



Rehabilitation exercises and their effect on the muscle balance after scapula injury

Dr. Fatemah Assad Khuraibet

Assistant Professor, Department of Physical Education and Sport, College of Basic Education, Kuwait
Email: prof.fatemah.khuraibet@gmail.com

Abstract: Sports injuries are one of the main obstacles facing the development of the athletic level of the player and prevent him from achieving the required athletic achievement, as the progressive development processes are affected by the distribution of sports training loads as a result of the various injuries that the player is exposed to, in order to prevent the player from achieving the target over the periods of the training season. **objectives:** The research aims to design a program of rehabilitative exercises to improve the percentage of muscle balance after a shoulder strap injury in some athletes and to know its effect on the following: (1) Muscle strength in affected muscles improved after physical rehabilitation. (2) Kinetic range of the affected muscles improved after physical rehabilitation. (3) The pain intensity of the affected muscles improved after physical rehabilitation. **hypothesis:** There are statistically significant differences between the mean pre-measurement and the mean after measurement in the improvement of the muscle strength of the affected muscles in favor of the post-measurement. (1) There are statistically significant differences between the mean pre-measurement and the mean after measurement in the improvement of the motor range of the affected muscles in favor of the post-measurement. (2) There are statistically significant differences between the mean pre-measurement and the mean after measurement in the improvement of the pain intensity of the affected muscles in favor of the post-measurement. **Conclusions explanation:** It is clear that there are statistically significant differences between the tribal measurement and the dimensional measurement in the research variables, where the rate of change between the average tribal measurement and the average dimensional measurement in muscle strength reached 146.88%, as well as a noticeable improvement in pain intensity of 86.29% Also, there is an improvement in the kinetic range of 44.05% for the tide movement, and 88.23% for the horizontal divergence movement, in favor of post measurement.

[Fatemah Assad Khuraibet. **Rehabilitation exercises and their effect on the muscle balance after scapula injury.** *Researcher* 2020;12(5):63-69]. ISSN 1553-9865 (print); ISSN 2163-8950 (online). <http://www.sciencepub.net/researcher>. 7. doi:10.7537/marsrsj120520.07.

Keywords: Injury, Physical motor therapy, Muscular balance

Introduction and Paper problem:

Sports injuries are one of the main obstacles facing the development of the athletic level of the player and prevent him from achieving the required athletic achievement, as the progressive development processes are affected by the distribution of sports training loads as a result of the various injuries that the player is exposed to, in order to prevent the player from achieving the target over the periods of the training season.

Izzat Al-Kashef (2004) explains the importance of the role of rehabilitative exercises in helping to speed recovery to recovery, as it is considered one of the most influential combined methods in the treatment of sports and non-athletic individuals with any disabilities in their body organs, it prevents the emergence of bleeding that can occur in the joints, Then it works to quickly restore the muscles and joints to its functions, hence the role of rehabilitative exercises that contribute to the player's return to the normal exercise of sports activities after his injury.

Ahmed Abdel Salam (2014 AD) indicates that rehabilitative exercises, whether positive or negative, are one of the means of motor rehabilitation, which is one of the most important steps for treating the injured, because physical exercises play a large role in maintaining the health and fitness of the injured individual and reducing complications that may occur in The vital organs of the body, and they work to restore the confidence of the person himself and his ability to perform motor normally.

Bornstein (2006) believes that rehabilitative exercises are a constructive and tight process for the body in order to adjust its movement and improve muscle functions and maintain good body building, and that the exercises increase the muscle strength, flexibility, range of movement and endurance, and the rate of sports injuries in training may decrease through the coach's knowledge of the reasons Which can lead

to their occurrence, in addition to knowing the movements of each joint and the muscles working on it depending on the type of sports activity used, as well as the corresponding muscles in order to achieve the principle of balanced training.

Abd al-Rahman Zahir (2004) indicates that the muscle balance requires equivalence between the working muscle group and the corresponding muscle group, and this requires a balance in the strength ratios of the individual body on both sides of the body and between the muscle groups around the same joint.

