 21.63 | 1.84 | 0.170 | 0.200 * | f |
| | | | | Post- | 53.38 | 4.71 | 0.197 | 0.200 * | f |
| | | Sitting on a bench. All angels of leg 90. ankle adduction | | Pre- | 14.12 | 2.23 | 0.174 | 0.200 * | f |
| | | | | Post- | 26.75 | 2.55 | 0.129 | 0.200 * | f |
| Circumference of muscle | | Circumcision of injured calf muscle "behind the leg" | Cm | Pre- | 37.18 | 2.85 | 0.279 | 0.066 * | f |
| | | | | Post- | 42.68 | 2.20 | 0.170 | 0.200 * | f |

* significant on $P \leq 0.05$

The results of the statistical analysis of the Kolmogorov Smirnov test in table (1) showed that the value of P.Value ranged between (6.6%: 20%) for all variables (descriptive - pain degree - muscle strength – range of motion), all of which are greater than the significant level of 5 %, Indicating that all sample data follow the nonparametric statistical.

Data collection tools:

**A) Forms:**

- Personal data form for each player (age – weight – height – injury record)
- Experts' opinions form about the recommended rehabilitation program

**B) Anthropometric measurements:**

- A Restameter of heights (cm) and weights (kg)
- A measuring tape for muscle circumference (cm)

**C) Tests and measuring tools:**

- Visual Analog Scale (VAS) for the degree of pain (point)
- A goniometer for the range of motion (angular degree)
- A dynamometer for muscular strength (kg)

**D) Equipment**

A swimming pool

- Table for measurements
- Multi-gym with weights (iron – sand) – rubber cords

**Motor and Functional Measurements:**

According to review of literature, the researcher concluded the tests and measurements needed for this research (Khalil, S. 2008 P: 276) (Abd Al-Maboud A. 2001 P: 222) (Galal El-Din , A. 2005 P: 173) (Radwan, M. 1997 P: 90).

Related literature indicated that the most relevant tests and measurements for the variables under investigation are Visual Analog Scale (VAS) for pain degree, the dynamometer for muscular strength and the goniometer for the range of motion of the affected joint.

**Visual Analog Scale (VAS):**

The scale is a line with (zero) at the beginning for "No Pain" and (10) at the end for "Max Pain". The patient is asked to identify the degree of pain he/she feels. The scale was used three times per week. It is previously used in the Egyptian environment and proved valid and reliable. (Radwan, M. 1997 P: 90).

**Leg muscular strength:**

A dynamometer is used for this purpose according to the following conditions:

- The participant grasps the pull grip with both hands with palms down at the point of thigh and pelvic bones meet
- The participant stands on the base with knees bent and pulls with knee extension. Chain length to participant height should be considered.
- Each participant has two trials and the best one is recorded. Arms, back and head should be extended (Khalil, S. 2008 P: 276)

**Range of motion:**

The range of motion is measured by a goniometer. The goniometer is fixed parallel to thigh bones externally and the moving arm is parallel to leg bone with a right angle of the joint. Reading is taken when joint is abducted to max. note that the reading is almost zero. A second reading is taken when the joint is adducted to max. difference between the two readings is the range of motion (Abd Al-Maboud A. 2001 P: 222).

**Muscle circumference:**

The player puts the injured leg on a bench with extended knee. The measuring tape is extended on the posterior side of the leg between the patella and foot. Half-leg point is marked and measuring tape is warped on it horizontally (Galal El-Din , A. 2005 P: 173).

**In-water exercises program:**

The program was designed according to review of literature. In-water exercises are used for (6) weeks (5 units per week). Total number of units reached (30) divided into three stages according to its goals.

**Aims:**

- Decreasing injury-related pain
- Restoring muscular strength of the calf
- Restoring the range of motion for the affected joint
- Strengthening the working muscles of knee and ankle
- Increasing the range of motion of knee and ankle

**Principles:**

1. Identification of goals and objectives
2. Review of related literature
3. Considering good warm-up and conditioning
4. Gradual increase of training loads according to stages
5. Suitability for participants

6. Progression from easy to difficult
7. Continuity and punctuality
8. Number of units is (30)
9. Number of units per week is (5)
10. Each unit lasts (45) minutes with gradual increase to (60) minutes. Progression depends on individual differences and healing rate.
11. Enough rest intervals
12. Identifying suitable exercises for each stage according to injury condition
13. Exercises are performed comfortably according to each player's physical efficiency
14. The program is applied individually
15. Flexibility of application should be considered according to changing conditions
16. The water temperature of the program was 25 ° C, while the humidity was 60%.

