El efecto de los ejercicios de rehabilitación acompañados de ondas ultrasónicas en la reducción del dolor y la curación de la compresión del túnel carpiano

The effect of rehabilitation exercises accompanied by ultrasound waves in reducing pain and healing from carpal tunnel compression

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Abstract

Objective: The current study aimed identifying the impact of rehabilitative exercises combined with ultrasonic waves on reducing pain in people with carpal tunnel compression and determining how these activities affect range of motion of the upper limb for those suffering from carpal tunnel compression.
Research methodology: With pre- and post-tests, the researchers employed the experimental method in the form of two equal groups, the experimental and the control. The scientific community and sample are among the priorities that fall on the researcher, so The scientific community is determined by those suffering from carpal tunnel compression, numbering (14) patients. (12) Patients were approved and two were excluded from the research community due to their inability to adhere to the implementation times of the method prepared by the researcher. The sample was split into two groups: experimental and control. (6) patients for each group
Result: The range of motion of the upper limb joints (shoulder, elbow, and wrist) is clearly improved by the rehabilitation activities that the researchers created. The results showed that the shoulder joint angle was 4.55, the elbow joint angle was 3.24, the wrist joint angle was 1.06, and the visual symmetry was 4.7.
Conclusions: The range of motion was positively increased and improved by the rehabilitation activities combined with the ultrasonic waves. upper limb joints, and the rehabilitation exercises prepared and accompanied by ultrasound waves have a clear effect in improving muscle strength.

Keywords

rehabilitation exercises; ultrasound waves; reducing pain and healing; carpal tunnel compression.

Resumen

Objetivo: El presente estudio tuvo como objetivo identificar el impacto de los ejercicios de rehabilitación combinados con ondas ultrasónicas en la reducción del dolor en personas con compresión del túnel carpiano y determinar cómo estas actividades afectan el rango de movimiento del miembro superior para quienes sufren compresión del túnel carpiano.
Metodología de investigación: Con pruebas previas y posteriores, los investigadores emplearon el método experimental en forma de dos grupos iguales, el experimental y el de control. La comunidad científica y la muestra se encuentran entre las prioridades que recaen sobre el investigador, por lo que la comunidad científica está determinada por aquellos que sufren compresión del túnel carpiano, numerando (14) pacientes. (12) Pacientes fueron aprobados y dos fueron excluidos de la comunidad de investigación debido a su incapacidad para adherirse a los tiempos de implementación del método preparado por el investigador. La muestra se dividió en dos grupos: experimental y control. (6) pacientes para cada grupo
Resultado: El rango de movimiento de las articulaciones del miembro superior (hombro, codo y muñeca) mejora claramente con las actividades de rehabilitación que crearon los investigadores. Los resultados mostraron que el ángulo de la articulación del hombro fue de 4,55, el ángulo de la articulación del codo fue de 3,24, el ángulo de la articulación de la muñeca fue de 1,06 y la simetría visual fue de 4,7.
Conclusiones: El rango de movimiento aumentó y mejoró positivamente mediante las actividades de rehabilitación combinadas con las ondas ultrasónicas. articulaciones de las extremidades superiores, y los ejercicios de rehabilitación preparados y acompañados de ondas ultrasónicas tienen un efecto claro en la mejora de la fuerza muscular.

Palabras clave

ejercicios de rehabilitación; ondas ultrasónicas; reducción del dolor y curación; compresión del túnel carpiano.

Overview

Strong and precise research and scientific activity must be grounded in sound scientific principles and rely on modernism to examine and resolve issues and challenges that may arise in a variety of domains, including sports (Hussein Kadhim, 2025). The physical and chemical conditions of the many vital systems of living things, along with their various classifications and names, are also expressed by physiology, which is closely related to the science (Badwi Shbeeb, 2023). The human being is an integrated unit physically, mentally and psychologically, so it became necessary to understand the nature of the human being and maintain his safety. Therefore, caring for the health and safety of the human being in all aspects became a subject of interest to scientists. (Hashem, Al Edhary, Radhi, & Hmeid, 2022)

One of these interests is rehabilitation, which is one of the sciences that contribute to restoring full function to the injured person after injury or illness. Accordingly, rehabilitation differs in degree and specificity. Rehabilitation of the injured person depends on the extent of his ability to perform the necessary functions and burdens without a strike (Shaalan, Aboode, & Radhi, 2022)

. development and scientific progress we are today and the growing interest in doing requirements of life activity the concept of improving the level of requires the development of its basic components through the adoption of the best methods of training (Almusawi DS, 2019)

One of the most prevalent hand disorders is carpal tunnel syndrome. It happens when the median nerve in the wrist's carpal tunnel is compressed. On the palm side of the hand, the carpal tunnel is a small opening encircled by ligaments and bones. The thumb and other fingers may become numb, tingly, or feeble when the median nerve is compressed. (Badwi Shbeeb et al., 2023).

