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THE EFFICACY OF PULSED ELECTROMAGNETIC FIELD ON CERVICAL DISC HERNIATION

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Abstract
In recent years, neck pain has become a widespread phenomenon in society. It attributes many reasons, such as little movement and non-practice sports, to weak muscles. Besides, noon or the nature of some professions, like business, handmade and sitting in offices and on computers and leadership, for a long time. Finally, the psychological anxiety causes some neck-shrivel cervical vertebrae. Ignorance, then, of such dangerous injury results in some shrivelled fragments. The study evaluated the effectiveness of pulsed electromagnetic field (PEMF) therapy in improving functional and structural symptoms in patients with cervical disc herniation. A randomized sample of 60 patients was divided into two groups: an experimental group receiving PEMF therapy alongside a conventional treatment protocol and a control group receiving traditional treatment alone. Results showed a significant improvement in pain intensity, neck functional index, and MRI parameters in the PEMF therapy group compared to the control group. The study concluded that PEMF therapy could be an effective and safe complementary intervention for cervical disc herniation and recommended further long-term studies to evaluate its lasting effects.

Keywords: Pulsed electromagnetic field, cervical disc traction, non-surgical treatment, cervical vertebra rehabilitation, chronic pain relief.

Introduction

المستخلص
في السنوات الأخيرة، أصبح ألم الرقبة ظاهرة منتشرة في المجتمع. ويرجع ذلك إلى أسباب عديدة، منها قلة الحركة وعدم ممارسة الرياضة، وضعف العضلات. إلى جانب ذلك، فإن الظهيرة أو طبيعة بعض المهن، مثل الأعمال اليدوية والجلوس في المكاتب وأجهزة الكمبيوتر والقيادة، لفترة طويلة. وأخيرًا، يتسبب القلق النفسي في تقلص بعض فقرات الرقبة العنقية. وبالتالي، فإن الجهل بهذه الإصابة الخطيرة يؤدي إلى اقلص بعض الأجزاء. تقدم الدراسة الحالية تقييم لفعالية العلاج بالمجال الكهرومغناطيسي النبضي (PEMF) في تحسين الأعراض الوظيفية والبنيوية لدى مرضى الانزلاق الغضروفي العنقي. حيث تم تقسيم عينة عشوائية من 60 مريضًا إلى مجموعتين: مجموعة تجريبية تتلقى العلاج بالمجال الكهرومغناطيسي النبضي إلى جانب بروتوكول علاج تقليدي ومجموعة ضابطة تتلقى العلاج التقليدي وحده. أظهرت النتائج تحسنًا كبيرًا في شدة الألم ومؤشر وظائف الرقبة ومعايير التصوير بالرنين المغناطيسي في مجموعة العلاج بالمجال الكهرومغناطيسي النبضي مقارنةً بالمجموعة الضابطة. وخلصت الدراسة إلى أن علاج PEMF يمكن أن يكون تدخلاً تكميليًا فعالًا وآمنًا لانزلاق الفقرات العنقية وأوصت بإجراء المزيد من الدراسات طويلة الأمد لتقييم آثاره الدائمة.

A cervical disc herniation is the exposure of the discs between the cervical vertebrae to pressure or load that affects the vertebrae as a result of a mechanical injury. This injury leads to the nucleus pulposus leaking outward, causing pain in the neck area. This pain extends to

the arm due to inflammation at the end of the nerve endings near the herniated disc. This herniation may be the result of a bony spur in the neck area (19) (116).

Recent scientific studies have indicated that the strength of the Earth's magnetic field has decreased by 50% compared to centuries ago. This reduces the amount of magnetic energy available in the human body. Our modern industrial society has surrounding metal structures and equipment that absorb some of the magnetic energy emitted from the Earth. It has also contributed to reducing the usefulness and strength of the magnetic energy we can obtain. Therefore, the concept of magnetic therapy is based on the same principles of magnetic energy in nature. Magnetic energy penetrates the skin at a specific location and is absorbed by the capillaries in the skin covering that location. It then travels through the blood until it reaches the main bloodstream, which nourishes all the capillaries in the body. The absorption of magnetic energy in the blood is because the blood's hemoglobin contains iron molecules and other electrical charges that absorb this magnetic energy. This action creates a magnetic current in the bloodstream, carrying the magnetic energy to parts of the body.