By examining the researcher - what references and studies were made available to her, as well as the researcher's experience in the field of athletic rehabilitation, it was found that there is a variation in the muscle strength between the working muscles and the interview, and this difference began to appear clearly after the player returns from injury, which was negatively affected by his performance and level. The technician, the researcher attributed the decline in the level of performance of the players after the physical rehabilitation process to the lack of suitable rehabilitation programs for them to restore the balance between the working muscles and the interview, and this in turn led to a negative impact on the health of athletes and also on sports results.

paper objectives:

The research aims to design a program of rehabilitative exercises to improve the percentage of muscle balance after a shoulder strap injury in some athletes and to know its effect on the following:

1. Muscle strength in affected muscles improved after physical rehabilitation.
2. Kinetic range of the affected muscles improved after physical rehabilitation.
3. The pain intensity of the affected muscles improved after physical rehabilitation.

Research hypothesis:

1. There are statistically significant differences between the mean pre-measurement and the mean after measurement in the improvement of the muscle strength of the affected muscles in favor of the post-measurement.

2. There are statistically significant differences between the mean pre-measurement and the mean after measurement in the improvement of the motor range of the affected muscles in favor of the post-measurement.

3. There are statistically significant differences between the mean pre-measurement and the mean after measurement in the improvement of the pain intensity of the affected muscles in favor of the post-measurement.

- 4.

Paper keywords:

1. Injury:

"It exposes the various tissues of the body to external or internal influences that lead to anatomical and physiological changes in the site of the injury, which disrupts the work or function of that tissue."

2. Physical motor therapy:

"One of the basic natural means in the field of integrated treatment of sports injuries, and some diseases by employing the codified movement aimed at restoring the injured person to his basic functions, as well as the affected organ."

3. Muscular balance:

"It is the strength of a muscle or muscle group and its relationship to another muscle or muscle group, and the balance often reflects the relative limits of muscle strength."

Paper procedures:

Paper curriculum:

Depending on the nature of the research and its objectives, the researcher used the experimental method using the experimental design of the pre and post measurements, using one group.

Paper sample:

The research sample was chosen intentionally by some 6-year-old athletes between 19-21 years, who suffer from partial tear muscles in the second-degree shoulder belt muscles, after conducting a medical examination and the approval of the specialist doctor.

Sample features:

Table (1) Arithmetic mean, standard deviation, and torsion coefficient of search variables N = 6

variables	Measurement unit	SMA	Standard Deviation	Mediator	Torsion coefficient	
Age	year	20.14	3.06	19.07	1.08	
Weight	Kg	75.32	2.45	74.89	0.53	
Length	cm	184.15	4.09	185.02	0.64-	
Muscular strength	Kg	9.26	2.55	9.74	0.56-	
Pain severity	degree	8.12	3.02	7.36	0.75	
Motor range	hyperextension	degree	55.00	4.11	54.19	0.59
	abduction	degree	30.00	3.22	29.01	0.92

Table (1) indicates to the fact that variables' torsion coefficient of the research total sample is between 0.64- and 1.08 which means that it locates between the values 3+ and 3- which is an evidence of the sample homogeneity in general.

Conditions of choosing the Paper sample:

- From some athletes between the ages of 19-21 years.
- Suffering from scapula pain as a result of partial rupture.
- Determine the specialist doctor for the injury.

Measurement tools and devices:

- Sample data collection form.
- Tensometer to measure muscular strength (Kg).
- A gyroscope to measure the range of motion (degree).
- VAS to measure pain severity (degree).
- Various tools (medical balls of different sizes, mace, stick, elastic tape...).
- Rest meter to measure length (cm).
- Medical scale to measure weight (Kg).
- Stopwatch.

Measuring muscular strength:

- A Tensometer is attached to one end of the wall.
- The injured stands in front of the device with the injured hand held, and the opposite leg forward with the armrest.
- The injured pulls back with maximum force and stability for 3 seconds.
- The measurement unit is Kg.

