PalArch's Journal of Archaeology of Egypt / Egyptology

EFFECT OF REHABILITATIVE EXERCISES IN AND OUTSIDE AQUEOUS MEDIUM ON MUSCULAR STRENGTH AND STATIC BALANCE OF THE SEMIMEMBRANOSUS MUSCLES FOR ADVANCED FOOTBALL PLAYERS

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Basimshareefsayah , Prof. Dr. Shaima Ali Khamis , Prof .Dr. Maher Abdul Hamza Hardan Alalwani , Effect Of Rehabilitative Exercises In And Outside Aqueous Medium On Muscular Strength And Static Balance Of The Semimembranosus Muscles For Advanced Football Players , Palarch's Journal Of Archaeology Of Egypt/Egyptology 18(7). ISSN 1567-214x.

Abstract:

Sports injuries are one of the basic problems that hinder the process of progressing at all levels of sports and moving them from one level to another, including football, which results from the injury they stop playing with the team and may be for a long time and thus the team lost important players during the competitions, and the importance of research in preparing exercises inside and outside the water medium lies in the muscular strength and stable balance of the posterior thigh muscles of advanced football players and using them in the future to avoid the occurrence of injury itself.

Research problem: Through the personal experience for researchers, they noted that the hamstring muscle injury is one of the most common sports injuries that occur to football players, the researchers attribute the reason for this due to the fact that most players and coaches ignore these injuries with mild symptoms at first and continue training with this injury and some players do not work to strengthen the posterior thigh muscles, so they are susceptible to injury as well as

the intense training load, which generates direct effort on these muscles and the result of all these things happen to us, therefore, the researchers decided to study this problem and develop appropriate solutions to it through preparing rehabilitative exercises based on sound scientific foundations to develop the muscular strength and stable balance of the posterior thigh muscles of advanced football players and to benefit from them in the future to avoid the occurrence of the same injury.

Research objectives: Prepare rehabilitative exercises inside and outside the aqueous medium for injured posterior thigh muscles for advanced soccer players and to identify the effect of rehabilitative exercises inside and outside the aqueous milieu on muscular strength and stable balance of the hidden thigh muscles of advanced soccer players and using them in the future to avoid the occurrence of the same injury.

The researchers followed the experimental approach by designing the two equivalent groups with the pre and post-tests, and the research sample was chosen by the intentional examination method. The sample included a number of injured players and according to the diagnosis by the doctor the specialist and the doctor's examination with sonar and the medical report of (10) injured players who were divided into (6) the players of the main experiment, (4) the players of the exploratory experiment were divided into two equal groups, and each group (3) of the injured players in the main experiment, while the rest of the members of the research community, who numbered (4) players with the same injury, were excluded as a result of their participation in the exploratory experiment .

The researchers reached a set of conclusions, the most important of which are: Rehabilitative exercises inside and outside the aqueous environment have a positive effect on developing muscle strength, balance, and rehabilitative exercises within the aqueous medium have a preference for rehabilitative exercises outside the aqueous medium over the injured posterior thigh muscles in the research sample.

In light of these conclusions, the researchers recommended several recommendations, the most important of which are: the necessity of using the water medium in the rehabilitation of the posterior thigh muscles and the rest of the thigh injury (front thigh muscles, connective muscles), the necessity of providing the water medium in rehabilitation and physiotherapy centers, and that the rehabilitation be by a rehabilitation specialist.

Introduction:

Sports injuries constitute a direct impact on the level of players 'performance and with the development of modern technology around the world and the abundance of rehabilitation programs and exercises they contain that help players prevent injuries and rehabilitation methods through therapeutic exercises, which are the basis for the rehabilitation of athletes.

The researchers chose the aqueous medium in its rehabilitation program, and the water medium is considered one of the important means in the field of training and rehabilitation of injuries that give the individuals practicing them a sense of acceptance and then affect their physical and psychological health, and water activities have spread widely in modern societies, as a result of the availability of special and appropriate facilities and services, to perform these various activities, in addition to the availability of qualified and trained cadres to supervise these activities through a set of standardized exercises according to the nature of the training or qualifying program, invested in that nature of water and its major role in providing a set of resistances that can be used for rehabilitation and which the researcher used to find out the extent of their impact on the muscular system for soccer players.

