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Original

LA EFECTIVIDAD DE UN PROGRAMA DE REHABILITACIÓN CON MEDIOS ACUOSOS SOBRE EL GRADO DE DOLOR Y EQUILIBRIO DE QUIENES PADECEN SACROILITIS EN FUTBOLISTAS

THE EFFECTIVENESS OF A REHABILITATION PROGRAM WITH AQUEOUS MEDIA ON THE EGREE OF PAIN AND BALANCE FOR THOSE SUFFERING FROM SACROILIITIS IN FOOTBALL PLAYERS

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Abstract

The aim of this study is to identify the effectiveness of rehabilitation exercises in conjunction with aquatic therapy for those suffering from sacroiliitis in football players. The researcher used the experimental approach, using the experimental design (pre-measurement, post-measurement). Similar to the objectives and procedures of the research, the researcher assumed the following: the existence of significant differences. Statistics between pre- and post-measurements in variables in favor of post-measurement for the following variables (degree of pain and level of balance).

The experimental approach was used with a pre- and post-measurement design on one group of football players with sacroiliitis, numbering (8) players whose ages ranged from (20 - 25 years). The program was applied for (8) weeks with (5) sessions in The week, the program included rehabilitation exercises inside and outside the aquatic environment, and the results of the research were. - The rehabilitation program prepared with hydrotherapy helped improve the general condition of the body and gradually disappear the feeling of pain in the joint clearly.

The use of hydrotherapy led to the disappearance of the feeling of pain and thus had a positive effect on performance

Prepared rehabilitation exercises and making the injured feel comfortable and improving the psychological state of the injured.

- The prepared rehabilitation program has a clear effect in improving the balance of the muscles working in the pelvic joint.

The exercises carried out clearly helped in the injured person's return to playing football normally.

- Using rehabilitative exercises accompanying hydrotherapy has good results, better than applying only rehabilitative exercises.

Recommendations: - Paying attention to following the rehabilitation program with hydrotherapy when football players suffer from sacroiliitis in order to avoid deterioration of the patient's condition. The researcher also recommended using rehabilitative exercises with hydrotherapy and employing it consistently within rehabilitation programs for all pelvic joint injuries. - The researcher recommended the importance of functional tests as a criterion for the player's return to playing football. - She pointed to the diversification and expansion of special

research into the prevention of pelvic joint injuries using modern means and devices.

Keywords: sacroiliitis, hydrotherapy, degree of pain, and instability.



Resumen

El objetivo de este estudio es identificar la efectividad de los ejercicios de rehabilitación junto con la terapia acuática para aquellos que sufren de sacroiliitis en jugadores de fútbol. El investigador utilizó el enfoque experimental, utilizando el diseño experimental (pre-medición, post-medición). Similar a los objetivos y procedimientos de la investigación, el investigador asumió lo siguiente: la existencia de diferencias significativas. Estadísticas entre pre y post mediciones en variables a favor de post-medición para las siguientes variables (grado de dolor y nivel de equilibrio).

El enfoque experimental se utilizó con un diseño pre y post-medición en un grupo de jugadores de fútbol con sacroiliitis, numeración (8) jugadores cuyas edades oscilaban entre (20 - 25 años). El programa se aplicó por (8) semanas con (5) sesiones en la semana, el programa incluyó ejercicios de rehabilitación dentro y fuera del medio acuático, y los resultados de la investigación fueron. - El programa de rehabilitación preparado con hidroterapia ayudó a mejorar el estado general del cuerpo y gradualmente desaparecer la sensación de dolor en la articulación claramente. El uso de hidroterapia condujo a la desaparición de la sensación de dolor y por lo tanto tuvo un efecto positivo en el rendimiento

Ejercicios de rehabilitación preparados y haciendo que los heridos se sientan cómodos y mejorando el estado psicológico de los heridos.

- El programa de rehabilitación preparado tiene un efecto claro en la mejora del equilibrio de los músculos que trabajan en la articulación pélvica.

Los ejercicios llevados a cabo ayudaron claramente a la persona lesionada a volver a jugar al fútbol normalmente.

- El uso de ejercicios de rehabilitación que acompañan a la hidroterapia tiene buenos resultados, mejor que aplicar solo ejercicios de rehabilitación.

