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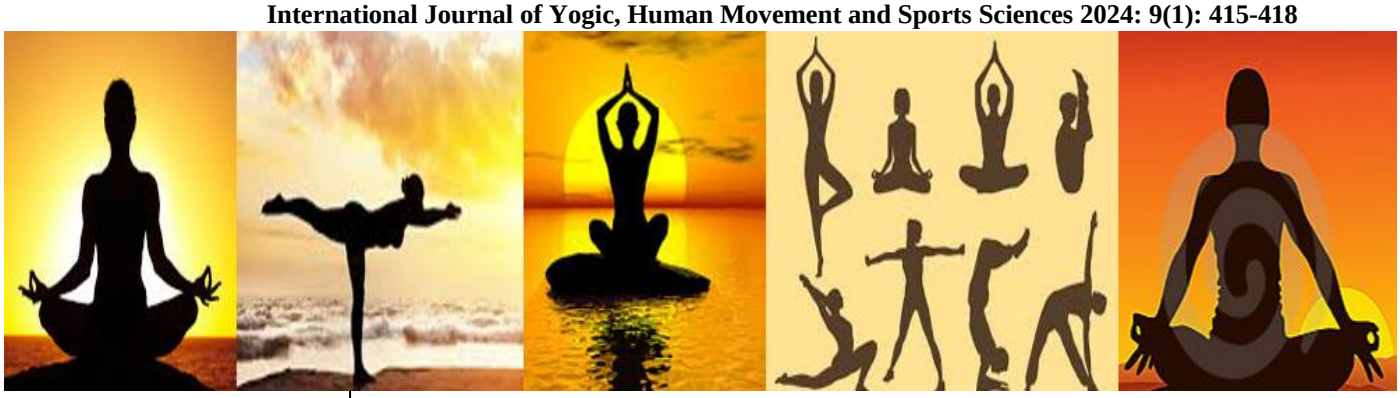

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# The effect of a rehabilitation program using ultrasound frequencies and thermal wax to increase the physical efficiency of handball players

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**Abstract**
The problem with the research is that coaches focus only on training programs and physical and skill preparation, and do not focus on the important aspect of preserving the player's physical and physiological safety. Therapeutic and rehabilitative methods such as thermal wax and ultrasound frequencies were not used. Therefore, the researchers worked to introduce a rehabilitation program that includes treatment by wax. In addition, ultrasound frequencies to improve the physical and functional condition of handball players. The researchers will use the experimental method with one experimental group due to its suitability to the nature and method of the research. The research community also included (25) handball players applying to Al-Kout Sports Club, and (18) players were selected by simple lottery to be a sample for the research, and they are members of the experimental group. As part of the research procedures, the researchers prepared a program suitable for a research sample, and after obtaining the results of the data of a research sample used through the main experiment, the researchers processed it statistically using the spss program, and in light of the research results that the researchers reached, a set of results were concluded, the most important of which was proven The proposed rehabilitation program using ultrasound frequencies and thermal wax showed an improvement in the level of physical performance of handball players, as it showed improvement in all of (speed, agility, flexibility, and muscular strength). The proposed rehabilitation program using ultrasound frequencies and thermal wax did not show an improvement in Endurance level. The most important recommendations are the need to use the rehabilitation program before any training unit and regularly. Work to conduct similar studies, and this indicates the development of the science of training and rehabilitation and preventing injuries.

**Keywords:** Handball players, thermal wax, ultrasound frequencies, Iraq

## Introduction
In the advanced era of treatment and rehabilitation, modern devices work to rehabilitate and improve kinetic functions in general and their connection to the sports aspect in particular, to work to improve the individual's efficiency related to the characteristic of the activity itself.
Ultrasound frequencies and thermal wax have been associated in different eras of time, but under other names, such as applying pieces of cloth with oil and placing them in places of pain or light beating when some muscles of the body contract. This indicates that this treatment was used in different times according to its development. (Zainab Abdel Hamid, Yasser Ali, 2005) [8] points out that the Chinese used thermal wax before Christ to increase activity in individuals and to improve circulation, as well as affecting internal tissues and the like. (Bendicet, 2010) [1] points out that rehabilitation includes all medical, natural and psychological methods to rehabilitate the injured person as he was before the injury. Developed countries have also paid attention to rehabilitation and physical therapy until this type of means has become an essential means in the process of sports training, which results in sports problems and injuries.
(Muhammad Sobhi Hassanein, 1987) [9] explains that one of the most important goals of physical therapy is to return the injured person to his normal position, using ultrasound frequencies that work to stimulate the muscles and nerves, improve blood circulation, work to penetrate superficial and deep tissues, and reach points through which pain can be controlled and functional and kinetic status improved. For affected parts.

**Research problem**

Through observing the work of sports clubs and the problems that most players encounter, including injuries of all kinds, because coaches focus only on training programs and physical and skill preparation, and the important aspect of preserving the player's physical and physiological safety is not focused on, and therapeutic and rehabilitative means such as thermal wax and ultrasound are not used. Therefore, the researchers worked to introduce a rehabilitation program that includes treatment using wax and ultrasound frequencies to improve the physical and functional condition of handball players.