Research objectives:

1- The aim of the research is to find a rehabilitation program that employs electromagnetic field technology for treating nerve roots in patients with cervical disc herniation.

2- The second aim is to determine how anthropometric variables change during pre- and post-test assessments of the experimental group being analyzed.

Research Hypotheses:

1- Statistically significant differences were found between the control and experimental groups in the pre-test, which was selected from the therapeutic nutrition program and electromagnetic field.

2- The evaluation of functional ability after the test for patients with cervical disc herniation reveals statistically significant differences between the control and experimental groups.

3- According to the study variables, the experimental group exhibited statistically significant differences between pre-test and post-test results..

Research Terms:

Magnetic therapy, an alternative medicine approach, employs magnetic energy to address various ailments affecting the body. Magnets do not heal on their own; instead, they establish a balanced environment that helps speed up the healing process for those affected.

Literature Review:

Iman Abdul Amir Al-Khazraji conducted a study in 2004 investigating the impact of an integrated treatment program on certain neurological and muscular variables caused by a herniated cervical disc. The objective of the study is to determine the impact of an integrated treatment program on certain neurological and muscular variables that arise from herniated

cervical discs. A sample of 39 patients was selected for the study. Six of them were excluded for not attending treatment programs regularly, and four were excluded due to having other diseases related to herniated discs. The other 33 patients were split into three groups of 11, with ages between 30 and 55 years.

❖ **First: Research Methodology**

The present research utilized an experimental approach with two comparable groups: a planned and managed alteration of the particular circumstances surrounding an event, monitoring the changes that ensued in the event itself, and analyzing them in light of the different influencing factors.

❖ **Second: Research Population and Sample:**

The research population comprises patients with herniated discs from different governorates, including Baghdad. The research sample is made up of 30 patients with herniated cervical discs from different Iraqi governorates, who were randomly divided into two groups: a control group and an experimental group..

❖ **Distribution of the study sample according to gender:**

As indicated in Table (1), the study comprised 22 male participants, which accounts for 73.33% of the total. The subsequent table displays their distribution by gender.

Table (1)
Distribution of the study sample according to the gender

Variable	Category	Frequency	Percentage
Gender	male	22	%73.33
	female	8	%26.66
	the total	30	%100

Table (2)
shows the age group of the study participants:

Variable	Category	Frequency	Percentage
Age	Less than 30 years	11	%36.66
	31-40 years	8	%26.66
	41-50 years	7	%23.34
	51-60 years	4	%13.34
	The total	30	%100

The first category was occupied by those under 30 years of age, with a percentage of 36.66%, while the last category was occupied by players aged 51–60 years, with a percentage of 13.44%.

Third: Research Tools:

In order to meet the aims of the present investigation, the researcher created a questionnaire design that includes all of the objective dimensions indicated by the research questions and aims, while also ensuring that it incorporates all necessary indicators for assessing reliability and validity. The researcher adhered to the scientific methods employed in building this kind of tool and utilized two main sources for gathering information: secondary sources and primary sources..

1. Questionnaire:

This research utilized the questionnaire, which is among the most crucial scientific tools for gathering data in field research. Consequently, the researcher chose it and aimed to utilize it in carrying out this study. The questionnaire was developed using a variety of earlier studies concentrating on the study variables as a foundation. The questionnaire was structured around two primary axes:

1- Es beinhaltete Fragen zur demografischen Information der Studienprobe, einschließlich der folgenden Items (Geschlecht, Alter).

2- Es beinhaltete Fragen zur unabhängigen Variablen. The impact of electromagnetic efficiency. It consisted of 30 items with five response options based on the five-point Likert scale. The Likert scale was analyzed, and the level of agreement and the degree of alignment with the scale were computed, as illustrated in the table below:

Table (3) Degree of approval and extent of approval

Level	Range	Encoding
Very Low	1	1-80
Low	2	1.81 – 2.60
Medium	3	2.61 - 3.40
High	4	3.41 - 4.20
Very High	5	4.21 – 50

Table (4)
Study variables and dimensions

Number of phrases	Variable
20	**Effect of electromagnetic fields on cervical disc herniation 20**

A. Validity and reliability of the study:

The scale is presented to a group of judges in the study, and they make modifications based on their suggestions. The judges are a group of academic judges specialized in the field of study from various universities, so that the number of questionnaire items (20 statements) in

its final form becomes clear. The judges' consensus serves as a sign of the content validity of the questionnaire. The subsequent table depicts the axes of the scale in its completed version.