Carpal tunnel compression injury is an injury that may occur as a result of several causes and has multiple symptoms that can be reflected in one way or another on the functional performance of the affected arm, so it is our responsibility as therapists and specialists to conduct studies and research to reduce this injury and return the affected part to its normal position before the injury. The use of One of the crucial pillars that needs to be considered is the use of suitable therapeutic techniques that reduce the time and effort required to achieve a state of recovery, in addition to selecting everything that is diverse and different from exercises and tools to reach better results in treatment(Shaker, Tuama, & Radhi, 2022)

Therefore, the researchers decided to use ultrasound waves accompanied by rehabilitation exercises due to the necessity of making a scientific addition to the field of rehabilitation and physical therapy as an attempt by researchers to rehabilitate the injured organ or part. Therefore, the researchers decided to get ready for rehabilitation exercises that use ultrasonic waves to relieve pain and heal from carpal tunnel compression.

The research problem reviewing the researcher's Arabic sources and references and to physical therapy centers and by conducting a complete survey of injuries, it becomes clear that carpal tunnel compression injury is one of the injuries that may occur as a result of multiple causes. After consulting a specialist In the realm of sports medicine and joints, the research problem was identified in an effort to identify potential treatments and rehabilitation strategies for carpal tunnel syndrome, including the use of ultrasound-assisted rehabilitation exercises that aim to increase upper limb range of motion and relieve pain.

Research objective

- Preparing rehabilitation exercises accompanied by ultrasound waves
- Identifying The impact of ultrasonic waves combined with rehabilitation exercises in relieving pain for those suffering from carpal tunnel compression
- Identifying the impact of ultrasonic waves and rehabilitative exercises on increasing range of motion of the upper limb for those suffering from carpal tunnel compression.

Hypotheses for research:

- The pre- and post-test results for patients' pain alleviation show no statistically significant differences. carpal tunnel compression.
- The post-test results show no statistically significant differences between the experimental and control groups' ranges of motion for brachial plexus patients.

Research fields

- Human field: A sample of (12) patients with brachial plexus injury
- Time field: (13/5/2024) to (14/7/2024)
- Spatial field: Physiotherapy Hall at Yarmouk Teaching Hospital

Method

Research methodology

With pre- and post-tests, the researchers employed the experimental method in the form of two equal groups, the experimental and the control. One of the study techniques that comes the closest to addressing issues in a scientific manner is the experimental method. All variables and fundamental components are attempted to be controlled, with the exception of one, which the researcher modifies or adjusts to ascertain and quantify its scientific impact (Suhad,2020;Suhad , 2022)

Research on communities and samples

The sample and research community are among the priorities that fall on the researcher, so the research community is determined by those suffering from carpal tunnel compression, numbering (14) patients. (12) patients were approved and two were excluded from the research community due to their inability to adhere to the implementation times of the method prepared by the researcher. The sample was split into two groups: experimental and control, (6) patients for each group.

Table 1. demonstrates how the control and experimental study groups are equivalent in the pre-tests of the variables under study

Index (degree)	Unit of measurement	Experimental group		Control group		computed T value	Sig Level	Type-Sig
		Mean arithmetic	Typical deviation	Mean arithmetic	Typical deviation			
Angle at which the shoulder joints	High to the side	176.50	4,6	178.01	2.61	5,78	1.029	Non-sig
	High in front	175,14	4,32	177.02	4.01	4,52	0.321	Non-sig
	High in behind	40,45	1,78	42.02	1.82	6,31	0.421	Non-sig
Angle of the elbow joint	Bend	146,41	4,51	144.75	3.81	3,56	0.2534	Non-sig
	Extend	175,61	3,82	176.75	4.31	5,92	0.6458	Non-sig
Angle of the wrist joint	Bend	70,28	3,81	72.83	3.51	5.61	0.2416	Non-sig
	Extend	65,28	2,01	65.14	2.71	4,66	0.5479	Non-sig
	Approximate	23,48	2,84	25.28	1.15	3,69	0.1456	Non-sig
	away	16,02	2,88	15.83	2.03	4,71	0.987	Non-sig