Among those injuries is the posterior thigh muscle injury to soccer players, which consists of three muscles that occupy the back of the thigh, and they are:The biceps muscle, the semitendinosus muscle, and the semimembranosus muscle, and most injuries to the posterior thigh muscle occur in the biceps (long head), followed by the semitendinosus muscle,

And finally, the semimembranosus muscle in a row, which takes into account the specificity and functioning of each of these muscles, to qualify them in a scientific way based on the mechanics and characteristics of each muscle, to ensure the healing of the injury as soon as possible, and to reduce the likelihood of its recurrence in the future for advanced football club players.

The importance of the research in preparing exercises inside and outside the aqueous environment lies in the muscular strength and stable balance of advanced soccer players and to benefit from them in the future to avoid the occurrence of the injury itself.

Research problem:

Through the researchers' field experience,they identified the problem of their research that the hamstring muscle injury is one of the most common sports injuries that occur to football players, and the researchers attribute the reason for this due to the fact that most players and coaches ignore these injuries with mild symptoms at the beginning and continue training with the presence of these injury and some players do not work to strengthen the posterior thigh muscles, so they are susceptible to injury, as well as the intense training load, which generates a direct effort on these muscles and as a result all these matters happen to us, so the researchers decided to study this problem and develop appropriate solutions for it through the preparation of rehabilitative exercises based on sound scientific foundations to develop the muscular strength and balance of the fixed back muscles of the thigh of football players the applicants and take advantage of them in the future to avoid the occurrence of the injury itself.

Research objectives:

Prepare rehabilitative exercises inside and outside the aqueous milieu for the injured posterior thigh muscles for advanced soccer players and to identify the effect of rehabilitative exercises inside and outside the aqueous milieu on muscular strength and stable balance of the posterior thigh muscles for advanced soccer players and to benefit from them in the future to avoid the occurrence of the same injury.

Research hypotheses:

Theresearchers assumed that the exercises inside and outside the aqueous medium qualify the injured posterior thigh muscles for the research sample, as well as there are significant differences between the pre and post measurement in some muscle strength and static balance in favor of the post measurement. Posterior thigh muscle injury.

Fields of research:

It was represented by the advanced players injured by the posterior thigh muscles in some clubs in Baghdad, the first degree in football, which numbered (10) players, and the time of conducting the experiment was from 12/20/2020 to 3/28/2021. Field exercises and experiments, they chose Aspetar 2 Medical and Sports Rehabilitation Center, located in Baghdad governorate.

Research methodology and field procedures:

Research Methodology:

The experimental method was used because it was compatible with the nature of the research problem, and by designing the method of two equal groups of pre and post-tests.

Community and sample research:

The research sample was chosen by means of intentional inspection. The sample included a number of injured players, according to the diagnosis by the doctor ((the specialist, the doctor's examination with sonar and the medical report of their number), (10) injured players who were divided into (6) players of the main experiment, (4) players of experience The survey was divided into two equal groups, and each group had (3) of the injured players in the main experiment. As for the rest of the members of the research community, who numbered (4) players with the same injury, they were excluded as a result of their participation in the exploratory experiment.

Devices, tools and means used in the research:

Meansof data collection:

- Arab and foreign sources and the internet.
- Personal interviews.
- Tests and measurements.
- Special forms for recording test results for players.

Tools and devices used:

- The dynamometer device.
- A bicycle fixed inside the water
- fixed bike outside the water
- Plastic signs.
- Balance balls.
- Rubber bands.
- Weight bars (3) kg.
- Weight bars (5) kg
- Indoor swimming pool (10m x 20m).
- Indoor swimming pool (3m x 3m).
- A mastaba number 3 (5 cm x 1 m).
- 2 Casio stopwatch.
- whistle type (AGME).
- Adhesive tape .
- CD.
- HP laptop computer.
- A tape measure (50 m) in length.
- A scale to measure weight.
- Tape measure length.

Field research procedures:

First: The leg muscle strength test: [1]

Purpose of the test: Measurement of muscle strength working to bend and extend the leg.
Used Tools: Dynamometer, mind a wall.
Performance description: The tested player stands facing the mind of the wall, then the body is fixed in four areas, which are the shoulders - the trunk - the foot - the thigh, and the fixation of the thigh is from the bending position of the thigh joint, where the circular dynamometer belt is placed at the end of the near end of the foot, when measuring the strength of the muscles that work On the leg bend, the dynamometer is at the top of the leg (Figure 168), and the dynamometer is at the bottom of the leg when measuring the strength of the muscles that work on bending the leg,figure (1).

