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The effect of rehabilitation exercises associated with local electrical stimulation according to the feeling of pain in the treatment of some cases of peripheral neuritis for women aged (50-55) years

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Abstract

The aim of the research was to develop rehabilitative exercises accompanied by electrical stimulation based on the perception of pain for women aged 50–55 years, and to identify the effect of these rehabilitative exercises accompanied by electrical stimulation—based on pain perception—on treating certain cases of peripheral neuropathy in women within the same age group. Accordingly, the researcher hypothesized that there would be statistically significant differences between the pre- and post-test results of the experimental group's electromyography (EMG) measurements, as well as statistically significant differences between the pre- and post-test results of pain level measurements using the Visual Analogue Scale (VAS) for the experimental group. The experimental research methodology was adopted using a one-group experimental design. The boundaries of the current research population were defined as women aged 50–55 years, with a total number of 9 patients who regularly attended the Al-Karkh Hospital / Physiotherapy Unit. All of them were deliberately selected using the comprehensive enumeration method, making up 100% of this population sample. The tests were determined, and rehabilitative exercises accompanied by electrical stimulation based on pain perception were designed. The experiment began with the pre-tests, followed by the implementation of these exercises. The duration of each rehabilitation session ranged from 28.5 to 32.36 minutes, with three sessions per week held on Sunday, Tuesday, and Thursday. Each session included four exercises and continued for eight consecutive weeks, resulting in 24 rehabilitation sessions. The experiment concluded with the post-tests. After processing the research results using the SPSS system, the conclusions and applications indicated that the rehabilitative exercises accompanied by electrical stimulation based on pain perception were suitable for women aged 50–55 years suffering from certain cases of peripheral neuropathy. These exercises had a positive effect on improving the EMG signals of the

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Journal of Physical Education

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https://jcope.uobaghdad.edu.iq

gastrocnemius muscles in both the right and left legs by increasing the peak level and reducing the spread area of the electrical signal. They also helped reduce pain levels as measured by the Visual Analogue Scale (VAS) in cases of peripheral neuropathy. It is essential to pay attention to the duration of the transitional rest period between electrical stimulation and the application of rehabilitative exercises based on pain perception when rehabilitating women aged 50–55 years with peripheral neuropathy. Furthermore, it is necessary to rely on the use of TENS (Transcutaneous Electrical Nerve Stimulation) current type when rehabilitating women in this age group to help reduce VAS-measured pain levels.

Keywords: Rehabilitative Exercises, Local Electrical Stimulation, Pain Perception, Peripheral Neuropathy.

Introduction:

Rehabilitation exercises are a means of stimulating the locomotor system and contribute to reducing the occurrence of exacerbations in various injury cases. In addition, these exercises play a role in supporting progress in functional efficiency to accelerate the recovery of motor, physical, and physiological capabilities, while taking into account the psychological factor following the injury. Integrating rehabilitation exercises with what technological means provides requires adherence to precautions, including the necessity of medical supervision when experimenting with technical rehabilitation protocols, and observing a scientific approach that is free of speculation or imposing personal experience. This is because this matter does not accept risking the condition of the injured person, especially neurological injuries, which are among the most difficult sports injuries due to the physiology of the nervous system and its anatomical composition, which requires familiarity with many of the sciences that assist in sports rehabilitation in physical education and sports science.

"Neurons are the foundation of the brain's working mechanism. They do not operate randomly, but rather as a network, organizing themselves into groups to specialize in processing different types of information, thus regulating the brain's working mechanism and making it more organized and precise) ".Alwan, 2012, p. 76)

“There are two types of nerve cells that emerge from the brain and spinal cord, either covered or not covered with melanin. The main part of the stem is surrounded by a membrane that reaches a thickness of (8 nanometers) in the melanin-covered cells. The melanin is outside the stem and separates from the cell membrane. The melanin membrane is segmented every (1-3) millimeters by nodes called (Renveir nodes), as shown in Figure (2-2) below) ”.Al-Ali and Hussein, 2016, p. 117)

Journal of Physical Education

Volume 37 – Issue (3) – 2025 Open Access

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"The nervous system is the body's means of establishing a connection between the sense organs and the reception and response to events in the internal and external environment. It is the center of thinking, decision-making, initiation and control of actions. It performs its function of dominating and controlling all parts of the body and is responsible for any movement emanating from the body, starting from eye movement and ending with the large muscles. The nervous system also plays a major role in motor performance at all levels ".)Kamash, 2008, p. 210)

The general task of the nervous system is to stimulate the various vital organs in the body to continue to function, and in the case of continuous stimulation, the speed of the organism's motor activity increases. (Wadi and Al-Janabi, 2005, pp. 79-80)

"In the anatomical structure of the central nervous system (CNS), the spinal cord is located below a number of alpha and succinate nerves located here. Connected to this cord is the medial pons (Medulla Oblongata), then the pons and the midbrain, which together form the brainstem and cerebellum (Brain stem), which is important in the process of motor regulation during exercise, as it controls the place and position during movement in cooperation with the brainstem. The brain is divided into two hemispheres connected to each other by several nerve fibers. There is an area that connects the nerves of the cerebellum to the brain with the nerves of the spinal cord, in addition to the thalamus, which is responsible for sensation, and the hypothalamus, which controls involuntary signals ".)Al-Ali and Hussein, 2016, p. 128)