Measuring motor range (arm back extension):

- The injured player will stand up straight.
- The goniometer is fixed in the middle of the shoulder joint from the outside and its direction is facing down.
- The moving arm is on the affected arm, and the stationary arm is parallel to the trunk.
- The arm is moved backward for maximum range with 3 seconds holding for measuring.

Measuring motor range (lifting arm aside):

- The injured player stands up straight.
- The goniometer is fixed in the middle of the shoulder joint from the front and facing down.
- The moving arm is on the affected arm, and the stationary arm is parallel to the trunk.
- The lever is raised aside for maximum range with 3 seconds steady to take reading.

Design the proposed qualifying program:

The researcher has reviewed the references and studies related to the subject of the study - which have been made available - both domestic and foreign to obtain the latest studies that used rehabilitative

exercises, to reach the construction of the proposed qualification program which is appropriate to the nature of injury, sports and the age stage.

The content of the proposed qualification program:

The proposed program was developed for a period of (6) weeks, with (18) pre-trial sessions divided into three phases as follows:

First stage:

The duration of the two weeks is three units per week with a total of (6) units distributed equally, and the session time was (30) minutes and included some rehabilitative exercises with the help of positive ones.

Second stage:

The duration of two weeks is three units per week with a total of (6) units distributed equally, and the session time was (40) minutes, and included some rehabilitative exercises with tools and devices, and the goal of the second stage was to increase the improvement in pain intensity and improve the range of movement and muscle strength of the muscles of the shoulder girdle area Infected.

Third stage:

The duration of the two weeks is three units per week with a total of (6) units distributed equally, and the session time was (50) minutes, and included rehabilitation exercises using the devices, as well as functional exercises, and the goal of the third stage was to eliminate pain and reach the kinetic range of the shoulder joint (stretch, distancing) To the maximum extent, as well as increase the muscle strength of the shoulder strap muscles.

Each training session included:

• **Warm-up (initialization):**

By doing a massage for the shoulder girdle muscles and simple movements with the help of the shoulder joint, its duration is (5-7) minutes to prepare the body in general and the affected muscles in particular, depending on the individual situation.

• **The main part (basic exercises):**

It includes the specific exercises in each stage of the program's application or the selection of several different exercises from the other stages, according to the condition of each injured person and the extent of his progress and the duration of this part of (20-36) minutes.

• **The final part (calm down):**

And its duration is (5-7) minutes. It includes a set of exercises for relaxing all the muscles participating in the rehabilitative exercises, as the body returns to its normal state.

Statistical treatment:

- SMA.
- Standard deviation.
- Mediator.

- Torsion coefficient.
- Change rate %.
- T- Test.

Results presentation:

The following is a presentation of the results to find an indication of the differences between tribal and dimensional measurements

Table (2) The significant differences between the research variables two dimensions of the post-pre-measurement and the change rate in the research sample group N = 6

variable	Measurement unit	Pre-measurement		Post-measurement		Difference between measurements	Change rate	
		C	H+/-	C	H+/-			
Muscular strength	Kg	10.26	2.55	25.33	3.89	15.07	146.88	
Pain severity	degree	8.17	3.02	1.12	0.45	7.05	86.29	
Motor range	hyperextension	degree	55.00	4.11	79.23	3.23	24.23	44.05
	abduction	degree	30.00	3.22	56.47	3.06	26.47	88.23

Table (2) shows the significance of the differences between the mean of the pre-measurement and the post-measurement in the research group in the search variables in favor of the post-measurement, at a significant level (0.05).

Conclusions explanation:

It is clear from Table (2) that there are statistically significant differences between the tribal measurement and the dimensional measurement in the research variables, where the rate of change between the average tribal measurement and the average dimensional measurement in muscle strength reached 146.88%, as well as a noticeable improvement in pain intensity of 86.29%. Also, there is an improvement in the kinetic range of 44.05% for the tide movement, and 88.23% for the horizontal divergence movement, in favor of post measurement.

