

The Effect of Rehabilitation Training by The means of Balance treatment Of Joint Nerves Inflammation

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Abstract

This research aims at developing rehabilitation exercises by the use of means of achieving of achieving balance, and recognizing its effect in the treatment of some joint nerves inflammation. The researcher assumes that these rehabilitation exercises, which were set by the use of balance achieving means has positive effect in the treatment of some peripheral neuropathy. I depended on the experimental method to form the experimental group, which consists of (9) patients of peripheral neuropathy, and who have visited the department of natural therapy at Baghdad teaching hospital after they were transferred to it by their neurologists, because they were diagnosed with minor joint nerves inflammation and they haven't developed serious complications between (15/12/2021) and (29/6/2022). All of them were chosen as a main sample to study of this community by 100%. Tests were determined to give a significance of recovery. The researcher headed for setting exercises, which include standing on different balance equipment's in different positions. The experimentation lasted for (3) consecutive months, with having daily therapy sessions without nonstop during this period. After the completion of experimenting, the scores pretests and posttest were collected, and the researcher checked the results by the use of the statistical package for social sciences (SPSS). The conclusions of which indicated that applying the rehabilitation exercises with the use of balance means helps to lower the pain (U.A.S) by increasing the maximum electric signal (Electro-magnetic generator) in the muscles of the left and right feet its space is reduced in the players who have joint nerves inflammation. It is necessary to do balance exercises by standing on the tips of toes, with the help of the suitable rehabilitation means, and choosing the physical and physiological exercises that gives indications of recovery.

Key words: Means of balance, peripheral neuropathy.

Research problem:

the nervous system connects the sense organs, and helps with receiving and response to the external and internal environmental incidents. Also, it is the center of thinking, making, decisions, doing things and controlling them. It is responsible for any move that the body make, starting with the eye movement and ending with large muscles. Also, the nervous system plays an important role in performing voluntary and involuntary movements. It controls the harmonic motions during the process of organizing the harmonization among the motor units in the muscles themselves, and among the muscle units. "(yossef,2008). in addition, " the nervous system has a role in stimulating the different vital organs of the body to continue performing its work. in the case of continuous stimulation, the speed of the motor activity in creatures increases."(Ali & Ikhlas,2005), where " the myoneural performance is one of the complex abilities. Which requires having high levels of other components of fitness, like balance, agility, and strength. All the sports events and exercises need a varying extent of cording movements that go well with the changeable environment constantly despite the complexity of the processes related to the myoneural harmonization, the human brain has the ability to integrate the information coming via the sense organs, muscles, joints easily. Then it provides a huge supply of the adaptive behavior. In sports field, there is a need to understand the underlying behavioral and neural mechanisms and understanding their role in enhancing the performance. "(Jantzen & Kelso,2008). Also, " the myoneural performance is very important because its development is considered one of the main goals of sports education. The important of motor coordination cannot be determined in sports activity only Rather, it extends to include the public life of the individuals. All the requirements of the public life demand some extent of harmonization between different body parts. The myoneural performance is the individuals' ability to combine more than one move, using more than one organ of the body in a single frame and in high fluidity and accuracy."(Abdulah,2006)." The action potential or the electric shift that happens in the neural membrane, which moves along the nerve, and it derives the energy from its source in the neuron. Its speed ranges between(90-100)m/s, while in the fibers sheathed with myelin, its speed increases ten folds. The diameter of the nerve leaf increases, the more the nervous impulses."(William.2006). "Almost all of the nerve fibers are connected with one nerve ending only, which is located close to the center of each nerve fiber. The specialized syngas, which separates the nerve from the membranes of the myocytes, is called the motor units, which produce acetylcholine from the nerve ending to the muscle which starts with contraction."(Hallab & others ,200).