The researcher believes that women at the age or stage of menopause often suffer from some cases of neuropathy other than cases of peripheral neuropathy resulting from modern diseases, malnutrition or excessive obesity. These affect the fear of neuromuscular movement due to the pain that affects those extremities, and then their cumulative effect is in the weakness of muscle strength, which is one of the components of the motor system controlled by the voluntary peripheral nerves. Any weakness or pain in the contractile processes and neuromuscular coordination to produce movements will cause an exacerbation of muscle weakness resulting from nerve weakness and then confusion of movement, and entering a stage of potential more susceptible to the disease risks that the lack of movement at this age in particular for women.

"Peripheral neuropathy can thus be defined as a dysfunction affecting the nerves that originate from the brain and spinal cord, particularly those that connect to the extremities, such as the hands and feet. This type of inflammation causes a weakening or loss of normal nerve function, leading to pain, excessive sensitivity, and weakness in the affected person's extremities) ".Al-Shafi'i, 2024, p. 127)

"The causes of these peripheral nerve inflammations are multiple, including certain infections, injuries, specific diseases, or genetic diseases, etc., and the symptoms in those affected include numbness, tingling, and tingling in the hands and feet, or feeling as if they are wearing tight gloves or tight socks, thinning of the skin, low blood pressure, frequent

Journal of Physical Education

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https://jcope.uobaghdad.edu.iq

dropping of objects from the hands when carrying them, excessive sweating, and digestive problems such as diarrhea or constipation, in addition to sexual dysfunction, especially in men. Specialist doctors have encountered problems in directing those affected to exercises that can be applied to reduce the symptoms of these inflammations and recover) ".Abdul Jawad, 2016, p. 11)

The researcher believes that women aged (50-55) years who are in a normal condition find it difficult to practice warm-up exercises and prepare the muscles for the contraction processes required by various exercises, especially for those who have not practiced physical activity regularly in the nature of their lives, so how about those who suffer from some cases of peripheral nerve inflammation, which calls for finding alternatives to strengthen the work of the muscles whose improvement in contraction processes is reflected in improving the action of nerve signals positively, and among these methods is the technique of local electrical stimulation.

"Electro Muscle Stimulation (EMS) technically means muscle contraction by delivering electrical waves to the muscle. These electrical waves are generated by a special electronic device and distributed through the ends of the electrodes to the surface of the skin directly above the muscles to be stimulated. In general, the electrodes are lined with an adhesive material so that they stick to the skin and facilitate the waves' transmission to the stimulated muscle. These waves resemble the potential action of waves coming from the central nervous system to stimulate the muscle to contract) ".Malatesta & Others, 2003, p: 574)

"The T.E.N.S. current for stimulation is low voltage and is delivered by electrodes placed over the skin at the ends of the muscle (its origin and its insertion). This combines two currents, one low and the other high frequency, to close the pain gate, while the first stimulates the pain-transmitting nerve fibers, which leads to the release of natural endorphins in the body) ".Jeffrey, 2009, pp. 136-137)

“The nerve cell is in a state of permanent electrochemical stability until it is stimulated by a message transmitted from a neighboring nerve cell. When the message arrives from one nerve cell to another, the receiving cell allows the entry of positive ions at a rate of about (100) million ions per second, which changes the charge of the receiving cell from the negative (normal) state to the positive state, forcing this cell to transmit the message through the axon towards the neighboring cell, so that this cell returns to the normal negative charge, awaiting another new message) ”.Al-Masha’la, 2010, p. 32) (Al-Atoum, 2010, p. 60)

"The electrical muscle stimulation current is pulses with a beginning and end determined by parameters represented by the gradation of its intensity, and the number of times is usually determined by the type and specifications of the device used, and it varies according to the medical, therapeutic, or sports use. In sports use, it is done through experimentation and adaptation, which is the method that the pulse takes from its beginning to its end. Its most common use is the gradation of intensity for each pulse, and the pulse undulation has

Journal of Physical Education

Volume 37 – Issue (3) – 2025 Open Access

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https://jcope.uobaghdad.edu.iq

several forms determined by the specifications of the stimulation device used) ".SALIBA &SALIBA, 2011, p: 20)

"The duration of electrical stimulation for one session should not be less than (10 minutes) at most) ".Alawi and Abdel Fattah, 2000, p. 130)

Electrical stimulation is considered a type of isometric training, so this type of training should not be relied upon alone, but rather it should be combined with another type of training) ." .Al-Rabdi, 2004, p. 31)

Transcutaneous electrical stimulation (TENS) takes advantage of short duration, high repetition rate, low intensity galvanic pulses above the sensory nerve threshold and below the motor nerve threshold. It is believed that pain-induced fiber transmission is either peripherally inhibited or there is activation of central inhibitory fibers, similar to the original proposed gate control theory of pain relief from TENS) .".SALIBA & SALIBA, 2011, P: 20)