Devices and tools used in the research

Medical balls weighing (1 kg), rubber ropes of (12) different strengths, rope length 100 cm, boxes with a height of 60 cm, 70 cm, HD computer, Arab as well as international references, the Internet, tests, and measurements, Genometer device

First: Flexibility measurement tests

- Shoulder joint flexibility measurement test
- The test's objective is to measure the shoulder joint's range of motion.
- Various tools: Genometer device to measure joint flexibility
- Procedures: The tester assumes a standing position, then raises the arm (right and left) high - sideways and high in front and high behind to the maximum extent so that one of the Genometer arms is perpendicular to the ground and the other arm is parallel to the humerus
- Test instructions: -

- Do not bend the elbow
- The legs should be straight (natural standing position)
- The The best of the tester's two efforts is recorded for him

- Calculation of scores: Read the angle shown on the equilibrium meter and take the best reading of the two attempts.

Elbow joint flexibility test

- The test's objective is to determine the elbow joint's range of motion
- Tools used: A genometer device to measure joint flexibility

- Procedures: The tester assumes a standing position and then bends the arm (right and left) to the maximum possible extent so that one arm of the genometer is on the forearm and the other on the upper arm.
- Test instructions: The tester must bend the elbow to the maximum possible extent
- The The best of the tester's two efforts is recorded for him
- Calculation of scores: - The angle that appears on the genometer device is read and the best reading is taken in the two attempts for the extension and flexion states.

Wrist joint flexibility test

- The test's objective is to determine the wrist joint's range of motion
- Tools used: A genometer device to measure joint flexibility
- Procedures: From a standing position, the tester flexes, extends, adducts and abducts the wrist joint to the maximum possible extent so that the arms of the genometer are towards the fingers and the other on the forearm.
- Test instructions: The tester must flex the wrist joint to the maximum possible extent
- The The best of the tester's two efforts is taken
- Calculation of scores: The angle that appears on the computer is read and the best reading in the two attempts is taken

Second: test of the visual analog scale with arm bend and extend

- The test's objective is to gauge how painful the arm bend posture is
- Measuring the degree of pain from the arm extend position
- Tools: - A paper divided into (10) squares from number (1) to number Ten (10) from left to right
- Procedures and conditions: When performing the position that is determined, the tester is questioned about how much discomfort he has when moving the afflicted area
- Recording: - While moving the injured part as much as possible, the tester's level of discomfort is noted, and the degree (10) indicates the highest level of agony the tester is unable to tolerate. In this case, the recording was done in two different positions from the arm flexion position and the arm extension position.
- Unit of measurement: Degree

Investigative test

Two injured individuals who were not part of the research sample participated in the exploratory experiment. on 5/5/2024. Its aim was to verify:

- The reliability of the instruments and equipment used in the study (Diana Hussein, 2020)
- The effectiveness of the support staff
- The extent of the appropriateness of the tasks the researchers created for the research sample members (Ghazi Salman,2024)

Prepared rehabilitation exercises

The researchers' devised rehabilitation workouts were implemented, as flexibility exercises were prepared for the shoulder, elbow and wrist joints, based on the following:

- The rehabilitation program lasts for eight weeks and consists of three units per week. (Shabib, 2023)
- The overall quantity of units of the curriculum is 24 units (Abdul, & Saeed, 2024)
- The researcher relied on the principle of gradual difficulty of the exercise (Rand, 2020)
- The researchers relied on determining the frequency of the exercise according to the difficulty of the exercise (Alyaa, 2022)
- Rest periods ranged between (15-60) seconds
- The time period for the exercises ranged between (10-20) minutes
- The components of the rehabilitation curriculum were applied by the center's specialized therapists

Pre-tests

The Individuals from the experimental and control research groups participated in pre-tests on October 5, 2024, at 10:00 a.m. at the Yarmouk Teaching Hospital's Physiotherapy Center, and the same conditions were taken into account in the post-tests

Principal Test

The primary experiment was carried out at a rate of three units per week from 13/5/2024 to 12/7/2024 for a duration of (8) weeks, equivalent to (24) training units.