Recomendaciones: - Prestar atención a seguir el programa de rehabilitación con hidroterapia cuando los jugadores de fútbol sufren de sacroiliitis con el fin de evitar el deterioro de la condición del paciente. El investigador también recomendó el uso de ejercicios de rehabilitación con hidroterapia y su empleo constante dentro de los programas de rehabilitación para todas las lesiones de las articulaciones pélvicas.

- El investigador recomendó la importancia de las pruebas funcionales como criterio para el retorno del jugador al fútbol. - Señaló la diversificación y

expansión de la investigación especial sobre la prevención de lesiones en las articulaciones pélvicas utilizando medios y dispositivos modernos

Palabras clave: sacroiliitis, hidroterapia, grado de dolor, e inestabilidad.



Introduction and problem: Sports received care and attention from the countries of the world. Through this, they were able to occupy a prominent position, and this was reinforced by the increase in progress in sports. One of the sports activities that spread widely is the sport of football, as it received wide demand, and with this increasing interest in football from the sports media. The professional orientation of the players pushed the athletes to compete with full force and enthusiasm, which generated the emergence of violent play with the motive of winning and self-display, to attract the attention of coaches, the media, and the public, and thus led to the emergence of various injuries to the player himself or to the opponent.

Clark and Hortan 2018 noted, "Low back pain problems have become increasingly common throughout the world, as it is a mixture of symptoms of musculoskeletal disorders or disorders of the lower back vertebrae, i.e. the lumbar vertebrae, resulting from several causes such as: osteoporosis, congenital deformity, tumors, fractures, Softening of the bones" (6: 104)

Liska points out, "The sacroiliac joint is one of the largest joints in the human body and is one of the common sources of pain in the buttocks and lower back, as it connects the ilium bones to the sacrum. Inflammation of this joint in particular can be diagnosed because its symptoms are similar to many common sources of back pain" (4:10)

As for Debalma, he discussed the incidence rates, saying, "The incidence of sacroiliitis is estimated at (15% to 30%) of the total number of people with chronic lower back pain, and (32% to 43%) of those with low back pain have the same symptoms as those with chronic lower back pain." With a herniated disc." (6:12)

Since exercise is an effective method in rehabilitation programs for treating pain, it not only maintains health, but also contributes to alleviating pain over time. Sports activities help control joint pain and swelling resulting from arthritis, and due to the importance of "using aqueous media in rehabilitation and treatment of injury." Sports, as its mechanical and thermal factors have an impact on the organs of the body, as the displacement of water, its temperature, and its upward buoyancy force, as well as the frictional resistance of water, have an

important role in performing rehabilitation programs in the water" (34:16). According to these characteristics, they are used for the problem and goal of the therapist according to Type of injury.

Scientific importance of the research: This research is one of the scientific attempts to prepare a standardized aquatic rehabilitation program to reduce inflammation of the sacroiliac joint and thus to raise the efficiency of the affected joint, which will contribute to treating this injury and on scientific foundations that "contribute to not exacerbating this injury and healing in a sound manner, and thus speeding the return." For playing fields and playing football with the highest efficiency in all aspects" (31:8), which will improve the player's performance level on the motor and physical levels.

Applied importance of the research : The results of this research can contribute to those interested in the field of sports rehabilitation and football player therapists in using this rehabilitation program of rehabilitative exercises inside and outside the water environment and how to treat such cases, and thus "providing the players participating in the program with skills whose effects extend beyond the process of Rehabilitation, for the football player to return quickly to practicing his sporting activity in a short period of time and with high efficiency" (14:13).

Research objectives: To identify the effectiveness of the rehabilitation program with the proposed aqueous medium for football players with sacroiliitis in improving the level of pain in the joint. And to identify the effectiveness of the rehabilitation program with the proposed aquatic environment for football players with sacroiliitis in improving the level of joint balance.

Research hypotheses: There are statistically significant differences between the pre- and post-measurements between the two legs (injured and healthy) for the variable degree of pain and in favor of the post-measurements.

Research population and sample: The research sample was chosen intentionally for patients with sacroiliitis in football players aged 20-25 years from the King of Power Center in Baghdad. They



numbered (10) patients and met the methodological and scientific conditions required by the study.

Table 1

Shows the homogeneity of the research sample members in the basic variables.