The researcher believes that when activating the integration processes between physical movements of rehabilitation exercises and electrical stimulation of muscles, it is necessary to adhere to the specifications of choosing the means and type of exercises that suit the specificity of some cases of peripheral nerve inflammation for women aged (50-55) years, and the effect of the direction of the resistance of this force on the working muscles that support the strengthening of neuromuscular control by strengthening the muscles targeted for rehabilitation to treat this common injury, and by virtue of the specificity of the burden that falls on the leg muscles, the need for balance tools and rubber ropes is considered a necessity to complete the therapeutic rehabilitation protocol as resistances that target the muscles to strengthen the nerves of this case.

"When preparing rehabilitation exercises, there are factors that must be taken into consideration in rehabilitation, which are the number of exercises used, the starting position from which each exercise begins, the performance rhythm of each exercise, the degrees of intensity with which each exercise is performed, the correct testing of rehabilitation exercises, the range of motion of the exercise, and the physiological endurance curve for rehabilitation exercises) ".Jamal, 2005, p. 20)

"The intensity of muscle contraction depends on the intensity of the stimulus, as the muscle fibers that make up the muscle have different degrees of excitability. Some of them contract in response to a weak stimulus, which means that these fibers have high degrees of excitability, while other muscle fibers contract in response to a stimulus of greater intensity than the first, which means that these fibers have a relatively low degree of excitability compared to the first type) ".Jalal al-Din, 2007, p. 85)

As for" the performance of static contractions, which are characterized by a relatively constant contraction state in which the amount of muscle tension is compatible with the

Journal of Physical Education

Volume 37 – Issue (3) – 2025 Open Access

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https://jcope.uobaghdad.edu.iq

degree of external resistance encountered by the muscle or group of muscles involved ".)Sayed, 2019, p. 268)

Balance devices differ in their material or their effect on the body's balance. They are of the following types: sponge devices, such as a thick, highly flexible mat that makes the individual feel the softness of its flat surface; rubber devices, which are in the form of models that players walk on; large Chinese rubber balls filled with air; and solid plastic and wooden devices that have a narrow base and a wide surface)) .".Frizzell & Dunn, 2015, P: 43

"Also, to maintain balance, the direction of the nerve impulses from the cerebral cortex is directed towards the muscles that increase the body's control over stability in unnatural conditions of balance. In fact, muscle tension continues to contract in some muscles to maintain balance or maintain posture without us feeling it unless we focus on it or increase this tension according to what is required to ensure the feeling of balance". Bronner & Other, 2013, P(365 :

After this digression to clarify this explanatory framework for the injury specificity and the independent variable in this research, the importance of this research is represented by the intended productivity to provide support to both doctors and therapists in the physical therapy department at Al-Karkh Hospital/Physiotherapy Department in order to help injured women who suffer from pain in cases of long standing to speed up recovery from this injury other than cases of peripheral impairment resulting from modern diseases, malnutrition or excessive obesity. The problem of the research lies in the fact that through the researcher's reviews of the physical therapy department at Al-Karkh Hospital and her observation of the slow recovery processes from some cases of peripheral nerve inflammation for women aged (50-55) years, and the reliance on medical drugs with limited exercises, and the need for rehabilitation exercises that help those injured with these inflammations to overcome them, which prompted the lack of specialized rehabilitation exercises that meet or are consistent with the instructions of doctors who emphasize their regular application, the researcher directed to try to experiment with accompanying rehabilitation exercises For electrical stimulation, the research aims to prepare rehabilitation exercises accompanying electrical stimulation according to the feeling of pain. For women aged (50-55) years, and to identify the effect of rehabilitation exercises accompanied by electrical stimulation according to the feeling of pain in treating some cases of peripheral nerve inflammation for women aged (50-55) years, and the researcher assumes that there are statistically significant differences between the results of the electrical signal measurement tests (EMG) before and after the experimental research group, and there are statistically significant differences between the results of the pain measurement tests (V.A.S) before and after the experimental research group.

Journal of Physical Education

Volume 37 – Issue (3) – 2025 Open Access

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https://jcope.uobaghdad.edu.iq

Method and procedures:

The problem of the current research imposed the adoption of experimental research with a single experimental group design, considering that it is not possible to choose a control group as stated in this problem due to the lack of integration of physical therapy in the manner required by doctors. The boundaries of the current research community were women aged (50-55) years, totalling (9) infected women who visit Al-Karkh Hospital / Physical Therapy Department, who were diagnosed with some cases of peripheral nerve inflammation other than cases of peripheral neuropathy resulting from modern diseases, malnutrition or excessive obesity. After the researcher confirmed their laboratory analyses and clinical examinations of nerve mapping in this hospital that there were no injuries in the limbs or complications that do not allow the application of rehabilitation exercises, they were all chosen intentionally using the comprehensive enumeration method for the total research sample at a rate of (100%) of this community. Also, to maintain the internal integrity of the experimental design, their homogeneity was verified in the degrees of some extraneous variables, as shown in the results of Table:(1)