After-tests

At precisely 10:00 in the morning on July 14, 2024, the post-tests were administered at the Physical Therapy Center at Yarmouk Teaching Hospital, as the researcher decided to follow the same method in the pre-tests, and the researcher was eager to offer identical circumstances. and requirements in terms of time and place.

Statistical methods

- Arithmetic mean.
- Standard deviation.
- T-test for samples that are correlated.
- For independent samples, the T-test.

Findings

Display, evaluation, and discussion of the T-test findings for the experimental and control groups in the pre- and post-tests (arms) of the upper limb

Table 2. displays the experimental group's pre- and post-test results for the range-of-motion tests of the upper limb (shoulder, elbow and wrist)

Index (degree)	Unit of measurement	Before the test		After the test		computed T value	Sig Level	Type-Sig
		Mathematical mean	Typical deviation	Mathematical mean	Typical deviation			
Angle at which the shoulder joints	High to the side	176.50	4,6	180,16	4.90	5,78	0.001	Sig
	High in front	175,14	4,32	181,03	4,61	4,52	0,021	Sig
	High in behind	40,45	1,78	46,22	2,11	6,31	0,0321	Sig
Angle of the elbow joint	Bend	146,41	4,51	147,16	4,89	3,56	0,001	Sig
	Extend	175,61	3,82	180,07	4,01	5,92	0,000	Sig
Angle of the wrist joint	Bend	70,28	3,81	80,09	4,08	5.61	0,004	Sig
	Extend	65,28	2,01	70,45	2,73	4,66	0,001	Sig
	Approximate	23,48	2,84	30,05	5,09	3,69	0,001	Sig
	away	16,02	2,88	20.00	3,02	4,71	0,000	Sig
Optical Symmetry	arm Bend	5.91	0.701	1.73	0.467	18.474	0.000	Sig
Optical Symmetry	arm extend	7.55	0.688	3.18	0.405	17.889	0.001	Sig

Significant below 0.05 significance level and below 5 degrees of freedom

Display and evaluation of the control group's (t) test results in the pre- and post-tests for the flexibility tests of the upper limb:

Table 3. displays the outcomes of the control group's pre- and post-tests on the ranges of motion of the upper limb (shoulder, elbow and wrist)

Index (degree)	Unit of measurement	Before the test		After the test		computed T value	Sig Level	Type Sig
		Mathematical mean	Typical deviation	Mathematical mean	Typical deviation			
Shoulder joint angle	High to the side	178,01	2,61	179,20	3,90	0,54	0,72	Non sig
	High in front	177,02	4,01	179,91	3,21	3,57	0,007	Sig
	High in behind	42,02	1,82	45,91	1,92	0,321	0,47	Non sig
Elbow joint angle	Bend	144,75	3,81	145,81	3,81	0,24	0,19	Sig
	Extend	176,75	4,31	179,00	4,71	4,06	0,012	Non sig
Wrist joint angle	Bend	72,83	3,51	77,2	3,01	3,10	0,002	Sig
	Extend	65,14	2,71	68,2	2,88	0,23	0,19	Non sig
	Approximate	25,28	1,15	27,1	2,80	0,13	0,51	Non sig
	away	15,83	2,03	18,32	2,67	3,86	0,001	Sig
Optical Symmetry	arm Bend	6.18	0.751	2.82	0.603	10.864	0.000	Sig

Optical Symmetry	arm extend	7	1	3.91	0.539	8.396	0.000	Sig

Significant below 0.05 significance level and below 5 degrees of freedom

Results of the post-tests for the experimental and control groups in the range-of-motion tests are presented, analyzed, and discussed. upper limb

Table 4. displays the outcomes of the post-tests for the experimental and control groups in the upper limb range of motion tests (shoulder, elbow, and wrist)