The functional anatomy of the nervous system indicates that the brain and the spinal cord and the central nervous system with the nerves at the limbs and the different parts of the body, like the arms, hands, and feet ... etc. the concept of inflammation that there is a defect, when it happens in the cells of the nervous system, particularly (sheath of Shawn), which extends to the limbs, and causes deterioration of the (myelin), which effects on the physiological support to maintain the ionic balance of the neural reticulation positions. The situation may aggravate to cause a total damage or deterioration in it. This thing may make default in the function of the nerves, which becomes clear when it starts with sending false signs of pain to the brain with any reason for this pain to happen. Or, it may not send any signs of pain when there is an actual cause for this pain. It is an illness which has more than (100) different types of it. In addition to this, there are numerous reasons for the peripheral nerves inflammation, also there is a specific infection, injuries, specific illnesses genetic diseases...etc. of its symptoms, include, numbness, slumber and twitching in hands and feet, or they feel like they are wearing tight gloves or socks, thinning of the skin, hypotension, dropping things continuously, desudation, and problem like diarrhea or constipation, let alone sexual dysfunction, particularly in men. Doctors encounter many problems in the injuries towards the exercises that can be applied to delaminate the symptoms of these inflammations to recover, as long as they encourage them to do these exercises. Here comes the role of the scientific studies in sports rehabilitation to support the efforts of the ones treated with the rehabilitation exercises that fit with the abilities of the injured. The increase in getting interested in doing rehabilitation exercises is no longer an urgency to the humankind. Also, some of the therapeutic schools depend entirely on returning the athletics to the field, and on returning the non-athletics to their daily activities "(AbduAl-Baset 2016). The kinesiotherapy is considered the origin of the sports rehabilitation, which derives its effect from the scientific uses of different natural elements to treat injuries and exhaustions in most cases, without having any side effects as in the case of many artificial, chemical and radiant means."(Mohamed 2020).the resistance exercises still contradict with the characteristics of the mentioned symptoms of these inflammations, in the cases of peripheral nerves inflammation of the joints, which include dropping things continuously from hands. Getting enough muscles for contractions require searching for what it makes them tight from both sides, which includes muscular tones to stretch the body muscles, which can be acquired from the balance. To facilitate the matter on the injured, this thing requires rehabilitation devices, including devices for the balance, and for supporting the body. A generally speaking, the ability to balance includes two types are static balance, which means the ability which allows the athletic to maintain the stability of the body without falling or shaking when they pose. The dynamic balance, on the other hand, is the ability to balance at the time of performing some movement "(Hisham& hala,2013). The tools of balance are defined as unstable platforms and seats that aim at stimulating the information in the vestibular system to produce the feeling of in balance, in order to make the body change its positions through the muscle contraction that leads to draw them up to avoid falling". (Collins & Bisset,2007). It can be defined as: 'A solid or flexible instrument that makes the body unstable, whether by the small size of the base of balance or leaning on them for a long time.'(Milner,2012). Also, different types of tools are often used to improve the balance in the field of training kids and enable them to balance. When these tools proved to be useful in increasing the level of their balance, they were used in that gymnastics training, static and dynamic trainings are related to accuracy, and the rehabilitation programs in therapeutic sports."(Mc Whorter,2006)". The tools used for improving balance should allow the body to maintain its balance at the end of its movement or when the response to its influence ends, since it is impossible for the body to remain unstable for a long time. This means that the tools require maintaining balance form one side and the necessity of maintaining the balance when standing on them on the other hand."(Burkhart& Beer,2000). Tools of balance varies in its materials or its effecton the body balance. They also have many types, of which the spongy tools, like highly- flexible thick rugs, which make the athlete feels the softness of its flat surface, and rubber tools. They take the shape of anthropomorphic that the athletes walk on, the huge Chinese rubber balls that are filled with air, and hard plastic and wood tools, which have narrow base and wide surface."(Fritzzel& Dunn,2015). The vestibular system is the organ that discovers the sense of balance. It consists of a group of bony tubes and chambers that are existed in the petrosal bones, which called(bony labyrinth). Within them, there exists a group of membranous tubes and chambers that are called (membranous labyrinth). This is the functional part of this system. There is gelatinous spot in this system which contains a number of small calcium carbonate crystal, which are called (statoconia). In this spot, there are thousands of hairy cells. The bases and endings of these cells tangle with the sensory endings of the vestibular nerve. There are other factors that have an influence on the balance, which are: the deep sensory receptors un the neck and the visual information."(Arthur and John,2020)." So, the use of these tools in the case of injured requires extreme vigilance on one hand, and to avoid their excessive use. Moreover, the tests, which