Table (1) shows the results of the homogeneity of the degrees of the patients in the research sample

Extraneous Variables	Unit of Measurement	N	Mean	Standard Deviation	Skewness
Injury Age	Day	9	10.11	0.782	-0.216
Chronological Age	Year	9	52.89	1.616	-0.687
Body Mass Index (BMI)	Kg/m^2	9	21.67	0.707	0.606

(BIM) = Body weight (mass in kg) / Body length squared in meters, Torsion coefficient between(1±)

The measuring tools for the recovery of some cases of peripheral nerve inflammation for women were determined based on consultation with neurologists, joints and fractures consultants at Al-Karkh Hospital / Department of Physiotherapy, which were represented by an (EMG) device with a (Bluetooth) transmitter using two sensors for each of the posterior gluteus muscle of the right and left leg. The results of the (EMG) signal are obtained and analyzed with the (Myo Research XP 1.06.67) program stored on a laptop computer. After synchronizing the movement of the injured person to test standing on tiptoes for (3) seconds with a (SONY) camera whose speed does not exceed (75 images per second), to take a reading of both the peak and area of the (EMG) signal for each of the two muscles, and it was represented by the pain level scale (V.A.S) graduated from (1-10) degrees to measure the degree of pain after standing according to the patient's ability to stand on the tips of the toes, as this

Journal of Physical Education

Volume 37 – Issue (3) – 2025 Open Access

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https://jcope.uobaghdad.edu.iq

measurement is done after (3) seconds of this type of Standing, i.e. one test was conducted, which is balance, to measure the degree of pain in the feet and the electrical signal of the posterior gluteal muscles of both the right and left legs of each injured person from the experimental group, as shown in Appendices (1) and.(2)

Basics of preparing rehabilitation exercises accompanied by electrical stimulation according to pain sensation and their applications:

R The goal of each exercise was determined to rehabilitate some cases of peripheral nerve inflammation in women aged (50-55) years, and to reduce the level of pain (V.A.S) in the posterior golf muscles of both the right and left legs, and to restore the ability to stand on the feet without this pain.

R The electrical stimulation device (Radium B333) was used, which contains an electrical transformer with switches that converts the direct electrical current into electrical vibrations that are transmitted to the posterior gluteus medius muscles of both the right and left legs by means of wire electrodes, the number of which varies from one device to another. The number of these channels or electrodes is (10) channels that help stimulate the muscles and nerves to prepare for the rehabilitation exercise in the treatment session. It contains several types of electrical waves, from which the (T.E.N.S) type was chosen for stimulation to suit some cases of peripheral nerve inflammation in women aged (50-55) years, gradually from (110) Hz to (180) Hz to stimulate the posterior gluteus medius muscles of both the right and left legs to strengthen their work and increase their synergy, taking into account the ability of women aged (50-55) years and their acceptance of this type of electrical stimulation by adopting the principle of gradual increase in the degree of electrical stimulation, as shown in Appendix.(3)

When electrically stimulating the hamstring muscles of both the right and left legs, care was taken to place the electrodes on both sides of each muscle.

Electrical stimulation of the posterior gluteus muscles of both the right and left legs was performed before rehabilitation with rehabilitation exercises targeting the rehabilitation of some cases of peripheral nerve inflammation in women aged (50-55) years.

The commitment to continuing comprehensive medical care and organizing periodic evaluations by the consultants and specialists responsible for them at Al-Karkh Hospital/Physiotherapy Department was taken into account.

The content of these rehabilitation exercises, tailored to suit each individual injured weightlifter, includes the following:

Journal of Physical Education

Volume 37 – Issue (3) – 2025 Open Access

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https://jcope.uobaghdad.edu.iq

Dynamic stability exercises.

Balance board exercises.

Resistance Bands exercises in degrees.(5 ,4 ,3 ,2 ,1)

The difficulty of the rehabilitation exercises was determined by calculating the maximum resistance received by all women suffering from pain in each rehabilitation exercise, by adopting the pain level scale (V.A.S) by gradually applying the rehabilitation exercises, as muscle strength gives an indication of a decrease in the degree of pain, as Figure (1) shows the percentages of these exercises in the total rehabilitation sessions applied to women aged (50-55) years:

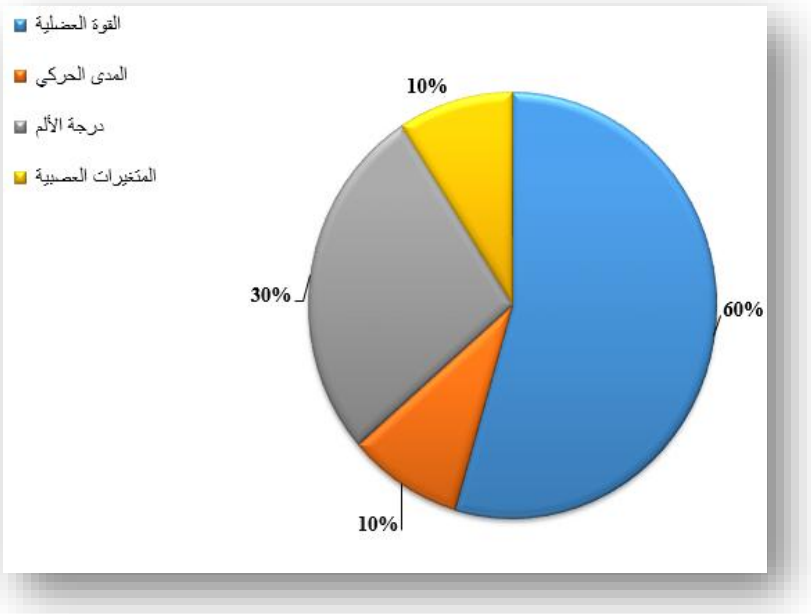

Figure (1) shows the distribution of percentages across the various rehabilitation exercises.

Muscle pain relief was considered by gradually increasing the (T.E.N.S) current for stimulation from (110) Hz to (180) Hz for a period of no less than (10) minutes in one session.

After completing the electrical muscle stimulation, the injured were given an appropriate rest period, after which rehabilitation exercises began.

The duration of the application of the rehabilitation exercises in each of the rehabilitation sessions ranged from (24.36) to (28.22) minutes, with (3) sessions applied in one week on

Journal of Physical Education

Volume 37 – Issue (3) – 2025 Open Access

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https://jcope.uobaghdad.edu.iq

the days (Sunday, Tuesday, Thursday) at a rate of (4) exercises in each session, which continued for (8) consecutive weeks, so that the total number of sessions reached (24) rehabilitation sessions, as shown in Appendix.(4)

The research experiment began by applying pre-tests on the infected women in the experimental research group, numbering (11) infected women. These tests were applied in Al-Karkh Hospital/Physiotherapy Department at ten o'clock in the morning on Wednesday, corresponding to the date.(2024/25/12)

Rehabilitation exercises accompanied by electrical stimulation were applied according to the feeling of pain on them during the period of their receiving physical therapy at Al-Karkh Hospital / Physical Therapy Department, extending from Sunday corresponding to the date (12/29/2024) until Thursday corresponding to the date.(2025/20/2)

After completing the rehabilitation exercises accompanied by electrical stimulation according to the feeling of pain, the post-tests were applied on Sunday, February 23, 2025..

After the completion of this experiment, the data were automatically processed using the SPSS system to extract the values of the percentage, arithmetic mean, standard deviation, skewness coefficient, and the t-test for correlated samples

Journal of Physical Education

Volume 37 – Issue (3) – 2025 Open Access

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https://jcope.uobaghdad.edu.iq

Results:

Table (2) shows the results of the pre- and post-tests for the experimental research group

Tests & Unit of Measurement			Measurement	Statistical Differences Processing for Comparison Between Pre- and Post-tests						Significance
				Mean	sd	Mean	sder	T	Sig	
Electrical Signal (EMG)	Right Calf Muscle	Peak (µV)	before	0.432	0.02	0.24	0.033	21.98	0.000	sig
			after	0.672	0.01					
		Area (µV·s)	before	0.253	0.02	0.077	0.027	8.663	0.000	sig
			after	0.33	0.00					
	Left Calf Muscle	Peak (µV)	before	0.413	0.01	0.115	0.015	23.55	0.000	sig
			after	0.528	0.00					
		Area (µV·s)	before	0.199	0.01	0.061	0.009	19.72	0.000	sig
			after	0.26	0.00					
Pain Degree (V.A.S) (Score)			before	8.222	0.44	6.778	0.667	30.5	0.000	دال
			after	1.444	0.52					

The differences are significant at a significance level of (0.05) and a degree of freedom of (8) when the degree of) Say (less than (0.05)

Discussion:

From reviewing the results of Table (2), it is clear that women aged (50-55) years who suffer from some cases of peripheral nerve inflammation have improved the post-test values of the five dependent variables compared to what these values were in the results of the pre-tests, which appeared clearly in the increase in the peak of the electrical signal (EMG) for the right and left golf muscles to give an indication of the efficiency of muscle contraction in the case of standing on the tips of the toes in the test measuring these electrical signals, in contrast to the increase in the area of spread of the electrical signal (EMG) in this test to give an indication of the lack of fatigue of these muscles targeted in this measurement. The results also showed a reduction in the level of pain severity (V.A.S) for cases of peripheral nerve inflammation by reducing their feeling of numbness, tingling and tingling in the hands and feet. The researcher attributes the emergence of these results to the rehabilitation exercises accompanying the electrical stimulation according to the feeling of pain, which the researcher was keen to apply this integration in the rehabilitation protocol in which the age and gender of the sample of women and the nature of their lives were taken into account, as