Index (degree) Unit of measurement		Before the test		After the test		computed T value	Level Sig	Type Sig
		Mathematical mean	Typical deviation	Mathematical mean	Typical deviation			
Shoulder joint angle	High to the side	180,16	4,90	179,20	3,90	4,55	0.007	Sig
	High in front	181,03	4,61	179,91	3,21	1,75	0,77	Non sig
	High in behind	46,22	2,11	45,91	1,92	3,23	0,004	Sig
Elbow joint angle	Bend	147,16	4,89	145,81	3,81	3,24	0,016	Sig
	Extend	180,07	4,01	179,00	4,71	1,06	0,71	Non sig
Wrist joint angle	Bend	80,09	4,08	77,2	3,01	1,10	0,65	Non sig
	Extend	70,45	2,73	68,2	2,88	3,23	0.005	Sig
	Approximate	30,05	5,09	27,1	2,80	4,3	0,003	Sig
	away	20,00	3,02	18,32	2,67	1,86	0,13	Non sig
Optical Symmetry	arm Bend	1.73	0.467	2.82	0.603	4.743	0.000	Sig
Optical Symmetry	arm extend	3.18	0.405	3.91	0.539	3.578	0.002	Sig

Conversation

Table (2) makes it evident that all tests of the ranges of motion and distance of the upper limb joints (shoulder joint, elbow joint, etc.) showed statistically significant differences between the pre- and post-tests in favor of the experimental group's post-tests. wrist joint) and for all movements whether (flexion, adduction, extension, lifting high to the side, forward, backward). The researchers explain these variations by pointing to the type of rehabilitation activities they created, which were distinguished by diversity and moving away from what is traditional and followed in physical therapy centers by using ultrasound waves in addition to tools represented by (rubber ropes, medical balls, weights of different weights), all of which aimed to improve flexibility, i.e. The joints' range of motion mentioned above.

Additionally, Table (3) makes it evident that the pre- and post-tests differed statistically significantly in favor of the control group's post-tests in the range-of-motion tests (shoulder joint high-forward, high-The noteworthy results showed that the planned activities were suitable for the research participants' skill level, based on sound scientific principles, and executed correctly by the players and training instructors. Furthermore, during the performance of these workouts, multiple physical attributes were used simultaneously. (Al-Nedawy, et al., 2022)

From Table (4), it is clear When the post-test results for the experimental and control samples differ statistically significantly in favor of the experimental sample in each of the shoulder joint flexibility test (high - side, high - back) and wrist joint angle (extension and flexion) and elbow joint flexion adduction). No significant differences appeared in each About the shoulder joint flexibility high - forward, elbow joint flexibility in extension, and wrist joint flexibility in flexion and abduction)

The researcher attributes the notable variations in the workouts' nature accompanied by the ultrasound waves that the researchers used, which were based on scientific and physiological foundations and the results of previous research, as they had a clear effect in improving muscle elongation. also points out that rehabilitation exercises have several benefits, the most important of which is strengthening the ligaments and working muscles, in addition to improving flexibility

adds that in order to maintain the joint's range of motion, there must be continuous movement of the joint to different ranges , as some researchers confirm. (Ibtihal, & Intisar. 2021), that the importance and increase of Each joint's range of motion (angles) is a crucial prerequisite for achieving optimal performance. or required motor duty

confirm that practicing stretching and flexibility, i.e. flexibility exercises, achieves stretching and increases the elasticity of the ligaments and muscles together. By developing these properties, the range of movement expands. Paying attention to stretching the muscles and flexibility of the shoulder joint, elbow, wrist, especially for those injured in the upper limb, whether with a brachial plexus injury or otherwise, is an important factor in preventing injuries or with recurrence of injury .

(Lamyaa &Entsar. 2020) also indicate that performing sports exercises for the purpose of improving Muscle suppleness contributes to fluid motion. Additionally, the researchers ascribe this to the fact that rehabilitation training in a therapeutic setting increases the injured person's capacity to enhance the angles of the body.

Huda Badawi adds that continuing with the rehabilitation approach and exercises that were prepared according to a studied scientific approach, taking into account The degree of injury had a clear effect in reducing the severity of pain by continuing to exercise on these exercises, and thus The degree of pain was evidently reduced by the joint's range of motion and muscular strength. The ability of a muscle or muscle group to generate tension against resistance during its maximal voluntary contraction is the test of muscular strength. (Huda , 2020) (Hanan et al., 2024).

agrees with what was mentioned previously that performing exercises using weights with different weights works to develop different muscle capabilities, including flexibility, which contributes to developing the ability of a specific muscle to achieve the required motor duty. (Huda, 2020)

Some researchers confirm that practicing flexibility exercises regularly and gradually works to develop and grow flexibility and contributes to preventing injury and the necessity of being the most important parts of physical preparation in training programs. Sports training results in alterations as a transient reaction to engaging in physical activity, which is consistent with the findings that rehabilitation activities are one of the tenets of sports rehabilitation for treating sports injuries (Saeed & Noaman, 2019).(Morad, & Shbeeb, 2023;Riam, & Huda ,2024).