Interpretation of the results of the first hypothesis, which states:

There are statistically significant differences between the mean pre-measurement and the mean after measurement in the improvement of the muscle strength of the affected muscles in favor of the post-measurement.

"Osama Reyad and Nahed Abdel Rahim" (2001) state that applying fixed and progressive exercises to using assistive exercises and then free exercises then resistance exercises that have a significant impact on improving and developing muscular work, and gradually increasing this resistance to reach the best possible level without complication.

Kadry Baky (2002) notes that integrated physical rehabilitation therapy has a positive effect on strengthening muscles, relaxing tense muscles, stimulating blood circulation, improving muscle tone, relieving pain and improving the psychological state. Abu Al-Ela Abdel-Fattah and Ahmed Nasr El-Din (2003) believe that the various doses of training in size and intensity help to gain more strength, and that

the gradual increase in resistance helps to gain muscle strength and growth.

Izzat Al-Kashef (2004) focuses on the importance of the role of rehabilitative exercises on the speed of hospitalization, as it is considered one of the most effective methods that affect the treatment of individuals with disabilities in the organs of their bodies, it prevents bloody bleeding that can occur in the joint and works to restore the muscles and joints to their functions and from here The role of rehabilitative exercises is clear.

And Ali Jalal Al-Din (2007) states that motor rehabilitation must go through hospital treatment in which the inflammatory condition is eliminated and the functional dysfunction resulting from the injury is eliminated. Then the stage of sports rehabilitation, which is summarized in the clear return of the athlete to the return of normal training in his specialization, appears, considering the appropriate levels of sizes and intensity of training loads as well as prevention of recurrence of injury.

And Bahaa Al-Din Salama (2002) states that continuous muscular training increases blood flow to the muscles, which works to build new blood capillaries, which helps to increase muscle tissue, and thus increases the cross section of the muscle, as well as increasing its efficiency, and that strength training can to protect the joint from injury due to strengthening the muscles that work on the joints.

The researcher believes that the regulated physical exercises help in the return of the affected part to its normal state, as well as through the design of the physical rehabilitation training program and the use of tools and devices that led to an increase in the efficiency of the muscle strength of the affected part and thus its impact on the speed of the injured player's recovery and a return to training in the activity practiced again.

Explaining the second hypo Paper which is:

There are statistically significant differences between the mean pre-measurement and the mean

after measurement in the improvement of the motor range of the affected muscles in favor of the post-measurement.

This is what the results of the "Abdul-Baqi praise" study (2002) showed, that the exercise of sound and positive flexibility exercises achieves stretching of the muscles and increasing the elastic properties of the ligaments and muscles together, and this leads to an increase in the range of movement. Both Faraj Abdul Hamid (2005) and Official Iqbal (2008) indicate that rehabilitative exercises increase the flexibility of the joint and thus increase the motor range for it and increase bone nutrition in a proper way, as well as increasing the elasticity of the muscles working on the joint.

This is in line with what the study of "Ehab Ismail" (2006), "Ahmed Mohieldin" (2008), Ahmed Riad (2009), Ashraf Mustafa (2009), and Ahmed Mohamed (2011), showed, that there is an imbalance in the muscular balance on the joints. It leads to reducing the range of kinetic range of the joint, which is reflected negatively on some fitness components such as strength, speed and alignment in athletes, and therefore leads to a weak level of muscular nervous compatibility, as well as between the working and opposing muscles, and this may cause injury to the muscles and ligaments.

"Ahmed Abdel Salam" (2014) indicates that rehabilitative exercises have a major role in increasing the kinetic range of the joints, as they increase the flexibility of the joint and thus increase the kinetic range for it, and that these exercises increase the elasticity of the muscles working on the joint. Through the foregoing, the researcher believes that the proposed rehabilitative exercises have a major role in increasing the motor range of the joint, due to the flexibility and muscular stretching exercises of the affected part, and then its effect is positively reflected on the muscle strength, taking into account the direction of movement in the activity practiced.

Explaining the third hypo Paper which is:

There are statistically significant differences between the mean pre-measurement and the mean after measurement in the improvement of the pain intensity of the affected muscles in favor of the post-measurement.