**Program characteristics:**

The program is applied in the swimming pools of Al-Baladia Sports Club and the Olympic Village of Assiut University.

**Timeframe:**

Timeframe was set to (6) weeks divided into three stages:

- Stage one (2 weeks): gradual decrease of pain – refining muscle tune – general rehab (muscular strength – range of motion).
- Stage two (2 weeks): special rehab (muscular strength – range of motion)
- Stage three (2 weeks): restoring muscular strength, range of motion and muscle circumference.

**Content:**

The program was applied for (6) weeks as follows:

- Stage one: (5) units per week - (45) minutes per unit (15 minutes for massage and stretches in the range of pain – 30 minutes in-water exercises)
- Stage two: (5) units per week - (50) minutes per unit (5 min walking – 10 min massage and stretches in the range of pain – 15 min dry-land exercises including static/dynamic strength and range of motion – 20 min in-water exercises for improving muscle strength and range of motion)
- Stage three: (5) units per week– (60) minutes per unit (10 min walking– 10 min massage and stretches in the range of pain– 20 min dry-land exercises including static/dynamic strength and

range of motion – 20 min in-water exercises for improving muscle strength and range of motion)

**Procedures:**

1. Pilot study was performed from 16-11-2014 to 21-11-2014 on (2) patients from the same research community and outside the main sample to validate tools and equipment and train assistants
2. Pre-measurements were taken for participants from 27-11-2014 to 14-3-2015
3. Main application: the recommended rehab exercises program was applied individually to participants for (6) weeks each, from 28-11-2014 to 29-4-2015
4. Post-measurements were taken from 11-1-2015 to 30-4-2015 according to the same protocol of pre-measurements.
5. Data was collected and tabulated for treatment

Statistical treatment:

The researcher used SPSS software to calculate the following: Mean – SD – Squewness – Wilcoxon test – Kolmogorov–Smirnov Test - Percentage.

**Results:**

**Table (2)**

**Calculate the significance of the differences between Pre- and post-measurements of the experimental group in the variables (pain degree - muscle strength– range of motion) Wilcoxon test (n = 8)**

| Variable | | Measure unit | Pre- | | Post- | | DA | IP% | Ranks | N | Mean Ranks | Sum Ranks | Z | P-value | f |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | ± z | X | ± z | | | | | | | | | |
| Pain | Pain degree | degree | 64.88 | 7.75 | 4.25 | 1.38 | 60.63 | 93.45 | - | 8 | 4.50 | 36.00 | 2.521 | 0.012 | f |
| | | | | | | | | | + | 0 | 0.00 | 0.00 | | | |
| | | | | | | | | | = | 0 | -- | -- | | | |
| | | | | | | | | | sum | 8 | -- | -- | | | |
| Strength | Sitting on a bench. All angels of leg 90. ankle flexion | Kg | 2.35 | 0.767 | 8.58 | 0.887 | 6.23 | 72.61 | - | 0 | 0.00 | 0.00 | 2.524 | 0.012 | f |
| | | | | | | | | | + | 8 | 4.50 | 36.00 | | | |
| | | | | | | | | | = | 0 | -- | -- | | | |
| | | | | | | | | | sum | 8 | -- | -- | | | |
| | Sitting on a bench. All angels of leg 90. ankle extension | | 3.58 | 0.608 | 12.41 | 1.322 | 8.83 | 71.20 | - | 0 | 0.00 | 0.00 | 2.521 | 0.012 | f |
| | | | | | | | | | + | 8 | 4.50 | 36.00 | | | |
| | | | | | | | | | = | 0 | -- | -- | | | |
| | | | | | | | | | sum | 8 | -- | -- | | | |

## Follow Table (2)
## Calculate the significance of the differences between Pre- and post-measurements of the experimental group in the variables (pain degree - muscle strength– range of motion) Wilcoxon test (n = 8)