It indicates that continuing to perform flexibility exercises regularly and gradually works to develop and enhance flexibility and to be part of the most important parts of physical preparation in training and rehabilitation programs.

From the above, researchers believe that the nature of Because of the coordination between the opposing, assisting, and working muscles brought about by neural adaptation, the rehabilitation exercises used in the program primarily stimulated the nerves surrounding the muscles and increased the level of motor flexibility of the upper limb joints. (Hadeel, & Dr. Suhad, 2021).

Along with the variation in the repetitions used to complete the exercises, the specificity that set apart the exercises designed for development was also a result of the exercises' balanced and coordinated preparation, which gave careful consideration and enough time to select the right exercises for each unit. Positive outcomes show that the exercises were designed to be suitable for the sample's level and absorption, that they were based on sound scientific principles, and that the players carried them out correctly.

Conclusions

- Rehabilitation exercises had a clear positive effect in improving the range of motion of the upper limb joints (shoulder joint, elbow joint, wrist joint)
- Ultrasound had a clear positive effect in improving the range of motion of the joints and reducing the limitation resulting from the injury
- The researchers used the visual analog scale to determine the degree of pain in the injured and then worked to relieve the pain using ultrasound and rehabilitation exercises

Recommendations

- Adopting the prepared approach and rehabilitation exercises designed for rehabilitation by the researcher patients with carpal tunnel compression
- Adopting the sound waves used by the researchers and the auxiliary tools (rubber ropes, weights, medical balls) in rehabilitating patients with carpal tunnel compression

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References

Abdul Kareem, Z., & Saeed, S. Q. (2024). The effect of hanging rope exercises on developing some physical and motor abilities and the accuracy of performing the Overwhelming beating for young volleyball players. Wasit Journal of Sports Sciences, 20(3), 56-72. https://doi.org/10.31185/wjoss.532

Almusawi DS., 2019. Effect of Battle Ropes Training in Some Components of Health Fitness and Vision of the Body Image of Women Aged (30-35) Years. Indian Journal of Public Health Research and Development.;10:2019. https://ijphrd.com/issues.html

Al-Nedawy , R. I. A. ., & Saeed Al-Mousawi , S. Q. (2022) . Effect of a training program on the development of physical abilities in football goalkeepers. SPORT TK-Revista EuroAmericana de Ciencias del Deporte, vol.11, p.36, https://doi.org/10.6018/sportk.522961

Alyaa ,A. , Suhad, Q. (2022). The effect of Cross Fit exercises on the development of explosive power, speed of Kinesthetic response , and performance accuracy of the skill of crush beating for volleyball players. Modern Sport, 21(2), 0010 https://doi.org/10.54702/msj.2022.21.2.0010

Badwi, S. H. , Saeed, A S. Q. , & Mousa, J. S.(2023) . Analysis of the amount of lost fluids, some blood components and mineral salts in volleyball under hot weather conditions. SPORT TK-Revista EuroAmericana de Ciencias del Deporte, vol.12, p. 36 , https://doi.org/10.6018/sportk.577361

Diana, H. & Suhad, Q. (2020). Exercises based on the phosphor-genic energy system to develop the ability to perform with precision and accuracy. Modern Sport, 19(3), 0001. https://doi.org/10.54702/msj.2020.19.3.0001

Ghazi Salman , J., & Saeed, S. Q. (2024). The effect of exercises specifically for repetitive training of the muscles of the upper limbs on developing explosive power, some mechanical starting variables, and achieving the javelin throw. Journal of Studies and Researches of Sport Education, 34(3), 92–104. https://doi.org/10.55998/jsrse.v34i3.622

Hadeel, T. M., & Suhad, Q. S. (2021). The effect of physical exertion training using a vertimax device in developing the characteristic strength with speed and the skill of shooting by jumping in front - high with the hand ball for youth. Modern Sport, 20(1), 0158. https://doi.org/10.54702/msj.2021.20.1.0158