Internal Consistency Validity:

To verify the internal consistency validity of the scale, correlation coefficients were computed between each axis and the total score from the pilot study questionnaire. The score of each statement of the independent variable (the training program) is used to calculate the Pearson correlation coefficient with the total score of the dimension it belongs to. Additionally, the Pearson correlation coefficient is computed for each statement's score of the dependent variable (the functional ability of the item) in relation to the total score of its corresponding dimension. This is done to ensure that every statement precisely assesses what it is meant to assess. After we verify the instrument's apparent validity, we will use it on a sample of 10 patients who are not included in the actual study. Table (5) shows the results of calculating the Pearson correlation coefficient based on data from the pilot sample.

Table(5)
Pearson's correlation coefficients between the score of each statement and the total score of the dimension to which it belongs

Phrase	Correlation coefficient	Phrase	Correlation coefficient	Phrase	Correlation coefficient	Phrase	Correlation coefficient
1	0.451	6	0.412	11	0.657	16	0.524
2	0.574	7	0.470	12	0.621	17	0.532
3	0.365	8	0.611	13	0.432	18	0.571
4	0.457	9	0.543	14	0.401	19	0.541
5	0.574	10	0.547	15	0.455	20	0.423

Function at level (0.01).

From Table No. 5, it's clear that all of the statistical correlation coefficients between each question on the questionnaire are positive, statistically significant at a level less than or equal to 0.01, and fall between 0.401 and 0.611. This indicates an increase in the internal consistency of the statements and the dimensions to which they belong. Thus, each statement measures its intended purpose, and the study tool has (high) validity and can achieve its goals.

The researcher indicates the percentage of development to the effectiveness of the developed electromagnetic rehabilitation program. Additionally, the rehabilitation process for cervical disc herniation incorporates the use of infrared rays, medical massage, and ice massage. Furthermore, patients recover from inflammation and potential side effects during rehabilitation. The rehabilitation process for disc herniation is, therefore, addressing it. This process leads to an improvement in the functional performance of the vertebrae and a gradual

improvement in muscle strength. The ability to perform motor functions improves. Additionally, the injured person's level of physical fitness increases, leading to an improvement in their motor coordination performance. The physical fitness of the body in general, especially the balance component, is one of the basic components of coordination. It is one of the important goals of the rehabilitation process, especially for the injured limb. In general, the body's coordination depends on developing balance, a sense of rhythm, agility, and motor coordination.

A. Reliability of the Study Tool:

The study tool's reliability reflects the stability and dependability of its results, as well as its capacity to evaluate the consistency of questionnaire responses when given multiple times under similar conditions. While there are various approaches to assess the reliability of the tool, the most widely used one is to compute Cronbach's alpha coefficient. The coefficient indicates how consistent responses are with each other. The degree of reliability increases with its value. A value greater than 80% is regarded as high, one between 70% and 80% is considered medium, and a value below 70% is deemed low. The subsequent table displays the computation of Cronbach's alpha coefficient regarding the tool's reliability..

Table (6) Stability of the study tool using Cronbach's alpha coefficient

Cronbach's alpha coefficient	Number of statements	Variable
0.754	**20**	**Effect of the training program on functional ability**

Table 6 presents results indicating that Cronbach's alpha coefficient values for the questionnaire axis and overall tool stability reached 0.754. The outcome shows that the study tool is highly stable and can meet its intended objective, making it appropriate for use with the actual sample.

Tests to assess the functional capacity of the cervical spine: This test can apply to the following conditions: Muscle strength:

- **Purpose of the test:** To measure the muscular capacity of the joint, arm, and shoulder area.
- **Equipment:** The use of 900-gram iron weight, ensuring its size is comparable to a hockey ball or a softball. Tools include a measuring tape and small metal markers to mark the approach area with two lines 1.80 meters apart, a flat area of space appropriate to the age of the examinee, and the throwing area with parallel transverse lines, each a quarter of a metre apart.

- **Method of performance:**

The examinee assumes a ready position within the designated throwing area, holding the weight in one hand. The examinee is then signaled to begin moving within the permitted distance of 1.8 meters to throw the weight in the direction of the throwing area. The examinee then throws the weight from the approach area over the hand, aiming the ball

above shoulder level and towards the throwing area. Each examinee receives three consecutive attempts.