Figure 1. Measurement of muscle strength working to bend and extend the leg.

Performance Instructions:

- The tested player should stand close to the mind of the wall.
- The player's body should be fixed in the shoulder, torso, foot and thigh areas.
- The circular belt must be fixed to the dynamometer precisely.

Test Administration:

- Referee: observes the performance and signals the start.
- Recorder: calls players, reads and records scores.

Scoring calculation:

- Each player is given two consecutive attempts for each leg from the flexed and stretched positions
- Record the best results.

Second: Static balance:
Metatarsal Stand test: [2]
Purpose of the test: Static balance measurement, when the tester is standing on the floor on the instep.
Used Tools: Stopwatch, wristwatch, and seconds hand.

Performance description:

- The laboratory takes a standing position on one of the feet, preferably the foot of a man to rise, then puts the foot of the other (free) man on the inner side of the knee of the man on which he stands, and also puts the hands in the middle.

- When the signal is given, the laboratory raises an obstacle from the ground and maintains its balance for as long as possible without moving the edges of its foot from its position or touching the heel of the ground, as in figure (2) .
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Figure 2. The static balance test demonstrates.

Test Instructions:

- The test is taken without shoes.
- The hands should be kept steady in the center.
- The test period ends when the feet are moved out of place or when the heel of the foot touches the ground.
- Three attempts are allowed.

Test Administration:

- Referee: Giving the start signal, monitoring performance and calculating time.
- Recorder: calls players, reads and records scores.

Scoring calculation:

- The best time for three attempts is calculated, and it is the time that starts from the moment the heel is lifted from the ground until some performance mistakes are made and the balance is lost.

Third: Diagnosis of infection:

After seeing, the researchers prepared an information and detection form for the injury, which concerns the players with partial tearing of the posterior thigh muscles, through the presence of researchers in the places where the players are trained, and the purpose of this form is to know the initial information about each injured player in terms of the date of the injury as well as some measurements such as age and height and the weight then the players were diagnosed through the specialist doctor and the doctor directed the ultrasound for the research sample, where the type of injury was determined by sonar and the medical report, and then they were given medical drugs by the specialist before the rehabilitation procedure.

Exploratory experience:

The researchers conducted their first exploratory experiment on Sunday, 12/20/2012 at 3:00 pm, on a sample of soccer players with partial rupture of the posterior thigh muscles,

numbering (4) players at Aspetar 2 Center in Baghdad , and the aim of this experiment is the following: -

- Knowing the difficulties and problems that the researcher may face.
- Ensure the validity of the place where the program will be implemented.
- Knowing how easy and difficult it is to measure.
- Knowing the appropriateness of the exercises used among the sample members.
- Ensure the validity of devices and tools.
- Identify the time of performance of the rehabilitation programs for the sample.
- Extracting the scientific foundations for the tests used.
- Defining the auxiliary work team of their actual work.

The second exploratory experience:

The researchers conducted the second exploratory experiment on Sunday 12/27/2020 at 3:00 pm on a sample of the research community with (4) players in the Aspetar 2 center located in Baghdad with the help of the work team and the aim of this experiment was the following: -

- The difficulties and problems that the researcher may face have been identified.
- The validity of the place in which the program will be implemented has been verified.
- Knowing how easy and difficult it is to measure.
- The suitability of the exercises used among the sample members was determined.
- The validity of the devices and tools has been verified.
- The time of performance of the rehabilitation programs for the sample was identified.
- The scientific foundations for the tests used were extracted.
- The auxiliary work team has been defined effectively with their work.

Preparing rehabilitative exercises:

The researchers reviewed the references, scientific sources and previous studies related to the research topic, and conducted personal interviews with a number of experts and specialists in the field of sports medicine and rehabilitative treatment for players with a partial tear of the posterior thigh muscles and then preparing rehabilitative exercises for players with a partial tear of the posterior thigh muscles, the first group uses exercises inside the aqueous medium, and the second group uses exercises outside the aqueous environment, and the rehabilitative exercises consist of three stages that include(3) rehabilitation units every week (Sunday, Tuesday, Thursday).