permit people to use them are available. When the researcher paid many visits to the rehabilitation center at the Bilad AL-Rafidain university college, she noticed that there is a need to do rehabilitative exercises that help the injured to recover from these inflammations. She also noticed the lack of rehabilitative exercises that meet or comply with. The doctors emphasized on the necessity of doing them regularly. After this, the research aimed at setting rehabilitative exercises with the use of static balance tools, and to recognize their influence on the recovery of some cases of periphery nerves inflammation of the joints. As a result, the researcher assumed the rehabilitative exercises prepared with the static balance tools have a positive effect on the treatment of some cases of peripheral nerves inflammation.

Methods

According to the information presented to find solutions for this problem, I depended on the experimental method, which is defined as: "The method in which we deal with and control an independent variable to examine its effect on a dependent variable, while noting the resulting changes and explaining them, whether the experiment contained one more of dependent and independent variables". (Majdy, 2019) by the use of the experimental design of the one experimental group that is strongly controlled by the pretest and the posttest.

***Sample and Sampling**

The human limitations of this community are represented in the women who are infected with the peripheral nerves inflammation numbering around (9), and of ages ranging between (30) and (35), who visited the department of physiotherapy at Baghdad teaching hospital, who were admitted to it on the parts of neurologists, after they were diagnosed with the minor inflammations of peripheral nerves, and they do not have complications between (15/12/2021 to 19/6/2022). After receiving written authorization, they volunteered to apply the rehabilitative exercises for the purpose of undertaking a study. They were all chosen as a master samples for this study by (100%) from this society. They were all have the same variables in chronological ages, the age of injury, and weight in order to maintain the internal safety of the experimental design.

Measurement Tools and Test:

I depended on the global visual analogue scale to measure the degree of pain, that is between (1-10) degree to measure the degree of pain after standing on the tips of the toes for (3) seconds, and examining the time that it takes to reach balance when standing on a ruler (standing on a stick by the use of instep metatarsus) horizontally (George). The researcher also uses the US Bluetooth transmitter, with the use of two catchers for the posterior gulf elbow of the left and right legs. The results of the (EMG) signal is obtained then they are analyzed with the use of (Myo Researcher Xp 1.06.67) program that is stored in the laptop. After synchronizing between the end of the balance test with the use of digital Sony camera, the speed did not exceed (75 photo/s). during this measurement, the researcher was reading the peak and area of the electrical signal (EMG) of both muscles. This means that one test was made, which is the test of balance and the measurement of the degree of pain by the electrical signal for each injured of the research samples.

The rehabilitative exercises were developed with the use of balance tools and according to the following certified restrictions in the rehabilitation of sports injuries, they are: "they should not be used in the case of impairment of muscles power of the injured, and in the case of myasthenia, except when they recover some of their muscles power that enables them to have synergic muscles. But, they must not use them in the cases of serious injuries of the limbs at the beginning of the rehabilitative programs, to determine the duration of their use then increase the period depending on the level of development, to avoid the complicated and difficult ones, and to emphasize on the variation of exercises which allow the exchange of the actions of the musculature". (Olowu & Atejuyo 2010). The researcher aimed at preparing trainings, which include standing on different balance tools in different positions (Appendix 2). They were as follows the first and second week contained standing with the feet stretched without lifting their heels for (15-30) second on the balance tools, and doing them daily and repeatedly (15) times x4 groups, with pauses suitable for the privacy of the injured. At the third and fourth weeks, the injured stand on the balance tools on the tips of their toes for (3) seconds, every day and repeatedly, with repetitions reached (10) repetitions (3) groups. At the fifth and the sixth weeks the injured stand on the balance tools on the tips of their toes for (4) seconds daily, with repetitions reached (15) repetitions X (4) groups with full recess. At the seventh and eighth weeks, the injured stand on the tips of their toes on the balance tools for (4) seconds daily, with repetitions that reach (25) X (4) groups with full recess. At the ninth and tenth weeks, the injured stand on the tips of their toes for (4) seconds on the balance tools daily with repetitions that reach (30) repetitions X (3) groups with full recess. At the eleventh and twelfth weeks, the injured stand on the tips of their toes on the balance tools for the longest possible time daily, with repetitions reach (20) repetitions X (4) groups with full recess. The experience lasted for (3) consecutive months, in addition to undergoing therapy rehabilitative