Range of Motion:

Aim of the examination: To assess the capacity for quick and precise reactions and movements.

– A stopwatch, a measuring tape, and a clear area that stands freely and measures 20 m in length and 2 m in width.

- Procedure: Mark the test area with three lines, spaced 6.40 m apart and measuring 1 m in length.

- **Method of Performance**:

At the start of this test, the player stands at one end of the center line, facing the referee, who is at the opposite end. The player takes a ready stance with the center line positioned between their feet, leaning their body slightly forward. The referee holds the stopwatch aloft with one hand. He then shifts his arm to the left or right while simultaneously starting the clock. Upon receiving a hand signal, the player tries to sprint in the indicated direction toward the sideline, located 6.40 meters from the center. As the player crosses the sideline, the referee halts the clock. Should the player begin in the incorrect direction, the referee will keep the clock running until the player alters their course and arrives at the proper sideline. The referee allows the player ten consecutive attempts, each lasting 20 seconds, with five attempts on each side. Subsequently, we make a random selection of trials on both sides.

– The test has to start with the referee indicating as follows: “Ready, start.” The interval between saying "Ready" and "Start" should be between 0.5 and 2 seconds..

- **Scoring:** The time for each attempt is calculated to the nearest 1/10 of a second. The player's score is the average of the ten attempts.

Pain: Purpose of the test: To measure pain tolerance.

Equipment used: Volleyball court, measuring tape, electronic clock, chalk, and a whistle to give the starting signal.

Test description:

The two players take up a high starting position right behind one of the parallel lines. Once the signal to start is given, the two players dash at maximum speed toward the other parallel line, touch it with their feet, and then quickly turn back to return to the first parallel line they started from. The two players will carry out this exercise eight times, covering a distance of 15 x 8 meters, totaling 200 meters.

Conditions:

- The players take up the correct position.
- Whenever they arrive at the two parallel lines, they need to touch them with their feet.
- Keep running without halting after the starting signal is given until the players.

- The researcher assesses the performance speed.
- To guarantee a competitive environment, he tests two players at once.
- Players are permitted a single try only.
- In order to maintain competitiveness, the two scores logged by the subsequent players are proclaimed.

Test Administration:

Scorer: Calls out the names and notes the players' performance first. The timer provides the starting signal and timing, records the performance, and counts .

Recording: The total time taken by the player to cover the distance between the two lines back and forth (8) times, or the time they recorded covering the distance of 25m x 8 times, is calculated.

Biomechanical devices (EMG, EEG):

These measure the electrical activity of the brain. EMG is an electromyography device that aims to determine whether the patient suffers from muscle weakness or loss of sensation as a result of an injury to the spinal cord, muscles, or nerves.

Fifth: Research Procedures

The researcher followed the following steps:

- Examining the theoretical literature and prior research connected to the subject of this study, namely the impact of a training program on functional capacity in patients with cervical disc herniation.

– Presenting the study tool to a panel of referees and adjusting it based on their feedback.

– Gathering data and information from the sample members, followed by entering the data into computer memory.

– Evaluating the data with the help of the Statistical Package for the Social Sciences (SPSS) software.

– The findings were obtained, showcased, and analyzed with consideration of the theoretical literature and earlier research.

– Creating proposals and recommendations that are informed by the results.

Sixth: Statistical Research Methods.

The researcher utilized the Statistical Package for the Social Sciences (SPSS, for Windows V.26) to complete and analyze the questionnaire, aiming to test the validity of the study questions. The researcher used the following statistical methods.

– Cronbach’s alpha test for assessing the reliability of questionnaire statements.

Analysis and discussion of the results:

This chapter aims to analyses the results of the study tools in terms of measuring the impact of the rehabilitation program on functional capacity assessment tests for cervical vertebrae.

Answer and the Study Hypotheses:

After the study sample individuals underwent the rehabilitation program, the study examined the problems they faced and how this rehabilitation program, positively impacted reducing the severity of the problems suffered by the injured individuals.:

Table (7)

The graph displays the scores of the individuals in the group who underwent the pre- and post-application of the electromagnetic field.