Main experiment:

Pre-test:

Pre-tests were conducted for the members of the research sample on Tuesday, 12/29/2020 at 3 pm, after diagnosing the infection after completing the drug treatment, taking into account obtaining the same sample in terms of type and severity of injury, in order to preserve scientific integrity.

Application the rehabilitative exercises:

The researchers applied the rehabilitative exercises on Thursday, 12/31/2020 until Sunday, 2/28/2021 at 3 p.m., as the first group members of the first group rehabilitated the

patients with a partial tear of the posterior thigh muscles using exercises inside the aqueous environment, and the injured were also rehabilitated By partial rupture of the posterior thigh muscles of the second group, using exercises outside the watery medium, by choosing rehabilitative exercises that are based on the latest sources and scientific references, taking into account the principle of gradual increase in intensity.

The specifications of the qualifying exercises were as follows:

- The rehabilitative exercises were implemented in eight weeks, the first phase was two weeks and the second and third phase three weeks,it included three rehabilitative units per week and it was applied on Sunday, Tuesday, and Thursday.
- The rehabilitative exercises for the first experimental group included the use of exercises within the aqueous environment.
- The rehabilitative exercises for the second experimental group included the use of exercises outside the aqueous environment.
- The time of the rehabilitative unit for rehabilitative exercises is graded according to the rehabilitation stages, as it ranged between (20 - 75) minutes.
- The total of the implemented rehabilitation units was (24) units for each injured player.

Post-test:

The post-tests were conducted for the research sample on Wednesday 3/3/2021 at 3 pm with the same sequence of pre-tests.

Statistical means: The researchers used the statistical bag (SPSS) to analyzing the research results, including: -

- Mean.
- Standarddeviation .
  - Std. Deviation
  - Median
  - Skew ness
  - Standard error
- T-test

Presentation, analysis and discussion of results:

Presentation and analysis of the results of the pre-tests for the two groups (the first experimental and the second experimental).

Table (1) : Shows the arithmetic mean, standard deviations, and t-values of the pre-tests of the two experimental groups and their statistical significance..

Variables	Pre-test		Post-test		T value	Sig type
	Mean	Std. Deviation	Mean	Std. Deviation		
Quadriceps strength	6.22	0.67	6.33	0.35	0.442	Non sig
Balance	8.11	0.22	8.17	0.25	0.500	Non sig

Presentation and analysis of (T) test results for the pre and post- tests of the first experimental group:

Table (2) : Shows the statistical indicators of the results of the tests in the pre and post measurement of the research variables that the members of the first group underwent.

Variables	Pre-testInside the middle		Post-testInside the middle		T value	Sig type
	Mean	Std. Deviation	Mean	Std. Deviation		
Quadriceps strength	6.22	0.67	16.89	0.42	40.70	Sig
Balance	8.11	0.22	18.89	0.72	39.81	Sig

Presentation and analysis of the results of (t-test) for the pre and post-tests of the second experimental group:

Table (3) : Shows the mean values, standard deviations, and t-values of the pre and post tests for the group outside the aqueous medium (second group).

Variables	Pre-test Outside the middle		Post-test Outside the middle		T value	Sig type
	Mean	Std. Deviation	Mean	Std. Deviation		
Quadriceps strength	6.33	0.35	15.39	0.42	49.42	Sig
Balance	8.17	0.25	16.72	0.97	25.58	Sig

Discussing the results of the t-test between the pre-tests of the two groups (first and second) for tests (thigh muscle strength, balance):

Through what was presented in Table (1), it was found that the differences were not significant between the first and second experimental groups in the pre-measurements, and the researchers attribute the reason that the sample is from the injured players in the process of starting qualifying exercises. It is natural that the result of the measurements is not significant because the muscle cannot the background for the thigh to resist tests due to injury, and among them, those with qualification must gradually undertake rehabilitative exercises from easy to medium difficult to ensure re-hospitalization and correct rehabilitation, and to ensure that the player can return to the stadiums and practice his sporting activity with ease and this is what the researcher sought during the qualification phase for a sample search .