| Variable | | Measure unit | Pre- | | Post- | | DA | IP% | Ranks | N | Mean Ranks | Sum Ranks | Z | P-value | f |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | X | ± z | X | ± z | | | | | | | | | |
| | Sitting on a bench. All angels of leg 90. ankle abduction | | 2.68 | 0.533 | 5.36 | 0.785 | 2.68 | 50.00 | - | 0 | 0.00 | 0.00 | 2.524 | 0.012 | f |
| | | | | | | | | | + | 8 | 4.50 | 36.00 | | | |
| | | | | | | | | | = | 0 | -- | -- | | | |
| | | | | | | | | | sum | 8 | -- | -- | | | |
| | Sitting on a bench. All angels of leg 90. ankle adduction | | 2.25 | 0.462 | 4.83 | 1.19 | 2.58 | 53.42 | - | 0 | 0.00 | 0.00 | 2.521 | 0.012 | f |
| | | | | | | | | | + | 8 | 4.50 | 36.00 | | | |
| | | | | | | | | | = | 0 | -- | -- | | | |
| | | | | | | | | | sum | 8 | -- | -- | | | |
| Range of motion | Sitting on a bench. All angels of leg 90. ankle flexion | Cm | 74.00 | 4.03 | 38.88 | 3.68 | 35.12 | 90.33 | - | 8 | 4.50 | 36.00 | 2.524 | 0.012 | f |
| | | | | | | | | | + | 0 | 0.00 | 0.00 | | | |
| | | | | | | | | | = | 0 | -- | -- | | | |
| | | | | | | | | | sum | 8 | -- | -- | | | |
| | Sitting on a bench. All angels of leg 90. ankle extension | | 15.88 | 3.04 | 37075 | 5.25 | 21.87 | 57.93 | - | 0 | 0.00 | 0.00 | 2.524 | 0.012 | f |
| | | | | | | | | | + | 8 | 4.50 | 36.00 | | | |
| | | | | | | | | | = | 0 | -- | -- | | | |
| | | | | | | | | | sum | 8 | -- | -- | | | |
| | Sitting on a bench. All angels of leg 90. ankle abduction | | 21.63 | 1.84 | 53.38 | 4.71 | 31.75 | 59.48 | - | 0 | 0.00 | 0.00 | 2.527 | 0.012 | f |
| | | | | | | | | | + | 8 | 4.50 | 36.00 | | | |
| | | | | | | | | | = | 0 | -- | -- | | | |
| | | | | | | | | | sum | 8 | -- | -- | | | |
| | Sitting on a bench. All angels of leg 90. ankle adduction | | 14.12 | 2.23 | 26.75 | 2.55 | 12.63 | 47.21 | - | 0 | 0.00 | 0.00 | 2.530 | 0.011 | f |
| | | | | | | | | | + | 8 | 4.50 | 36.00 | | | |
| | | | | | | | | | = | 0 | -- | -- | | | |
| | | | | | | | | | sum | 8 | -- | -- | | | |
| Circumference of muscle | | Cm | 37.18 | 2.85 | 42.68 | 2.20 | 5.50 | 12.89 | - | 0 | 0.00 | 0.00 | 2.536 | 0.011 | f |
| | | | | | | | | | + | 8 | 4.50 | 36.00 | | | |
| | | | | | | | | | = | 0 | -- | -- | | | |
| | | | | | | | | | sum | 8 | -- | -- | | | |

Z table value on $P \leq 0.05 = \pm 1.96$

It is clear from Table (2) that there are statistically significant differences between the mean scores of the pre- and post-measurements of the experimental group in all the variables (pain degree, muscle strength, range of motion) and for the dimension measurements. The mean value of the variables was 0.011: 0.012 (1.1%: 1.2%), which was below the significant level of 0.05 (5%), which confirms the superiority of the averages of post-statistically significant measurements on the average of pre-measurements In all the variables of the search, and the positive improvement rates in all the search variables were also shown to confirm that The percentage of improvement in the percentage of pain was (93.45%). The improvement rates in the muscle strength variables ranged between (50%: 72.61%). The improvement rates in the range of motion variables ranged from 47.21% to 90.33%. The improvement rate of the variable muscle area was (12.89%).

**Discussion:**

The researcher thinks that positive improvements in pain degree (93.45%) as it shown in table (2) are due to the use of isometric progressive exercises (forcefully – with help – free movement) with stretching and tow kinds of Effleurage massage, the soft one after injury directly (acute stage of injury) or deep after that stage on the partial rupture place of the calf during the first and second stage. This eliminated edema and inflammation and decreases pain gradually till it disappeared. This is consistent with the American Pain Foundation (2006), Riad, O. & Abd Al-Raheem, N. (2001) and Riad, O. (2000) who indicated that rehab exercises are common in treating pain. It preserves health and decreases pain in addition to controlling joint pain and swelling resulting from inflammations.

This is consistent with Kalebo et al (2004) and Fakeer, A. (2010) who indicated that rehab exercises decrease pain and inflammation. Abd Al-Nasser, A. (2004) and Holmich, P. (2007) indicated that static rehab exercises improve pain and it has positive effect in improving pain if accompanied by massage.