Journal of Physical Education

Volume 37 – Issue (3) – 2025 Open Access

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https://jcope.uobaghdad.edu.iq

they are not practicing sports activity in a way. Regularly, in addition to their constant feeling of pain in cases of prolonged standing, which helped the low-intensity electrical stimulation of the type (T.E.N.S) in preparing the muscles to perform exercises for a relatively short period of time, by adopting the principle of gradually increasing its hertz to suit the size of the muscle, the type of contractile work it performs, and the strength produced by this muscle, in addition to the good suitability of the time period for the continuation of this electrical stimulation, and the time period between receiving the stimulation and applying the rehabilitation exercises, which was also taken into account for the length of each rehabilitation exercise according to its difficulty according to the feeling of pain by adopting the pain level scale (V.A.S) in determining the difficulties of each rehabilitation exercise, and the repetitions appropriate for them without straining the muscles and in a logical manner. This helped the internal responses to accept these exercises to have a clear role in increasing the capabilities of each of the injured women and strengthening their muscles, which had a clear effect in reducing pressure on the neurons of the nerve cells and their branching dendrites by adopting the principle of relieving the burden on the system The motor system includes bones, muscles and nerves. Strengthening any part of it reduces the burden on the other part, depending on the physiology of the motor performance of the legs. This role in the systematic integration of stimulation and exercises in a single rehabilitation session, under the supervision of doctors according to sound standards, had a positive impact, leading to improved results of the dimensional values and progress in the recovery of the research sample of women in the experimental group.

“Sports rehabilitation is an organized, well-prepared and studied process carried out by specialists to work on raising the functional efficiency of the injured organ and trying to return it to the previous state it was in before the injury, and not allowing any deformities or disruption to its function) ”.Banwan, 2019, p. 51)

“Kinesiology is the basis of sports rehabilitation, which derives its effect from the scientific uses of various natural elements to treat injuries and manifestations of fatigue and exhaustion in many cases, without these natural methods having side effects as is the case with many unnatural chemical and radiological methods) ”.Bakri, 2020, p. 132)

"Transcutaneous electrical muscle stimulation (TENS) is a low-voltage device that delivers current through electrodes placed over the skin at both ends of the muscle (its origin and insertion). This combines two currents, one low and the other high-frequency, to close the pain gate, while the first stimulates the pain-transmitting nerve fibers, which leads to the release of natural endorphins in the body) ".Jeffrey, 2009, p. 137)

"The injured person must be trained to perform the exercises correctly and safely, and provided with the necessary support and assistance to improve results. This includes working to improve communication between the patient and the sports trainer or specialist physician, and providing continuous follow-up to assess the individual's progress and modify the program when necessary) ".Jacobs & Other, 2019, p: 245-255)

Journal of Physical Education

Volume 37 – Issue (3) – 2025 Open Access

P-ISSN: 2073-6452, E-ISSN: 2707-5729

https://jcope.uobaghdad.edu.iq

"Messages are easily transmitted across neurons by neurotransmitters that permeate brain cells, and large changes in the concentration of these neurotransmitters in certain areas of the brain can alter our moods and affect our movement) ".Soussa, 2009, p. 11)

Likewise" ,repetition is the most important component of the rehabilitation exercise load in developing the nerves' function aimed at improving neuromuscular control to restore the body to its natural movements, especially in cases of weak neuromuscular control) ".Joan, 2023, p. 55)

Likewise“ ,the diversity of static and dynamic muscle contractions in strength training is of great importance, because overall strength lies in the ability to endure and control powerful movements in both directions of these two contractions) ”.Thomas & Newton, 2017, p: 154)

“One of the advantages of electrical stimulation is that it leads to the development of a strong stimulus for muscle growth, and it can be used to train specific muscle groups in isolation. Therefore, it can be used in rehabilitation processes after injuries, and it serves the same purpose as regular training, but in a short and abbreviated period. Its negative effects cancel out the role of nervous and coordination functions in training) ”.Al-Anbaki, 2010, p. 97)

"The more electrical stimulation applied to the muscle, the greater the force of contraction and the recruitment of the largest possible number of motor units, even if not all of them, because involuntary electrical stimulation of muscles differs from voluntary contraction in this respect, i.e. electrical stimulation to stimulate the muscle differs from voluntary contractions) ".Al-Bishtawi and Al-Khawaja, 2005, p. 330)

Conclusions and applications:

R Rehabilitation exercises accompanied by electrical stimulation according to the feeling of pain are suitable for sessions for women aged (50-55) years .Patients with some cases of peripheral neuropathy.

R Applying rehabilitation exercises accompanied by electrical stimulation according to the feeling of pain has a positive effect in improving both the EMG signals of the hamstring muscles of both the right and left legs by increasing the level of the peak and reducing the area of spread of this electrical signal, and reducing the level of pain intensity (V.A.S) in cases of peripheral nerve inflammation.

R It is necessary to pay attention to the transitional rest period between electrical stimulation and the application of rehabilitation exercises according to the feeling of pain when rehabilitating women aged (50-55) years .Patients with some cases of peripheral neuropathy.

R It is necessary to adopt the type of current (T.E.N.S) when rehabilitating women aged (50-55) years .Patients with some cases of peripheral neuropathy and pain relief (V.A.S).