Discussing the results of the (t.test) test between the pre and post tests and for the two groups (first and second) for tests (thigh muscle strength, speed, balance):

Through what was presented in tables (2,3), it was found that there are discrepancies between the pre- and post-tests and for the two groups, so we find that the injured players and the two groups showed a statistically significant development in the tests (muscle strength of the leg, balance) , however, the development that took place in the first experimental group, which was performing exercises inside the water medium for the dimensional tests, was much better than the pre-tests, and this is evident by looking at the values in table (3) .The researchers attribute the reason for the development that took place in the telemetry from the pre-measurement to the qualifying program using exercises within the water medium of the first group prepared by the

researcher and what included in it to determine the distance, rest periods and repetitions that are consistent with the research sample as it had a positive effect on the development of all tests, as well as helped In increasing the strength of the posterior thigh muscle, and this is one of the most important reasons that led to the occurrence of differences between the pre and post measurements in favor of the telemetry, and this is consistent with what was mentioned in the second hypothesis of the research.

The researchers believe that the diversity in the use of exercises helped complete the rehabilitation requirements for the affected area, since the use of some biomotor capabilities is supported by the use of rehabilitative exercises as it has importance in strengthening the working muscles of the affected area and as a result is to reach better motor performance in restoring movement and muscle balance to the injury area and this In turn, it works to reduce the recurrence of infection.

In order to help the injured and return to what he was before the injury, it is necessary to work on finding these exercises that play an effective role that has wide-ranging effects in the rehabilitation of many cases by applying practical and scientific means to obtain the best results that serve the human health in general and the injured athlete in particular, this is what was confirmed by (Samia Khalil) (that they are specific sports movements for different disease cases whose purpose is preventive and therapeutic, and that is not usually the movement body to a normal and rehabilitative state, and the use of the basic principles of the sensory-kinesthetic action that work in influencing the ability of muscles and nerves by choosing appropriate movements and positions for the body) [(3)].

The researchers also see that the commitment to performing exercises in a large percentage had a clear role in improving the mobility, which in turn was reflected in the posterior thigh muscles (leg muscle strength, balance) and all related to some and the effect falls on all parts, so directed exercises that are subject to scientific standards in rehabilitation and treatment Natural, accompanied by specialized cadres and scientific centers, will have a clear impact on achieving development [(4)].

As for the development of the second experimental group, which used to perform exercises outside the water environment for the pre-tests, much less than the dimensional tests, and this is evident by looking at the values in table (1), where the researchers attribute the reason for the development that occurred in the post-measurement from the pre-measurement to the role the positive for these exercises is in addition to the devices used in order to rehabilitate the affected area better and faster, rehabilitation exercises work to stimulate blood circulation and increase the flow of blood flow to the affected muscle (the posterior thigh) in order to increase muscle nutrition and strength, and this is consistent with what was stated by (Qassem Al-Mandalawi and Mahmoud Al-Shati) (that the development of strength is through the optimal use of exercises, whether from the stationary position) Or mobile, which leads during the rehabilitation program to reach better results for developing the characteristic of strength [(5)] .

The researchers believe that treatment with rehabilitative exercises and modern methods that work to rehabilitate according to the type of injury, whether in the event of surgical intervention or without it, the injured player will resort to conducting rehabilitative exercises because of its great role to reduce the injury and avoid it in the future, which was approved by the researcher, hence, rehabilitative therapeutic exercises give physical and psychological treatment, so if the physical characteristics of the injured person develop to perform many daily movements without any hesitation, obtaining strength and a good range of motion of the joint

and muscle gives enthusiasm to the injured to go to treatment and this is one of the goals achieved by the rehabilitation programs.

Presenting, analyzing and discussing the results of the dimensional tests of the two experimental groups:

Presenting and analyzing the results of the (t-test) test for the post tests and for the two groups (experimental first, experimental second):

Table (4) : Shows the arithmetic mean, standard deviations, and t-values of the dimensional tests of the two experimental groups and their statistical significance:

Variables	Pre-test inside the middle		Post-test Outside the middle		T value	Sig type
	Mean	Std. Deviation	Mean	Std. Deviation		
Quadriceps strength	16.89	0.42	15.39	0.42	7.637	Sig
Balance	18.89	0.72	16.72	0.97	5.21	Sig

Discussing the results of (t-test) for the post-tests between the two experimental groups.