sessions daily and without stopping during this period. The injured were offered medical recommendations in addition to the rehabilitative exercises, for example: avoiding alcohol drinks and smoking, no excessive diets, and they should wear loose clothes and medical shoes. After the end of the experience, the grades of the pretests and posttests were collected, and the researcher checked them with the help of the (SPSS) system, in order to calculate the percentage, the arithmetical average, the standard deviation, Leven test for the homogeneity of variance, (T-test) examinations of the connected samples.

Results:

Table 1: The Results of pretest for the study groups

The Test		Experiment group			Leven	sig	Ass.	
		N	Mean	±SD				
V.A. S		9	8.33	0.707	0.707	0.3337	N. S	
Balance		9	3.44	0.527	0.507	0.514	N. S	
EMG	Summit	Summit	9	759	4.359	0.711	0.378	N. S
		Area	9	66.11	4.4	0.739	1.22	N. S
	Area	Summit	9	680.22	3.492	0.891	0.42	N. S
		area	9	70.11	1.537	0.101	0.553	N. S

Significance Level = 0.05; t-test value is significant at p-value ≤ 0.05

Table 2: Results of the study groups of the pretest and posttest

The tests		pretest		Posttest		Mean differences	Std.Err orMan.	T	sig	As s	
		mean	±SD	mean	±SD						
(V.A.S)		8.33	0.707	1.33	0.5	7	1.118	18.783	0.000	S	
Balance		3.44	0.527	11.22	0.441	7.778	0.667	35	0.000	S	
E. M · G	right	summit	759	4.359	827.33	4.123	68.333	4.77	42.98	0.000	S
		Area	66.11	4.4	59.56	1.944	6.556	5.388	3.65	0.000	S
	left	Summit	680.22	3.429	745.89	3.1	65.667	4.899	40.212	0.000	S
		area	70.11	1.537	64.33	0.5	5.778	1.641	10.56	0.000	S

Significance Level= 0.05; t-test value is significant at P-value ≤ 0.05 df. (N-1)

The researcher noticed that the posttest values have improved more than those of the pretest. She attributed this improvement to the rehabilitative trainings, with the use of the balance tools, which have helped them to develop the quality of their muscles first, and increase the effectiveness of the muscles contractions, which indicate to better access of the electrical signals to the muscles. This has increased the levels of the neuromuscular control, though motor units are centrally supplied with acetylcholine from the peripheral nervous system. This is illustrated by the increase of the duration of static balance, with the decrease of the pain (V.A.S), and the increase of the (EMG) with lack of space, which indicate to the decrease in the neuromuscular fatigue. This means that the rehabilitative trainings have physical effects on the pharmacological efficiency, which needs the nerves' power and chemistry. This thing cannot be achieved unless the nerves were intact and free from diseases or inflammations. This is contrary to what were the pretest results. So. With these results, which indicate the decrease of pain, the results of the recovery from these inflammations were positive, because the injured had restored their abilities of neuromuscular control. So, this study supports the doctors by applying what was mentioned in sports science about this kind of physical rehabilitation, considering that muscle strengthening can be achieved through forcing them to take a position that requires synergy that is controlled by the nerve cells, and it leads to reduce their fatigue. According to the results of the (EMG) signal of the posterior gulf muscles in the left and right feet, "the skeletal muscles contract in response to a nerve signal that the motor neurons produce. They do not show an immediate response when they are under the influence of the hormones. This is contrary to the case of heart and smooth muscles." (Hussein & Ahmed, 2017). "It starts with muscle contraction from the motor neurons then the contraction begins. When the nerve signal reaches the