Journal of Physical Education

Volume 37 – Issue (3) – 2025 Open Access

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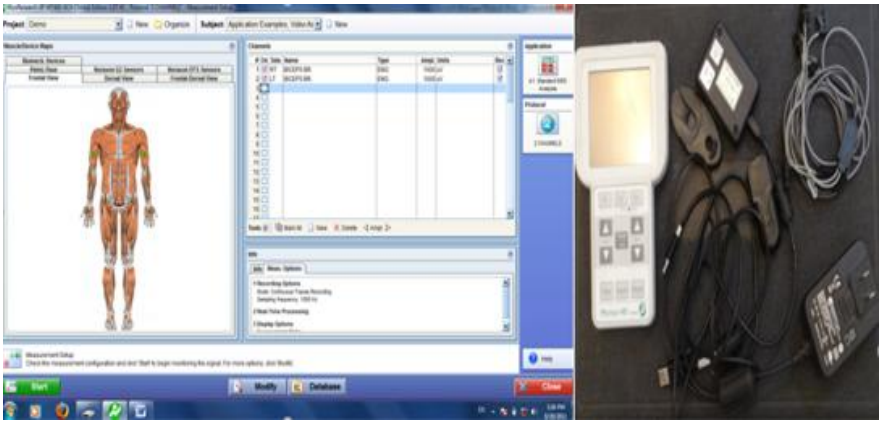
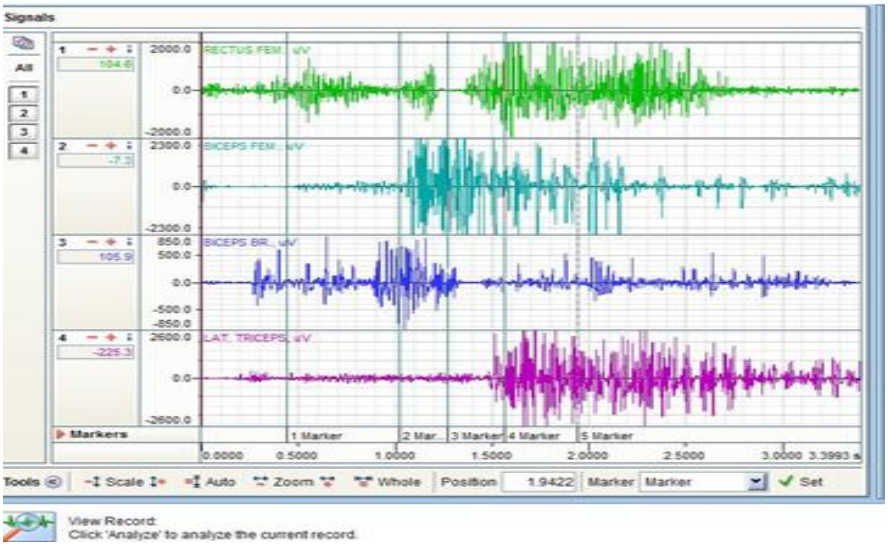
https://jcope.uobaghdad.edu.iq

Appendices:

Appendix (1) shows the search tests for EMG images and the system window in the computer. The raw signal sent to the electromyography device)