As Izzat Muhammad (2004) indicates that rehabilitative exercises are among the most natural means that contribute to restoring the affected part to his physical and functional capabilities, as exercises help to quickly remove blood clusters and the speedy recovery of muscles and joints to their functions as a result of the removal of pain. And consistent with that indicated by both Emin Ergen and Karol Hibner (2006) that exercises are the common way in rehabilitation programs to relieve pain as they

maintain the health of the individual and relieve pain throughout the time, and that physical activities help control joint pain and swelling resulting from arthritis. Abdel Basit Seddik (2013) also believes that the first goal of rehabilitation is to reduce pain and swelling that may continue during the rehabilitation stages.

It is clear from the above that the rehabilitation program has a positive effect on increasing muscle strength and range of motion and reducing pain intensity for the muscles of the affected shoulder belt, and this may be due to the containment of the program to a set of exercises by the player himself or by resistance of the specialist and devices. Osama Reyad (2006) and Siham Farouk (2006) indicated that targeted, targeted movement therapy is one of the basic natural means in the field of integrated treatment of injuries. From the aforementioned, it appears that the rehabilitation program has a positive effect on increasing muscle strength, motor range, and pain intensity for the muscles working on the affected shoulder belt.

Conclusions:

1. The proposed rehabilitation program has a positive effect on the muscle strength of the shoulder girdle.
2. The proposed rehabilitation program has a positive effect on the motor range of the shoulder joint (stretch, horizontal stretch).
3. The proposed rehabilitation program has a positive effect on improving pain intensity in the injured.

Recommendations:

1. Follow the qualifying program in the case of shoulder strap injury in different games.
2. Consider safety and security factors during training and pay close attention to warm up.
3. The earlier the injured player can be noticed, the shorter the physical rehabilitation period.

References

1. Abul-Ela Ahmed Abdel-Fattah, Ahmed Nasr El-Din Saied (2003): Physiology of Fitness, Arab Thought House, Cairo.
2. Ahmed Abdel Salam Attito (2014): injuries in stadiums and private parking, ambulance-rehabilitation, Al-Amal publish house, Mansoura.
3. - Ahmed Abdel-Salam Attito (2014): "The effect of suggested rehabilitative exercises using weightlifting to achieve muscle balance after torn muscles behind the thigh", scientific production.
4. Ahmad Riyadh Al-Minshawi (2009): "Training program with weights to achieve balance in