Also the researcher thinks that improvements to the regularity of all injured players "the research sample" in the rehabilitation sessions, the appropriate configuration at the beginning of each rehabilitation unit and codified in using of different forms of muscle work between the isometric, isotonic and Isokinetic (similar to movement) to develop the range of motion, Stretching and muscular strength in all of muscular angle work available to all directions of joint motion according to the limits of pain and the degree of progress of each case, and commensurate with the qualifying stage and objective. This allows the flexibility exercises to be performed and increased the range of motion rapidly to the joint effected with injury. And then the various forms of muscular strength exercises are performed.

Mengoshoel & Fore (2006) indicated that regular exercises below the range of exhaustion and pain can improve injury-induced pain. Center for Pain Rehabilitation (2006) and Riad, O. (1999) indicated that rehab exercises are preferred to accompany ultrasonic waves as it can decrease pain.

Rushdy, M. (2004) indicated that ultrasonic waves can treat a wide range of injuries and illnesses if we consider time and intensity. Sadek, T. (2000), Bakri, K. (2000) and Aiad, H. (2003) indicated that rehab programs should aim to decreasing pain as it prevents athletes from practicing regular activities due to hindering the joint function. It may lead to absence for a while. Steps and intensity are decided according to each case and motor requirements of the patient.

Dahan (1999) and Kivi P. et al (2009) indicated that pain should disappear gradually while maintaining blood supply to the injured area in addition to displacing pressure from the affected muscle. Loads should increase gradually to avoid pain.

The rehabilitation program used rehab exercises with massage to renew damaged cells and improve fibers' function. This decreased pain and inflammation and decreased the chance for more damage to tissues with decreasing swelling.

Bakri, K. (2000) indicated that rehabilitation programs strengthen muscles and relax tensed one through activating blood circulation and refining muscle tune. This decreases pain and improves psychological status.

This proved that the recommended rehabilitation exercises program with massage decreased pain resulting from partial rupture of the calf.

Tables (2) indicated statistically significant differences at a significant level (0,05) between pre- and post-measurements of muscular strength as all calculated Z values are greater than their tabular values. The probability of the variables (0.012) that (1.2%) is less than the level of significance 0.05 (5%), which indicates a significant improvement in this variable that the researcher is due to all exercises of recommended rehabilitation program, especially in-water exercises that has undergone the experimental group during the research.

As shown in Table (2), the improvement percentage between pre- and post-measurements ranged from (50%: 72.61%) for post-measurement in the muscle strength variable for football players with partial rupture of the calf muscle.

The researcher attributed the increase in the rate of muscle strength variable in the post-measurements to improvement of muscle fibers' function and muscle recovery of functional efficiency and improved muscular function due to the positive effect which was subjected to the sample of football players with partial rupture of the calf muscle and use of the exercise program and regular attendance in sessions Has resulted in improvement and development of muscle strength and in accordance with the sample capabilities of football players with partial rupture of the calf muscle according to individual regulation.

Also the researcher attributed that to the rehabilitation program, which includes exercises, in addition to that the regularity of all injured players "the research sample" in the rehabilitation sessions, the appropriate configuration at the beginning of each rehabilitation unit and codified in using of different

forms of muscle work between the isometric, isotonic and Isokinetic (similar to movement) to develop the range of motion, Stretching and muscular strength in all of muscular angle work available to all directions of joint motion according to the limits of pain and the degree of progress of each case, and commensurate with the qualifying stage and objective.

Lofty, A. (2009), Richard (2000), Rev (2011) and Bergamin M. et al (2013) indicated that static/dynamic strength exercises can improve muscular strength positively through involving more muscle fibers in contraction. This involves more motor units in muscular work and improves functional efficiency of the knee and ankle joint.

Mohamed, M. (2007) indicated that rehab programs can improve muscular strength of extensors, flexors, abductors and adductors and this improves the functional efficiency of the injured joint.
The massage has a mechanical effect on the muscle tissue. It also strengthens blood circulation, lymphatic and intracellular fluid, improves tissue nutrition, removes harmful substances from metabolic residues, improves muscle tissue, and massages are of great benefit in helping to rehabilitate muscular dystrophy, dispose of lactic acid in the muscles especially after severe fatigue as well as the elimination of adhesions soft tissue. (5-61) (27- 239) (68-28, 29)

When temperature of the skin is increased, blood vessels extend and provide limps with more blood. When blood flows through these parts, it carries temperature to other parts and this increases internal temperature of muscles due to blood redistribution. This also increases metabolism in skin and muscles and increases muscular strength of muscles working on the joints.

This is consistent with Gad, A. (2003), Zaki, I. (2008) and Al-Demardash, W. (2010) who indicated that rehab programs increase the physiological cross-section of muscles, blood vessels and strength of ligaments and tendons.

This is also consistent with Ozakaya et al (2009) and Willits et al (2010) in that early rehabilitation increases muscle circumference of the leg and

differences between the injured and health limps decrease.