**Research objective**

Identify the effect of the proposed rehabilitation program using ultrasound frequencies and thermal wax to raise the physical efficiency of handball players.

**Research hypotheses**

There are statistically significant hypotheses for the pre- and post-measurement of the handball players under study.

**Research fields**

- **Human field:** Second year students at the University of Wasit - College of Physical Education and Sports Sciences.
- **Time field:** (8/1/2024) to (22/4/2024)
- **Spatial field:** The closed hall in the College of Physical Education and Sports Sciences

**Research methodology and field procedures**

**Research Methodology**

The experimental approach with one experimental group was chosen because of its suitability to the nature and method of the research.

**Community and sample research**

The research community was identified as handball players applying to Al-Kout Sports Club, numbering (25) players, and (18) players were selected by simple lottery to be a sample for the research, and they are members of the experimental group.

**Homogeneity of the research sample**

The research sample was homogenized in terms of chronological age, height, and weight, as shown in Table (1).

**Table 1:** Shows the distribution of the study sample members according to variables (Age, length, weight) study tests

| Variables | Measuring unit | Mean | Std. Deviations | Skewness |
|---|---|---|---|---|
| Age | Year | 22.09 | 0.82 | 0.52- |
| Weight | Kg | 176.9 | 5.90 | 0.61- |
| Length | Cm | 73.12 | 8.40 | 0.16- |

**Means of collecting information, tools and devices used in research**

**Means of collecting information**

The researchers used the following methods (Observation, interviews, Arab and foreign sources and references, player data registration form, tests and measurement, the Internet).

**Tools and devices that were used in the research**

The researchers used the following tools and devices: a Rastameter to measure height to the nearest (cm), a medical scale to measure weight to the nearest (kg), a (Sony) camera, a measuring tape with a length of (300) cm, a stop watch (2), a laptop calculator, Whistle, tablets, office supplies, hand calculator, adhesive tape, signs, ultrasound device, thermal wax device, mat, stool without back, ruler.

**Description of the tests used in the research**

**1. Sprint speed test (30 m) (Mohamed Hassan and Mohamed Nasr, 2001)** [14].

- **Purpose of the test:** To measure speed.
- **Tools:** A suitable space area with a straight path to conduct the test. Its length should not be less than (40) meters and its width should not be less than (4) cm.
- **Performance method:** Each laboratory is conducted to measure the time it takes to cover the desired distance. The test starts from the high start position. When the test begins, the start signal is given, and the time is calculated during the distance covered
- **Registration method:** Registration is done for each laboratory with the time covered within (30) m.

**2. Flexibility test: bending the torso forward from a tall sitting position (Mohamed Sobhi, 1987)** [9]

- **Purpose of the test:** To measure flexibility.
- **Tools:** Stool without back, ruler, registration form, and pen.
- **Performance method:** The close one is in the negative, but the student is able to reach their fingers to the far area of the fingers. The zero point is determined at the edge of the box and the numbers are divided so that the result obtained by the student is an inflexible ruler divided from (0-100) cm, fixed vertically on the seat. Standing on the ground. Submit it and the result is positive. On the box (on the edge of the seat while keeping the knees straight, the students bend the torso. The athlete sits from a sitting position tall with the feet together and the toes together, moving forward and down slowly so that they push the pointer with their fingertips as far as possible, provided that it is fixed at the last distance it reaches.
- **Method of recording:** The distance achieved by the player in the two attempts is recorded for the player, and the greater distance is calculated in centimeters.

**3. Agility test: Zigzag running (30 m) (Amin Anwar Al-Khouli and Osama Kamel Rateb (1982)** [10].

- **Purpose of the test:** To measure agility
- **Tools:** Five medium-sized signs, a stop watch, flat ground, and a registration form.
- **Test specifications:** The five cones are placed on one line so that the distance between each cone and the other is (90 cm). The student runs between the cones without one of the cones falling. The female students imam performs a model back and forth to illustrate the process of running between hurdles.

**4. Strength test: (Modified pressure) (Amer Fakher, 2011)** [11].

- **Purpose of the test:** To measure the strength of the arms.
- **Tools:** Stopwatch, registration form.
- **Performance method:** The player performs the prone position and bends the elbows down with the elbows bent.
- **Recording method:** Repeat the exercise for 30 seconds.

**5. Endurance test: Cooper test (1000) m (Ali Azab Abbas 2008)** [12].

- **Purpose of the test:** To measure cyclic respiratory endurance and estimate maximum oxygen consumption

- **Tools used:** Running track, stopwatch, registration form
- **Performance method:** Place the players behind the starting line and then give the start signal with the whistle. Players must complete the shortest possible period within (1000) m. When the time is up, give a timing beep.
- **Recording Method:** The time covered by the athlete during the 1000 m run is calculated.