Through what was presented in Table (4), it was found that there are significant differences between measuring the dimensional tests and in favor of the first experimental group that used exercises inside the water medium in the rehabilitation process, and this is consistent with what was mentioned in the third hypothesis of the research, and the researchers attribute this development to the use of biomotor capabilities there has been a noticeable improvement in the amount of muscle strength and balance in the variables under study (as the use of exercises within the water medium in the type of specialized activity leads to an increase in muscle strength by a greater rate than its counterparts) [(6)], as well as the use of the water medium is important in the healing process than it had a significant positive effect in the rehabilitation phase, which resulted in a noticeable increase in the amount of muscle strength.

(AmerFakherAshgati) confirmed that balance is related to muscle strength and that muscle strength is a factor affecting the ability to balance [(7)]. This is consistent with the study (Ahmed KamelAllawi)[(8)], who indicated that balance is achieved when muscles are strengthened ,this is what the researcher worked on, as he used strength exercises in his rehabilitation program, which aims to strengthen muscles and achieve muscle balance, and thus develop a stable balance component for players with a partial tear of the posterior thigh muscles, sources indicate that rehabilitative exercises can be performed easily in the water medium, due to the buoyancy laws that reduce the specific weight according to the laws that the body is subject to in the water, which helps to perform rehabilitative exercises in the water medium without feeling the weight of the body, which reduces pressure on the affected joints and weak muscles and it contributes to relaxing the patient during the treatment session, and thus the risks of recurring injury during rehabilitation are reduced [(9)].

The researchers concluded through their study that the exercise of exercise inside and outside the aqueous environment with the biomechanical abilities led to the return of the injured to his normal position after the occurrence of the injury and this is consistent with what was stated in the first hypothesis of the research, and the researchers took into account the extent of ease and difficulty when using rehabilitative exercises as well as thrill and excitement and

commitment to exercises and other things that led to the success of the rehabilitation phase and the return of the injured player to his normal position.

Conclusions and recommendations:

Conclusions:

- Rehabilitation exercises inside and outside the aqueous environment have a positive effect on developing muscular strength, balance.
- Rehabilitation exercises within the aqueous environment are preferable to rehabilitative exercises outside the aqueous environment on the injured posterior thigh muscles of the research sample.
- Rehabilitation exercises within the aqueous environment are preferable to rehabilitative exercises outside the aqueous environment on the injured posterior thigh muscles of the research sample.

Recommendations:

- The necessity to use the water medium in the rehabilitation of the posterior thigh muscles and the rest of the thigh injury (the front thigh muscles, the connective muscles).
- The necessity of providing the water medium in the rehabilitation and physiotherapy centers, and that the rehabilitation be done by the rehabilitation specialist and not by others.
- Conducting comparative studies between rehabilitative exercises inside and outside the water milieu to find out which is better in rehabilitating players with football.
- Circulating rehabilitative exercises used inside and outside the aqueous environment in rehabilitation and physiotherapy centers to rehabilitate players injured in the hamstring muscles.

References:

1. Ahmed KamelAllawi; The effect of some therapeutic methods and rehabilitative exercises on the range of motion and efficiency of the knee joint before and after the reconstruction of the anterior cruciate ligament and after it for soccer players, unpublished PhD thesis, University of Baghdad, College of Physical Education and Sports Sciences, 2019.
2. Hassan Al-Sayed Abu Abdo: (2015);Physical preparation for football players.
3. Samia Khalil: (1990);Therapeutic Sports, Baghdad University Press - College of Physical Education.
4. AmerFakher my works: (2013); Sports Training Science, (1st Edition, Amman, Arab Community Library).
5. Qasim Al-Mandalawi and Mahmoud Al-Shati: (1987);Sports Training and Records, University of Mosul, Dar Al-Kutub for Printing and Publishing.
6. Muhammad Hassan Allawi and Muhammad NasreddinRadwan: (1982);Kinetic Performance Tests, 1st Edition, Cairo, Arab Thought House.
7. Hashem Al-Kilani: (2000);Physiological Foundations of Sports Training, Cairo, Al-Falah Library.
8. Guitlty B-&et-al-physiottherpy: (2003);inclyding quadriceps exercices and patellar taping,forkn,no,30,.
9. Lorin,thein& Paul richly : (2009); aquatic exersice for rehab ilition and traning.