Hanan, M., Huda, B. S., suhad ,Q. A. (2024). The effect of anaerobic (phosphagenic) exercises on some offensive and defensive skills of handball players. Mustansiriyah Journal of Sports Science, 6(3), 232–242. https://doi.org/10.62540/mjss.2024.3.6.20

Huda B. 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

Ibtihal, R. U., & Intisar, K. A. (2021). Motor capacity and Its relationship with some indicators Albaiukinmetekih and performance of the wheel of human skill. Modern Sport, 20(2), 0099. https://doi.org/10.54702/msj.2021.20.2.0099

Jumana, G. S.,2024 The Effect of Exercises According oo The Ranges of Arm Movement And Their Effect on Muscle Strength, and Some Biomechanical Variables, and Javelin Throwing Achievement for Young People. . Smart Innovation, Systems and Technologies. https://www.springer.com/series/8767/books

Lamyaa, A, K. &Entsar, K. A. (2020).The effect of rehabilitating exercises by using a therapeutic medium on some motor abilities of hemiplegia patients.internationalJournalof psychosocial Rehabilition.Vol.24.Issue03.https://www.psychosocial.com/article/PR2021237/35720/

Morad, H., & Shbeeb, H. B. (2023). The Effect of Special Exercises Using Two Designed Devices in Developing Some Defensive Handball Skills. Revista Iberoamericana de Psicología del Ejercicio y el Deporte, 18(2), 153-155.

Rand Issa & Suhad Qassim. (2022). The effect of special exercises to develop explosive power, speed and anaerobic endurance for soccer players. Modern Sport, 21(3), 0074. https://doi.org/10.54702/msj.2022.21.3.0074

Riam, E. J., & Huda, B. S. (2024). The Effect of Rehabilitative Exercises in a Sandy Environment on Improving the Range of Motion of the Knee Joint in Patients with Partial Meniscus (Medial) Tears Among Baghdad Volleyball Club Players. Modern Sport, 23(2), 0047-0056. https://doi.org/10.54702/nzpht357

S. Q. Saeed, M. F. Khalifa, and M. H. Noaman. (2019). "Screening of obesity blood pressure and blood glucose among female students athletes at college physical education and sport sciences in university of baghdad," Indian Journal of Public Health Research and Development, vol. 10, no.,.View at: Publisher Site | Google Scholar

Shabib, H. B . Qassem S. Al-mousawi suhad . (2023). The effect of the two top calming strategies (straight-fixed) for the development of special strength and some functional abilities of volleyball. Wasit Journal Of Sports Sciences, 27–44, https://doi.org/10.31185/wjoss.298

Suhad, Q. A. (2020).The effectiveness of upward training with weights to develop explosive strength and speed and some functional variables for young volleyball players journal of the college of basic education https://www.iasj.net/iasj/article/209711

Suhad, Q. Al. (2022). The effect of crossfit training in a stylistic, unified and multiple direction to develop some physical and functional abilities of young volleyball players . Journal of Sport Science, vol. 14, no. 53, pp. 185-96, https://pessj.uodiyala.edu.iq/index.php/1/article/view/1009

Hussein Kadhim, F. A., Hussein Farhan, A., Husnl Tahseen, T., Al-Mousawi, S. Q. S., & Radhi Raheem, H. (2025). El efecto de la estrategia de nominación de ideas sobre la atención dividida y selectiva y la realización de algunas habilidades de voleibol. *Retos, 65*, 293–306. https://doi.org/10.47197/retos.v65.111346

Hashem, N. Y., Al Edhary, D. F., Radhi, M. N., & Hmeid, M. G. (2022). The effect of dynamic lactic exercises in the maximum oxygen consumption and lay-up shot endurance of under-20 basketball players. *SPORT TK-Revista EuroAmericana de Ciencias Del Deporte*, 2.

Shaalan, R. A., Aboode, M. A., & Radhi, M. N. (2022). The effect of qualitative exercises in developing motor compatibility and learning the skill of volleyball jump set. *SPORT TK-Revista EuroAmericana de Ciencias Del Deporte*, 5.

Shaker, A. S., Tuama, H. M., & Radhi, M. N. (2022). The effect of using e-learning technology in learning the skill of clean and jerk in students of Physical Education and Sports Sciences. *SPORT TK-Revista EuroAmericana de Ciencias Del Deporte*, 4.

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