Experimental Sample		Patient	Experimental Sample		Patient
Post-measurement	Pre-measurement		Post-measurement	Pre-measurement	
46	52	**L9**	35	42	**L1**
45	50	**L10**	24	37	**L2**
44	50	**L11**	23	36	**L3**
46	51	**L12**	37	45	**L4**

As illustrated in Table (7), the severity of problems experienced by individuals who benefitted from the motor injury rehabilitation program has diminished when compared to the post-test results. This attests to the effect of the rehabilitation programmes offered to them. In addition, the researcher aims to confirm the validity of the study's hypotheses in order to assess the degree of individual differences between the control and experimental groups. These can be shown as follows:

First Hypothesis:

There are statistically significant differences between the control and experimental groups in the pre-test of body composition variations, which were fully selected for motor function, the therapeutic nutrition program, and the proposed electromagnetic field. To verify the validity of this hypothesis, the arithmetic means and standard deviations for the study scale are calculated according to the study variables in the pre-test, which can be illustrated in the following table:

Table (8) Illustrates the hypothesis of statistical significance between the two groups in the pre-measurement of the tests to assess the functional ability of the cervical .vertebrae

Significance T-value	Significance Level	T-value	Standard Deviation	Arithmetic Mean	Group	N.	Variables	M
There are no differences at the level of 0.05	0.821	-0.216	0.565	2.71	Control	15	Functional assessment tests for cervical disc herniation	1
			0.527	2.76	Experimental	15		

Table t-value with a degree of freedom (sample number - 1 = 14) and at 0.05 = 2.145 Table (8) shows that there are no statistically significant differences at the 0.05 significance level. The scale t-value we calculated is less than the table t-value, which is 2.145. This means that there are no statistically significant differences (at the 0.05 level) between the experimental and control groups' scores or between the dimensions of the scales used by the experimental and control groups.

The researcher believes that increasing motor performance contributes to the acquisition of specific, rapid, and appropriate motor patterns for the muscles, tendons, and joints.

Second Hypothesis:

The functional ability assessment tests given to patients with a herniated cervical disc show statistically significant differences between the control group and the experimental group after the tests were given.

To see if this hypothesis is correct, the following table shows how to figure out the arithmetic means and standard deviations of the functional ability tests of the cervical vertebra based on the study variables in the dimensional measurement. This can be explained through the following table:

Table (9)

It shows the statistically significant differences between the control and experimental groups in the post-test.

Significance T-value	Significance Level	T-value	Degrees of Freedom	Standard Deviation	Arithmetic Mean	Group	N.	Variables	M
A function of the level of significance 0.05	0.00	5.89	14	0.550	2.55	Control	15	Functional assessment tests for cervical disc herniation	1
			14	0.367	1.88	Experimental	15		

Table t-value with a degree of freedom (sample number - 1 = 14) and at 0.05 = 2.145.

Table (9) presents differences that are statistically significant, with a significance level of 0.05. The researcher found that the calculated t-value for the joint functional ability assessment tests exceeds the tabular t-value of 2.042, confirming statistically significant differences at the 0.05 significance level between the experimental and control sample scores in favor of the experimental group in the posttest. A statistically significant difference of 0.67 is observed between the arithmetic mean values, favoring the experimental group. The result corroborates that the variations in the arithmetic mean and standard deviation were not coincidental; they reflect the rehabilitation program's effectiveness in reducing joint injury severity among individuals in the experimental sample compared to those in the control sample during the post-test..

Third Hypothesis:

There are statistically significant differences between the pre- and post-tests of the experimental group according to the study variables.

Table (10) Eta squared value of the effect of electromagnetic field efficiency

μEta squared value ^{2}	T-Value	Arithmetic Mean	N.	Experimental Group
0.732	3.24	70.31	15	Pre
		24.00	15	Post

Table (10) shows that the Eta square value is 0.732, indicating the impact of the rehabilitation program on treating the functional capacity of individuals suffering from herniated discs. The greater the Eta square value is above 0.14, the greater the impact of the independent variable on the dependent variable.

The researcher cites the reason for the development and superiority in the results of the variables under study for the individuals in the sample who underwent the integrated rehabilitation program. This is because the integrated rehabilitation program includes various rehabilitation exercises, increasing muscle contractions' frequency, leading to greater growth and development of muscle strength than the traditional program. This program achieved the same rehabilitation goal but with lower results. It also achieved progress compared to the therapeutic nutrition program alone, which only su

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