- strength for some of the flexor and extensor muscles of the knees", Master Thesis, College of Physical Education, Tanta University.
5. Ahmed Mohamed Hussein (2011): "The effect of a training program to achieve balance in the strength of some muscles of the lower limb on the effectiveness of the skill performance of Karate (Kata major)", Master Thesis, Faculty of Physical Education, Tanta University.
 6. Ahmed Mohy Al-Din Issa (2008): "Weight training program to develop the muscle balance of the muscular strength of some muscles of the lower limb and its effect on the digital level of chest swimming", Master Thesis, College of Physical Education, Tanta University.
 7. Osama Reyad Awani (2006): Sports Medicine and Bicycles, the Book Publishing Center, Cairo.
 8. Osama Riad, Nahed Ahmed Abdel-Rahim (2001 AD): Measurement and motor rehabilitation for the handicapped, The Book Publishing Center, First Edition, Cairo.
 9. Ashraf Mustafa Abdel-Hafez (2009): "A training program to improve the muscle balance of the lower limb among 400-meter hurdles", Doctor's Message, Faculty of Physical Education, Tanta University.
 10. Iqbal Official Muhammad (2008): Sports injuries and their treatment methods, Cairo, Dar Al-Fajr for publication and distribution, Cairo.
 11. Ehab Mohamed Ismail (2006): "A training program for muscle balance in the dynamic strength of elbows muscles and its effect on the digital level for dolphin swimmers", scientific production, volume twenty-four, first issue, January, Faculty of Physical Education for Girls in the island, Helwan University.
 12. Bahaa Al-Din Salama (2002): Health, sport and physiological determinants of sporting activity, Dar Al-Fikr Al-Arabi, Cairo.
 13. Thana Abdel-Baqi Hassanein (2002): Water Exercises, El Gamal Institution for Printing and Advertising, Tanta.
 14. Samia Khalil Muhammad (2004): Sports Injuries, College of Physical Education for Girls, University of Baghdad.
 15. Siham Farouk Ismail (2006): "The effect of an exercise program on healthy fitness and body components to reduce fat areas in the lower end of university students", unpublished doctoral dissertation, Faculty of Physical Education, Minia University.
 16. Abdel Basset Seddik (2013): Recent readings in sports injuries - rehabilitation and treatment programs, what are for publication and distribution?, Alexandria.
 17. Abdel Rahman Abdel Hamid Zahir (2004): Encyclopedia of Sports Injuries and First Aid, the Book Publishing Center, Cairo.
 18. Izzat Muhammad Kashaf (2004): Rehabilitation exercises for athletes and cardiac patients, Nahdet Misr Library, second edition, Cairo.
 19. Ali Jalal al-Din (2007): Addition in sports injury, third edition, Zagazig.
 20. Faraj Abdul-Hamid (2005): The importance of physical exercises in treating stigma deformities, Umm Al-Qura University, 1st edition, Al-Wafa House for world of printing and publishing.
 21. Muhammad Hassan Mustafa (2006): "The effect of a proposed preventive program using one of the methods of neuromuscular facilities for sensory receptors on the scapula belt and its relationship to the digital level of the national team of the bow and arrow, master's thesis, College of Physical Education for Boys, Helwan University.
 22. Mohamed Zakaria Jazar (2010 AD): "A training program to achieve balance in the muscle strength of the flexor and extensor muscles of the elbow joint in the boxers and its effect on the speed of performing straight punches" Paper of Dr., Faculty of Physical Education, Tanta University.
 23. Muhammad Qadri Bakri (2000): Sports Injuries and Modern Rehabilitation Book Center for Publishing, Cairo.
 24. Muhammad Qadri Bakri (2002): Sports Rehabilitation, Sports Injuries and First Aid, the Book Publishing Center, Cairo.
 25. Mohamed Qadri Bakri, Siham Al-Saied Al-Ghamry (2013): Sports Injuries and Physical Rehabilitation, Dar Al-Manar Printing, Cairo.
 26. Hani Abdul-Aziz Al-Deeb (2003): "The effect of a training program for muscle strength on improving muscle balance", PhD thesis, College of Physical Education for Boys, Helwan University.
 27. Hind Mohamed Nagib (2011): "Training program with weights to achieve muscle balance of the arms and its effect on the level of performance of the overwhelming hitting skill for volleyball", Master Thesis, Faculty of Physical Education, Tanta University.
 28. Mohammed Nader Shalaby. (2017). "The Determinants of Leadership: Genetic, Hormonal, Personality Traits Among Sport Administrators", International Journal of Pharmaceutical and Phytopharmacological Research, 7(5), pp:9-14.
 29. Mohammed Nader Shalaby. (2018). "The Effect of Whey Protein (Natural Nanoparticle) on Muscle Strength, GH, IGF, T. Protein and body