end of the motor nerve, the nerve ending produces neurotransmitter, which is called (Acetylcholine). The acetylcholine spreads through the neuromuscular opening to connect with its own receptors, which are situated above the scapula. This leads to increase penetrance of sodium ions, which results in depolarization. This, in turn, leads to the beginning of the muscle contractions." (Abu Al-Ula, 2003). "To maintain balance, the cortex controls the direction of the nerve impulses to be toward the muscles. This increases the ability to control the body stability when undergoing unusual conditions of balance. In fact, muscle stretching continues its contraction to maintain balance without even feeling it, unless we focused on it or tried to increase this stretching according to what it requires to achieve the balance. The repetition of different positions, using the balance-achieving tools helps us to reach the state of balance quickly, unless the body encountered unstable conditions." (Bronner & Others, 2013). "In training, we must take into consideration the rules of balance during performance and try to improve the balance by depending on increasing the actions of the muscular sensibility, because the vestibular system does not develop by training, and this is due to its similarity to the platform balance, which tells the brain about the body positions without producing any orders. This emphasizes the idea that the vestibular system acts as a messenger, not as a controller, as it is normally known. The efficiency of its neurophysiological action can be improved, but its structures cannot be developed." (Arthur, 2012). "The muscular balance on both sides of the body is considered the actual base for a perfect figure. Also, it modifies the body shape to reach the perfect one." (Mohammed, 2020). "The nervous signal connection is achieved, and the neurotransmitters differ in the nature of the nerve signals, which transmit, as some of which has an arousal effect, while others have an inhibitory one. There are more than forty neurotransmitters that can be classified into rapid neurotransmitters and slow neurotransmitters. Acetylcholine and norepinephrine are considered primary transmitters concerning the physiological response during the physical effort, as the acetylcholine is the primary transmitter of the motor neurons, which stimulate the skeletal muscles. (Abu Al-Ula, 2003). Also, "75% of the recovery falls upon rehabilitation, because recovery is affected by the level of rehabilitation." (Yasser, 2001). The variations in the contractile speed of the fibers occur because of their different ways of catabolizing the adenosine triphosphate particles, which is found inside the heavy chain of the myosin. These variations help to recover the needed energy for the contractions." (Lewandowsky, 2000). "Without sensors, we will not be able to coordinate our body movements, because they provide us with information about our muscles and the positions of our movements and joints. The receptors that exist at the nerves' endings in muscles, tendons and joints, in addition to the information received from them, give us the base and sense to make the movement coordinated. They also cooperate with the vestibular senses (the sense of the body balance and direction)." (Michael & Ronald, 2001). "By developing the work of the muscles and the reflexes existed in the muscles and tendons, the effective ability of some motor skills improve, as they do not depend on developing the power or speed only. Rather, they depend on developing the necessary matchings for achieving balance during performance. The function of the vestibular system is to send signals to the brain to support the balance, which is considered as a voluntary action of the nervous system, and it can be developed by developing the necessary muscles contractions." (Ayed, 2009). "Regarding static contractions, which are characterized with a condition of relatively static contractions, in which the amount of muscular tension adjusts with the degree of external resistance, which the participated muscles or the musculature encounter." (Ahmed 2019). "The strain, whatever resources it has, will lead to the weariness of the receptors and sensors connected with the nervous system. By the means of strain, many negative influences that affect the activity of the central nervous system appear." (Adel 2009).

Conclusions and Implications:

- 1- The application of the rehabilitative exercises, with the use of the equipment of balance helps to decrease the degree of pain (V.A.S), by increasing the time that the athletics, who struggle with the joints' peripheral nerves inflammation, take to achieve balance.
- 2- The application of rehabilitative exercises with the use of balance equipment helps with the increase of the (EMG) of the posterior gulf muscle in the right and left feet. The athletics, who struggle with the joints' peripheral nerves inflammation, have narrow gulf muscles.
- 3- It is necessary to focus on the application of balance exercises, by standing on the tip of the toes, using suitable rehabilitative means and choosing the physical and physiological tests, which give indications of recovery from joints' peripheral nerves inflammation.

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Appendix (1): Balance Instruments that are Used at the Rehabilitative Exercises