Journal of Physical Education

Volume 37 – Issue (3) – 2025 Open Access

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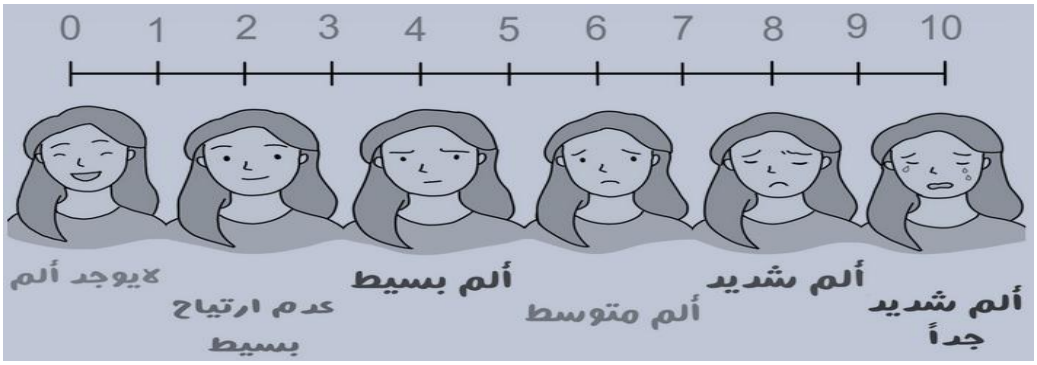
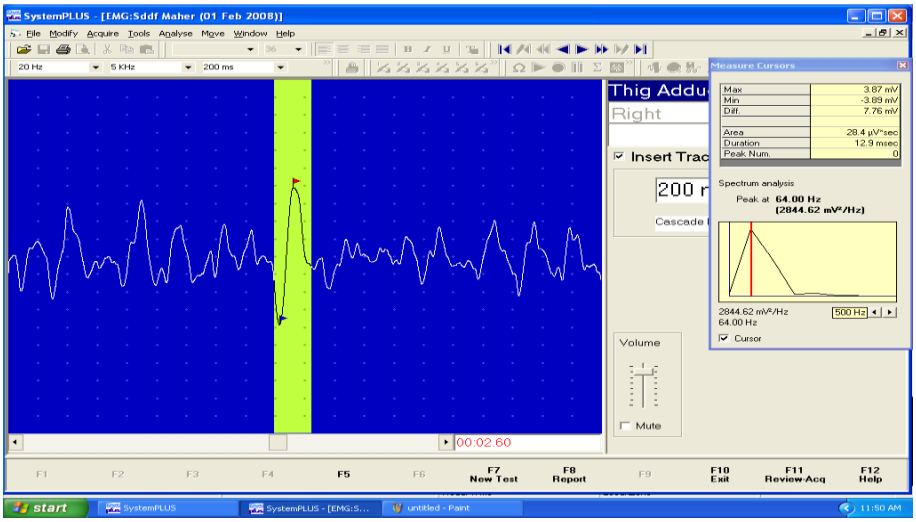
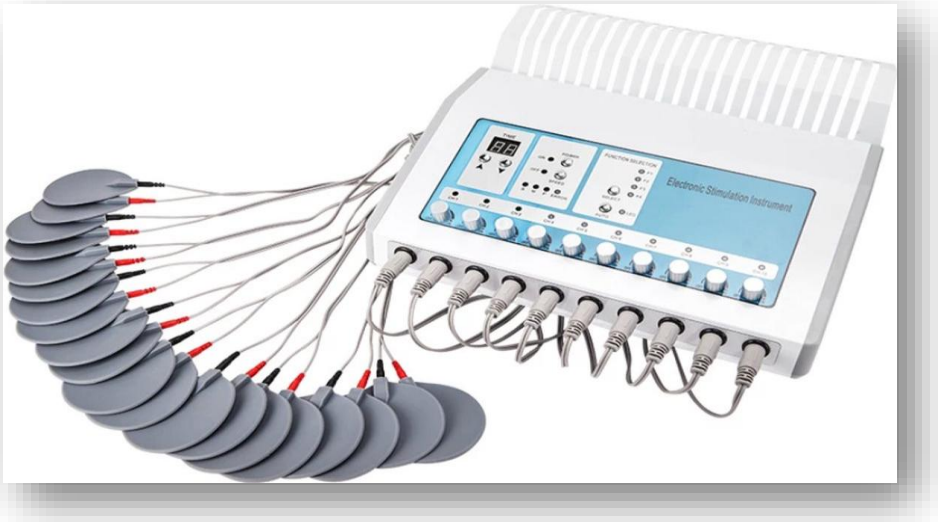
https://jcope.uobaghdad.edu.iq



Appendix (2) shows the pain level measurement form:





Appendix (3) shows a picture of the electrical stimulation device (Rhidium B333).

Journal of Physical Education

Volume 37 – Issue (3) – 2025 Open Access

P-ISSN: 2073-6452, E-ISSN: 2707-5729

https://jcope.uobaghdad.edu.iq

Appendix (4) illustrates a model of a rehabilitation session for applying rehabilitation exercises accompanied by electrical stimulation according to the sensation of pain.

Third rehabilitation week: Seventh session.

Objective of the rehabilitation exercises: To treat some cases of peripheral nerve inflammation in women aged (50-55) years.

First: Electrical stimulation session: for (10) minutes for each of the right and left gluteus muscles at a frequency of (110) Hz.

Second: Rest period between electrical stimulation and rehabilitation exercises: (5) minutes.

Third: Planning and content of the rehabilitation exercises:

Exercise N	Exercis Duratio	Repetitic	Rest Betwee Repetitions	Rest Betwe Exercises	Total Work Rest
1	2 sec	10	3 sec	120 sec	192 sec
2	3 sec	15	3 sec	120 sec	177 sec
3	3 sec	15	3 sec	120 sec	177 sec
4	2 sec	10	3 sec	120 sec	192 sec

(1) From the waist position, standing on a flexible mat, and alternate raising the legs and raising the leg backward, alternating between the legs for (2) seconds.

Journal of Physical Education

Volume 37 – Issue (3) – 2025 Open Access

P-ISSN: 2073-6452, E-ISSN: 2707-5729
https://jcope.uobaghdad.edu.iq

(1) From a standing position, resting the foot on the toes and pressing on a solid ground, and raising the leg backwards, alternating between the two legs for (3) seconds, while leaning on a chair to relieve pressure on the leg muscles.

(3) From a standing position, supporting yourself with the sole of your foot and pressing on a low-height balance ball on a flexible mat using a base extension board, and raising your leg backwards, alternating between the two legs, for (3) seconds.

Journal of Physical Education

Volume 37 – Issue (3) – 2025 Open Access

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Journal of Physical Education

Volume 37 – Issue (3) – 2025 Open Access

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