Tables (2) indicated statistically significant differences at a significant level (0,05) between pre- and post-measurements of range of motion as all calculated Z values are greater than their tabular values. The probability of the variables was 0.011: 0.012 that (1.1%: 1.2%), which was below the significant level of 0.05 (5%), which indicates a significant improvement in this variable that the researcher is due to all exercises of recommended rehabilitation program, especially in-water exercises that has undergone the experimental group during the research.

As shown in Table (2), the improvement percentage between pre- and post-measurements ranged from (47.21% to 90.33%) for post-measurement in the range of motion variable for football players with partial rupture of the calf muscle. Stretch exercises from simple to complex and from easy to difficult in water affected the range of motion positively and improved the functional efficiency of the knee joint.

This improvement is also due to the use of water characteristics such as floating, which works to reduce the excess tension in the non-functioning muscles, in addition to the floating is the direction of its work Anti-gravity, Allowing the body to work and move easily and better from work during ground exercises. The body work during the water aquatic helps to ease the flow and validity of blood in a proper manner that reduces the causes of decreases fatigue.

This is agreed with Bakri (2000) reported that physical motor therapy is used to develop muscle strength and elasticity and to increase the range of motion of the joints, thus restoring the motor memory of the injured organ and restoring its motor functions.

This is consistent with Atito, A. (2006), Mohamed, M. (2007), Spargue, K. (1993), Suetta, S. (2008) and Bergamin M. et al (2013) who indicated that progressive static exercises then resistance exercises improve the range of motion of knee and ankle joint.

Tables (2) indicated statistically significant

differences at a significant level (0,05) between pre- and post-measurements of muscular circumference as Z calculated values are greater than their tabular values. The probability of the variables was 0.011 that (1.1%), which was below the significant level of 0.05 (5%), which indicates a significant improvement in this variable that the researcher is due to all exercises of recommended rehabilitation program, especially in-water exercises that has undergone the experimental group during the research.

As shown in Table (2), the improvement percentage between pre- and post-measurements was (12.89%) in favor of post-measurement in the muscular circumference variable for football players with partial rupture of the calf muscle.

The researcher thinks that this improvement is due to the use of water qualities like floatation that decreases stress on working muscles. It works anti- gravity and helps the body to move quickly and easily compared to dry-land exercises. Aquatic medium helps improving blood flow and decreases fatigue.

The researcher attributed the improvement rates in the variant of the circumference of the injured calf muscle behind the leg to the exercises within the water aquatic used and the variety of the exercises in it, which indicates by researcher to achieve the benefit of the rehabilitate exercises, and led to the disappearance of the proportion of pain in the leg and ankle and muscles surrounding it for football players with partial rupture of the calf muscle behind the leg.

Ozkaya U et all (2009) and Willits K et al (2010) agree that the use of early physical rehabilitation leads to increased muscle circumference around the leg and there is no significant difference between the healthy limb and the affected limb.

These improvements are due to the variety of in-water exercises as it eliminated pain in leg and ankle. Al-Khateeb, N. et al (1997), Husam Al-Din, T. et al (1997) Kivi P. et al (2009) and Bergamin M. et al (2013) indicated that variations in strength and stretch exercises improve power and circumference of muscles and elasticity of muscles and ligaments and this eliminates

pain and increases range of motion of knee and ankle joints.

This is consistent with Ronald et al (1991), Foad, W. (2004), Abu Kurish, A. (2001) and Bryan (2009) who indicated the great importance of the strength exercises "static and dynamic" "free and against resistors" and stretch exercises in increasing the strength and size of the muscles involved, decreasing swelling and increasing the range of motion through increasing blood vessels and blood flow.

**Conclusions:**

1. In-water rehabilitation exercises with massage improved pain significantly.
2. In-water rehabilitation exercises with massage improved muscle strength of the calf significantly in participants.
3. In-water rehabilitation exercises with massage improved the functional efficiency of the affected ankle in participants with partial rupture of the calf through improving muscular strength of the working muscles on this joint.
4. In-water rehabilitation exercises with massage improved the Circumference of the calf muscle significantly.

**Recommendations:**

1. Using the recommended rehabilitation in-water exercises with massage with soccer players suffering from partial rupture of the calf
2. Improving flexibility through in-water exercises to improve knee joint function in soccer players suffering from partial rupture of the calf
3. Improving muscular strength of the ankle working muscles in soccer players suffering from partial rupture of the calf
4. Considering the use of in-water rehab exercises in sports rehab and physical therapy clinics
5. Performing similar research studies on various age groups.

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