**Exploratory experience**
The exploratory experiment was conducted on (10/1/2024) on a sample of (6) players out of (20) handball players for Al-Kout Advanced Club.

**Field research procedures**
**Pre-tests:** Pre-tests were conducted on January 13, 2024 on members of the experimental group.

**Application of the qualifying program**
The rehabilitation program was applied using ultrasound waves and thermal wax to raise the physical efficiency of handball players for a period of (8) weeks, with (3) weekly training units, and the training unit time was 40-50 minutes, on a date from (15/1/2024) to (16/3/2024).

**Post-tests**
Post-tests were conducted on 18/3/2024 on members of the experimental group.

**Statistical methods**: The search data was processed through the Statistical Package for the Social Sciences (SPSS).

**Results and discussion**
**Presentation and analyzing the measurement results of the pre- and post-tests for individuals in the research sample:**
**Presentation and analysis of the results of the differences between the test (Pre-post) of the experimental group regarding the variables of the level of physical performance of handball players**

**Table 2:** Shows the results of the research sample tests for significance of differences. It shows the measurement (pre-post) and the percentage of the variable of the level of physical performance of handball players.

| Variables | Measuring unit | Pre-test | | Post-test | | t value | level sig | % change |
|---|---|---|---|---|---|---|---|---|
| | | Arithmetic mean | Standard deviation | Arithmetic mean | Standard deviation | | | |
| Speed | Second | 8.82 | 1.06 | 8.33 | 0.98 | 5.551 | 0.001 | -8.04 |
| Flexibility | cm | 10.70 | 7.10 | 11.41 | 7.91 | 6.230 | 0.000 | 17.66 |
| Agility | second | 7.60 | 0.91 | 6.83 | 0.62 | 6.671 | 0.000 | 10.55- |
| strength | count | 18 | 3.60 | 20.61 | 3.11 | 5.609 | 0.001 | 16 |
| Endurance | minute | 7.70 | 0.72 | 7.61 | 0.93 | 3.122 | 0.063 | 1.55 |

Statistically significant at the significance level of 0.05, tabular t (2.262), degree of freedom (9)
It is clear from Table (2) that there are statistically significant differences between the pre- and post-measurements at the significance level (0.05) in the level of physical performance for the variables of speed, flexibility, agility, and muscular strength, when the percentage of the variable was (%), respectively (- 8.04, 17.66, 10.55, - 16). There were no statistically significant differences in the tolerance variable.

**Discuss the results**
Through the research objectives, writing the research hypotheses, and the results reached statistically. The results showed in Table (2) that there are statistically significant hypotheses for the pre- and post-measurement of the research sample in the level of physical performance for speed, agility, strength and flexibility.
The researchers believe that the percentages of change varied between physical performances, as each individual obtained a percentage of change in performance. For speed (-8.04), flexibility (17.66), agility (-10.55), and strength (16), while there is no change in the endurance variable, and the reason for this change is practicing physical exercises and applying the rehabilitation program, as well as learning about physical therapy methods from ultrasound waves. And thermal wax and it was consistent with the study (Borlow, 2007) [3] (Hart, 2005) [5] (Verch, 2013) [7].

**Conclusions and recommendations**
**Conclusions**
**According to the results and discussion of hypotheses, the following conclusions were reached**

- The proposed rehabilitation program using ultrasound frequencies and thermal wax showed an improvement in the level of physical performance of handball players, as it showed improvement in all of (speed, agility, flexibility, and muscular strength).
- The proposed rehabilitation program using ultrasound frequencies and thermal wax did not show an improvement in the level of endurance.

**Recommendations**

- The necessity of using the rehabilitation program before any training unit and regularly.
- Work to conduct similar studies, and this indicates the development of the science of training, rehabilitation, and preventing injuries.

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## Appendices

A model of the rehabilitation program using ultrasound and thermal wax

**Use of ultrasound frequencies**

- The beginning and end of the deltoid muscle
- The beginning and end of the biceps muscle
- The beginning and end of the triceps muscle

**Use thermal wax**

- The deltoid muscle
- Biceps muscle
- The beginning and end of the triceps muscle

**Use of ultrasound frequencies**

- The beginning and end of the flexor muscle
- Extensor muscle

**Use thermal wax**

- vastus femoris muscle
- Medial femoral muscle
- Lateral femoral muscle

| Month | Week | Day | Exercises used | Time |
|---|---|---|---|---|
| / | First | Sunday | (1-7) (Ultrasonic frequencies - thermal wax) | 3-3 minutes |
| | | | (1-3) (Ultrasonic frequencies - thermal wax) | 3-3 minutes |
| | | | (2-5) (Ultrasonic frequencies - thermal wax) | 3-3 minutes |
| | | | (4-8) (Ultrasonic frequencies - thermal wax) | 3-3 minutes |
| | | | (11-6) (Ultrasonic frequencies - thermal wax) | 3-3 minutes |