Coefficient Convolution	Standard deviation	Arithmetic mean	Unit scaling	Variables	t
0.275+	5.848	76.5	kg	Weight	1
1.368-	5.473	175.2	cm	Length	2
0.144+	1.901	20.44	year	Body mass index	3

Means of collecting information, devices and tools:

Arabic and foreign references and sources.
 Personal Interviews
 International Information Network (INTERNET)
 Questionnaires.
 Survey of Focus Groups.
 Underwater treadmill (Chinese) (quantity:1)
 Chinese-made weight and height measuring device (1)
 Kanon Camera (Chinese) (2)
 Chinese-made Dell laptop (1)
 Chinese-made sports stopwatch (3)
 Examination hall.
 German-made video camera (1)
 Biodex Balance
 FMS Functional Movement Meter
 A range of different free weights

Exploratory experiment: The exploratory experiment was conducted on 3/3/2023 on Thursday and was repeated on 5/3/2023 on Saturday on a sample of (2) patients with sacroiliac arthritis, and the efficiency of the assistant team was determined because the experiment was exploratory "is a similar and miniature experiment to the basic experiment"

Pre-tests: The pre-tests of the sample under consideration were conducted on 5/3/2023, corresponding to Saturday at ten in the morning in the King of Forces Hall and with the help of the team, and the results were recorded to measure (weight, height and age) and the results of the tests.

The Rehabilitation method used:

The proposed rehabilitation program was applied in (8 weeks) by 5 rehabilitation sessions per week, and the program was divided into 3 rehabilitative stages, where the application of the first stage took (2 weeks), the second stage was (3 weeks), and for the third stage (3 weeks), the duration of the rehabilitation per session ranged from 35 to 40 minutes.

Guidelines to be taken into account when implementing the proposed rehabilitation program :

The rehabilitation unit begins with general warm-up exercises of the body and then special exercises . Start with static muscle contraction exercises and then mobile exercises .

The sensation of pain is the criterion for stopping the exercise .

Gradation in intensity in the performance of exercises. Taking into account the psychological state of the injured and working on making the player to gain confidence in him/herself and his/her specialist.

Medical consultation when needed.
 Continue to exercise for overall fitness and muscular strength of the trunk area

And hip in particular throughout the season .

Post-tests: The researcher conducted the post-tests on Saturday and Monday, corresponding to 22, 24 4/2023 and the same steps were used when implementing the tests and pre-measurements.

Statistical methods: Statistical methods were used, including Statistical characterization using arithmetic mean, median, standard deviation, lowest and largest peak, range, torsion and flattening, Mann Whitney test for the significance of differences, Wilcoxon test for the significance of differences, percentage improvement.



View Results

Table 2.

The statistical description and moderation of the sample surveyed shows the degree of pain and balance of the affected leg

flattening	Sprain	extent	Great est value	Smallest value	Standard deviation	Broker	Arit hmetic mean	Unit of measu rement	Variable	t
0.14-	0.74-	6.01	10.2	4.24	1.84	7.98	7.84	degree	Degree of pain	1
0.54-	0.34	2.82	7.00	4.21	0.81	5.55	5.34	degree	Equilibrium	2

Table No. (2) shows the arithmetic mean, median, standard deviation, the smallest and largest value in addition to the range and the coefficient of torsion and flattening of the injured leg and it is clear from the above table that the torsion coefficient for the degree of pain (-0.74) and for balance (0.34) either flattening for the degree of pain (-0.14) and for balance (-0.54) and the coefficient of torsion and flattening for the degree of pain and balance is located between (3±), which indicates the moderation of the sample for both.

Table 3

Shows the significance of the differences for the two legs (injured and healthy) in the pre measurements of the degree of pain and balance

sig	z	u	Total ranks	Average ranks	Style	Unit of measurement	Variable	t
0.00	4.35-	0.00	219.00	18.40	affected	degree	Degree of pain	1
			79.00	6.60	healthy			
0.00	4.11-	0.99	225.00	18.41	affected	degree	Equilibrium	2
			79.05	6.56	healthy			

indicating at sig ≤ 0.05



Table (3) shows the results of the Mann Whitney test for the significance of the differences and the level of its significance sig for the pre-measurement of the degree of pain and balance to show that the value of (z) = (4.35) for the degree of pain and (-4.11) for the balance with the level of significance sig (0.00)

which is less than (0.05) to show that there are statistically significant differences between the injured and healthy legs in the pre-measurement of the degree of pain and balance in favor of the best average clear in the following table.