- composition". *Int. J. Pharm. Res. Allied Sci.*, 2018, 7(1):126-132.
30. Mohammed Nader Shalaby, Mona Mostafa Abdo Sakoury, Omar Ali Hussein Mohammed, Shaimaa Elsaid Ebrahim Elgamal. (2017). "Effect of PNF Stretching Training on Stem Cells and Growth Factors in Performance Soccer Players", *International Journal of Pharmaceutical and Phytopharmacological Research*, 7(2), pp:12-17.
 31. Mohammed Nader Shalaby. (2018). "Study of Markers behavior in Myocardial Infarction". *Int. J. Pharm. Res. Allied Sci.*, 2017, 6(2):138-148.
 32. Mohammed Nader Shalaby, Mona Mostafa Abdo Sakoury. Effect of different exercise intensities on CD34+ stem cells and physiological variables parameters. *Life Sci J* 2017;14(1):104-110.
 33. Mohammed Nader Shalaby, Nawaf Elshemary, Ezz El-Din Mohamed Ahmed, Mona Mostafa Abdo Sakoury. Sport College Students Uses and Perceptions of Social Networking Sites of Sport Doping Information. *J Am Sci* 2018;14(2):20-66.
 34. Mohammed Nader Shalaby, Jin Yu Liu, Hussein Heshmat, Nader M. Shalaby, Mohammed Salah Zaeid, Ahmed Ibrahim Shalgham, Maged Elazazy, Samy Akar, Hossam Elaraby, Mohammed Abdelrazik Taha, Wael Elfiel. The Effect of Aerobic and Anaerobic Exercise Bouts on CD34+ Stem Cells and Some Physiological Parameters. *Life Sci J* 2012;9(2):1037-1043.
 35. Shalaby, Mohammed & Saad, Mohammed & Akar, Samy & Reda, Mubarak & Shalgham, Ahmed. (2012). The Role of Aerobic and Anaerobic Training Programs on CD34+ Stem Cells and Chosen Physiological Variables. *Journal of Human Kinetics*. 35. 69-79. 10.2478/v10078-012-0080-y.
 36. Mohammed Nader Shalaby, Jin Yu Liu, Mohamed Saad and Hossam Elaraby. Impacts of Different Exercise Intensities on Hematopoietic Stem Cells and Certain Physiological Parameters on Handball Players and Non-Athletes. *Life Sci J* 2012;9(3):2100-2105.
 37. Mohammed Nader Shalaby, Jin Yu Liu, Mona Mahmoud Kassem, Mohammed Saad. Circulating Hematopoietic Stem Cell and Some Physiological Parameters in Different Training Programs. *Life Sci J* 2012; 9(1):965-971.
 38. Mohammed Nader Shalaby, Jin Yu Liu, Hussein Heshmat, Nader M. Shalaby, Mohammed Salah Zaeid, Ahmed Ibrahim Shalgham, Maged Elazazy, Samy Akar, Hossam Elaraby, Mohammed Abdelrazik Taha, Wael Elfiel. The Effect of Aerobic and Anaerobic Exercise Bouts on CD34+ Stem Cells and Some Physiological Parameters. *Life Sci J* 2012;9(2):1037-1043.
 39. Mohammed Nader Shalaby, Mona Mostafa Abdou Sakoury and Marwa Ahmed Kholif, Mona Fathi Rizk. Assessment of the muscular power index using infrared technology. *Life Sci J* 2019;16(12):20-31.
 40. Shalaby, M. N. (2020). The effectiveness of a water sports program on the level of poly unsaturated fatty acids and the severity of the disease in children with Autism spectrum disorder. *Medical Science*, 24(101), 143–164.
 41. Bornstein V. Bowden (2006): Neck Paine Medical Diagnosis and Comprehensive Management Congress Publication Data Crosier & Others, (2008): "strength imbalance and prevention of hamstring injury professional soccer ", A Prospective Study, A.M.J, Sports Med, (pup-med).
 42. Emin Ergen; Karol Hibner (2006): Sports medicine and since in Archery 1st published, FITA medical commute.
 43. Fuller CW, Walker j. (2005): "Quantifying the functional Rehabilitation injured football players" University of Leicester, UK.
 44. Gamal Abdel Halim Elgaml (2004):"Training Program Physiological Cross-Sectional Area (PCSA) of Working Elbow Muscles and its Effects on the Digital Level of crawl Stork Swimmers ", medical journal, Tanta.
 45. Krueger Franky (2006): Muscular Imbalance and Shoulder pine in volley ball Attackers, British Journal of Sport Medicine, Oxford, England.
 46. Rayan, G.M (2009): Archery related injuries, Department of the pedicle surgery Baptist medical center Oklahoma city USA.