Table 4
Shows the arithmetic mean and standard deviation of the two legs (injured and healthy) in the pre-measurement of the degree of pain and balance

sig	z	Total ranks	Average ranks	Differences		Unit of measurement	Variable	t
				Number	Direction			
0.00	3.35-	77.00	5.40	10	negative	degree	Degree of pain	1
		0.00	0.00	0	corresponding			
		0.00	0.00	0	Equals			
0.00	3.11-	78.00	6.41	10	negative	degree	Equilibrium	2
		0.00	0.00	0	corresponding			
		0.00	0.00	0	Equals			

indicating at sig ≤ 0.05

Table (4) shows the arithmetic mean (m) and standard deviation (p) for the injured and healthy legs in the tribal measurement of the degree of pain and balance and the table indicates that the statistical

differences were in favor of the healthy man where the degree of pain decreased to almost zero as in balance.



Table 5

Shows the significance of the differences between the two measurements (pre- and post) of the sample surveyed in the degree of pain and balance of the affected leg

Healthy leg		Affected leg		Unit of measurement	Variable	t
on	M	on	M			
1.87	7.67	0.50	13.45	degree	Degree of pain	1
0.44	3.80	0.77	5.55	degree	Equilibrium	2

indicating at sig ≤ 0.05

Table (5) shows the results of the Wilcoxon test for the significance of the differences and the level of significance (sig) for the degree of pain and balance of the affected man to show us that the value of Wilcoxon for the degree of pain (-3.35) and for the balance (-3.11) at the level of significance of sig

(and refers to (0.00) and they are less than (0.05) to indicate that there are statistically significant differences at the level of moral (0.05) between the pre- and post-measurements in the degree of pain of the affected man in favor of the best average as will be shown in Table (6).

Table 6

The arithmetic mean and standard deviation of the two measurements (before and after) of the sample surveyed shows the degree of pain and balance of the affected leg.

Percentage of improvement	Telemetry		Pre-measurement		Unit of measurement	Variable	t
	on	M	on	M			
98.90%	0.30	0.09	0.50	13.45	degree	Degree of pain	1
56.66%	0.34	2.40	0.77	5.55	degree	Equilibrium	2

Table (6) shows the arithmetic mean (m) and standard deviation (p) for each of the pre- and post-measurement of the degree of pain, balance and

percentage of improvement, and the table indicates that the percentage of improvement was in favor of the post-measurement.

**Table 7**

The significance of the differences between injured and healthy legs in the dimensional measurement of the degree of pain and balance.

say	with	you	Total ranks	Average ranks	Style	Unit of measurement	Variable	t
1.00	0.00	73.00	155.00	12.51	affected	degree	Degree of pain	1
			155.00	12.51	healthy			
0.00	3.50-	12.00	210.10	17.50	affected	degree	Equilibrium	2
			90.01	7.51	healthy			

Table No. (7) shows the results of the Mann Whitney test for the significance of the differences and the level of its significance sig for the dimensional measurement of the degree to show that the value of $(z) = (0.00)$ at the level of significance of sig (1.00), which is greater than (0.05) to show that there are no statistically significant differences between the

injured and healthy legs in the dimensional measurement of the degree of pain, either the balance to show that the value of $(z) = (-3.50)$ at the level of significance sig (0.00) which is less than (0.05) to show that there are statistically significant differences between the injured and healthy legs in the measurement of equilibrium.

Table 8

Shows the arithmetic mean and standard deviation of the two legs (injured and healthy) in the dimensional measurement of the degree of pain and balance

The healthy leg		Affected leg		Unit of measurement	Variable	t
on	M	on	M			
0.30	0.09	0.30	0.09	degree	Degree of pain	1
0.25	1.99	0.34	2.40	degree	Equilibrium	2

Table (8) shows the arithmetic mean (m) and standard deviation (p) for both injured and healthy

legs in the dimensional measurement of the degree of pain and balance.



Discussion of results

Degree of pain

It is clear from the previous tables that there are statistically significant differences between the pre- and post-measurement of the injured leg to measure the degree of pain for the sample studied, and this is reflected in the percentage of improvement in Table No. (6), where the post-measurement had an improvement rate of (98.90%) As for the healthy leg, there are no differences, as the healthy leg does not suffer from any pain.

The researcher attributes this development to the effectiveness of the rehabilitation approach with the water environment and also to the diversity of exercises and water exercises used, "and the important role of exercises inside the water because of their impact reflected in the results" (17: 25), and when returning to the previous tables and to analyze and discuss them, it turns out that the remarkable development contributed to the relief of pain through the results, and this is what was pointed out by (Emin Ergen) " (11: 29) However, exercise is a common means of rehabilitation programs to relieve pain as it maintains the health of the individual at all times, "and because physical activities contribute to the control of joint pain and swelling resulting from arthritis" (4: 76).

To be supported by Talib Jassim ("Rehabilitation exercises have an important and significant role whose effects are positively reflected in alleviating the degree of pain" (2: 8).

The researcher believes that the role of the used water medium and exercises inside the water effectively affected the rehabilitation of the injured leg, as it led to an increase in blood flow in the affected area and "thus stimulate blood circulation to contribute to the disposal of waste and waste resulting from the injury, which reduces the pressure, which in turn leads to relief of pain" (5: 104), and this is supported by (Abbas Hussein) "Performing therapeutic exercises improves blood circulation and leads to an increase in blood reaching the organs and to the musculoskeletal system on a regular basis" (3:250), which will help "increase the nutrients that will reach it to compensate for the deficiency caused by the injury, which in turn will compensate for the damage caused by the affected tissue" (15:50).

Balance

As it is clear from the previous tables for the existence of statistically significant differences in the balance variable, this reason is due to "the impact of the rehabilitation program and the aquatic medium, which included balance exercises and others in the aquatic medium" (13: 5), which began at a stage of the program prepared to emphasize the researcher on the development of balance exercises in "rehabilitation programs for their important role in the success of the athlete's return to the football field and not limited to strength exercises only" (19: (157) This agrees with William as he points out that "muscular weakness, impaired motor sensation and lack of range of motion can challenge an individual's ability to retain the body's center of gravity within the base of equilibrium, leading to a loss of equilibrium" (18:218).

Ahmad and Kamal refer to "activating and activating the deep sensory receptor system using advanced exercises with balance that can achieve distinct positive results and benefit from them through the stages of the rehabilitation program and rely on them to move from one stage to another" (1: 103).

Conclusions: The rehabilitation program prepared with hydrotherapy helped improve the general condition of the body and gradually disappear the feeling of pain in the joint clearly.

The use of hydrotherapy led to the disappearance of the feeling of pain and thus had a positive effect on performance

Prepared rehabilitation exercises and making the injured feel comfortable and improving the psychological state of the injured.

- The prepared rehabilitation program has a clear effect in improving the balance of the muscles working in the pelvic joint.

The exercises carried out clearly helped in the injured person's return to playing football normally.

- Using rehabilitative exercises accompanying hydrotherapy has good results, better than applying only rehabilitative exercises

Recommendations: - Paying attention to following the rehabilitation program with hydrotherapy when football players suffer from sacroiliitis in order to avoid deterioration of the patient's condition. The researcher also recommended using rehabilitative exercises with hydrotherapy and employing it consistently within rehabilitation programs for all pelvic joint injuries. - The researcher recommended



the importance of functional tests as a criterion for the player's return to playing football. - She pointed to the diversification and expansion of special research into the prevention of pelvic joint injuries using modern means and devices.

References:

- Ahmad Farhan and Ahmad Kamel: Qualifying exercises after the eradication of the frontal cruciate ligament for footballers, *Journal of the Faculty of Sports Education - University of Baghdad*, (vol. XXXI, first issue 2019) p. 103
- Student Jassim Mohsen: elongation exercises for the back muscles and spinal ties to cure the pain of the cotton region of ages (35-40 years) www.iasj.net/iasj?func=fulltext&aId 2011 p. 8
- Abbas Hussein, *Sports Medicine and Athlete Injuries* (Najaf al-Ashraf, Dar al-Diya Printing House, 2013), p. 250
- alaa wissam, & Abdhussain, S. (2022). Effect of constant stretching exercises in improving the elasticity of cervical vertebrae for patients with cervical spondylitis's for ages (40-50) years. *Modern Sport*, 21(1), 0075. <https://doi.org/10.54702/msj.2022.21.1.0075>
- Anaam Jaafar Sadiq, & Bushra Kadhim Abdul-ridha. (2023). The effect of rehabilitative exercises preceded by an electrical stimulation device for working muscles in relieving lower back pain for women aged (25-35) years: . *Modern Sport*, 22(3), 0102–0114. <https://doi.org/10.54702/ms.v22i3.1157>
- Clark S, Horton R. Low back pain: a major global challenge. *Lancet*.
- DePalma MJ, Ketchum JM, Saullo TR. Etiology of Chronic Low Back Pain in Patients Having Undergone Lumbar Fusion. *Pain Med*.
- Diana Haider, & Widad Kadhum. (2021). The Effect of compound exercises using the (RANDOM SHOT) device and the electronic goal in developing the speed of the motor response and the rapid ability of the two goal keepers youth football halls. *Modern Sport*, 20(3), 0022. <https://doi.org/10.54702/msj.2021.20.3.0022>
- Dr. Huda Badawi, R. I. (2020). The effect of rehabilitative exercises accompanied by aids to improve muscle strength and range of motion for people with dislocated shoulder joint. *Modern Sport*, 19(3), 0134. <https://doi.org/10.54702/msj.2020.19.3.0134>
- Dr. Warda Ali, R. Q. (2020). Effect of therapeutic methods and exercises for the rehabilitation of low lumbar herniated disc in the infected (30-40) years. *Modern Sport*, 19(2), 0001. <https://doi.org/10.54702/msj.2020.19.2.0001>
- Emin Ergen; Karol Hibner: *Sports medicine and since in Archery 5st published*, , FITA medical commte2014) p 29
- Khudhair, M. A. (2023). Motor compatibility and its relationship to the accuracy of scoring and handling of first-grade students for the academic year (2023-2022) with football. *Journal of Humanities and Social Sciences Research*, 2(4). <https://doi.org/10.33687/jhssr.002.04.000253>
- Khudhair, M. A., Hamza, G. B., & Abboud, I. N. (2023). The impact of the use of hydromassage rehabilitation exercises on the recovery of certain motor potentials of knee roughness sufferers. *Journal of Humanities and Social Sciences Research*, 2(4). <https://doi.org/10.33687/jhssr.002.04.000252>
- Majeed, S. H. . (2023). Effect of an exercise program on physical-kinetic intelligence and the skills of dribbling and shooting in basketball among female students. *SPORT TK-Revista EuroAmericana de Ciencias del Deporte*, 12, 15. <https://doi.org/10.6018/sportk.563541>
- Pratama, Cavin & Pristiano, Arif & Herawati, Isnaini & Ervianta, Widya & Ridhuwan, Muh. (2020). Efektivitas Program Aquatic Exercise Terhadap Penurunan Nyeri Pasien Chronic Low Back Pain. *FISIO MU: Physiotherapy Evidences*. 1. 49-53. 10.23917/fisiomu.v1i2.10525
- Riham Abdul-Rassoul, & hatem, A. D. (2021). Effect of rehabilitation exercises in improving the motor range of people with partial rupture of the anterior cruciate ligament of the knee joint by ages (30-35) men. *Modern Sport*, 20(4), 0032. <https://doi.org/10.54702/msj.2021.20.4.0032>
- Ruaa Akram Al-Hijazi, & Abeer Dakhil. (2021). The effect of rehabilitative exercises associated with the technique of Chiropractic in relieving the pain of muscle stretching in the lower back of people with a herniated disc. *Modern Sport*, 20(2), 0023. <https://doi.org/10.54702/msj.2021.20.2.0023>
- William E. Prentice (2011) : *Rehabilitation techniques for sports medicine and athletic training*, Me Graw-Hill Companies.Inc., ISBN 0-07-246210-8, Fifth Edition.
- ج. ب. ج. (2020). The effect of using Pilates exercises on some physical structures of women aged (30-40) years. *Modern Sport*, 19(1), 0157. <https://doi.org/10.54702/msj.2020.19.1.0157>

