

## THE ROLE OF PHYSICAL EXERCISE IN MULTIPLE SCLEROSIS

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### Abstract

*Aim.* The aim of this study was to examine the relationship between the physical exercise and the symptoms of multiple sclerosis patients.

*Methods.* This control study was performed to determine the outcomes of aerobic and strength exercise concerning the quality of life regarding patients with multiple sclerosis, recurrent-relapsing form. Six patients with multiple sclerosis, aged 18-55 years, with an Expanded Disability Status Scale < 4 completed the study. Every patient was evaluated through several questionnaires monthly.

*Results.* The results of the patients that practiced sport have improved during the six months, with a beneficial outcome for their health of body and mind, also improving their quality of life, especially lowering the stages of stress that they have experienced, which was reflected mostly in lowering depression and anxiety levels.

*Conclusions.* Physical exercise is an important non-pharmacological instrument in multiple sclerosis rehabilitation.

*Keywords:* multiple sclerosis, sport, physical exercise, quality of life.

### Introduction

Multiple sclerosis is a chronic demyelinating disease of the central nervous system having characteristics of different trajectories of demyelinating, inflammation and axonal loss. The prevalence of this disease is the highest among young adults. The immunological explanation regards of the disease shows a impairment of the synergical function of the T helper lymphocytes type 1 and type 2. The symptomatology is represented by a wide spectrum of accusations such as dysfunctions in the sphere of power deficit, balance, gait, coordination, sensitivity disorders, vision disorders, dysfunctions in the urinary and excretory systems.

Physical exercise has been an unelucidated subject for the last period of time in multiple sclerosis rehabilitation, and the general opinion has been the avoidance of physical exercise for the multiple sclerosis patients. This conclusion was contoured due to the fact of instability of the symptoms that multiple sclerosis patients experienced during exercise, but also because of the belief that consisted in the need of energy preservation for other activities of the patients during the day.

Among people without health problems it is very well known that lack of movement and exercise is a risk factor for health because a life with deficiency in physical activity predisposes to chronic cardiovascular diseases, obesity, type 2 diabetes, osteoporosis and fatigability. One of the most common causes of exitus

in the population of patients with multiple sclerosis is represented by cardiovascular diseases, also an increased incidence of osteoporosis and depression with fatigue is among the patients with multiple sclerosis and this risen incidences can be accounted for the lack of physical motion. It is well aware that as a vicious circle descends, because by the lack of physical activity, it resonates with atrophy of the skeletal muscles, subsidiary of the decrease of the individual's strength and the decrease of the aerobic possibilities. These mechanism have been demonstrated among the multiple sclerosis patients by the changes in the parameters of strength like isokinetic and isometric muscle contractions and force progress, having both peripheral and neural origins. Also, the phenomenon of decreased maximal oxygen utilization was observed in patients with multiple sclerosis, alongside an increase in the diastolic parameters of the heart. In the pathophysiology of functional capacity disorders and the decrease of the quality of life of the patients suffering from multiple sclerosis, the decrease of the aerobic capacity of the patients and the decrease of the muscular strength are involved by the incidence of the disease or by the incidence of physical inactivity, which can lead to increased risks of developing different pathologies dependent on physical inactivity.

Cognitive impairments have been demonstrated between the patients with multiple sclerosis, the most of them regarding of attention, concentration, long term memory and executive

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function. Studies using functional imaging tools have demonstrated that for multiple sclerosis patients to obtain the same outcome as the control group patients, the multiple sclerosis patients need to access more larger brain areas. Experimental studies have expressed that the need for practical exercise among patients with multiple sclerosis is vital for the improvement of executive and functional cognition training is increasing the cerebral connectivity, fact shown through MRI.

Studies have shown that by practicing physical exercise the inflammation rate has decreased for atherosclerosis in cardiovascular chronic patients, in extensive speculations have risen in connection to the exercise and potential disease-modifying anti-inflammatory effects in multiple sclerosis.

Fatigue is one of the most common symptoms of patients with multiple sclerosis and it is accompanied by a feeling of tiredness, spasticity, muscular weakness and motor dysfunction, which is why various studies have committed to check and demonstrate that through physical exercise fatigue of patients with multiple sclerosis tends to decrease. Sport practice attempts to produce beneficial changes into the physiological profile of the patients.

#### **Methods**

For the elaboration of this study, the specialized literature, guides and scales related to multiple sclerosis were consulted. The target of this study was to examine in contrast the results of patients with multiple sclerosis, regarded to their outcomes after using physical exercise in their routines. Patients with multiple sclerosis who practiced physical exercise for six months, from January 2019 to July 2019. The patients were investigated and observed in the private clinic of "Dr. Docu Axelerad Any", in Constanta, Romania. The contributors were patients with multiple sclerosis, with the recurrent-remissive form. The participant patients were separately diagnosed by the neurologist physician mentioned above and the participants fulfilled the standard criteria for the admittance in the relapsing-remitting form of multiple sclerosis.

The benchmarks that were used for the incorporation of the multiple sclerosis patients in the study were the following: diagnosis of relapsing-remitting form of multiple sclerosis, the age being between 18 -55 years, the competence to sign the informed consent.

The benchmarks that were used for the exclusion of the multiple sclerosis patients from the study were the following: age below 18 years or over 55 years, the diagnosis of primary and secondary progressive forms of multiple sclerosis, the incompetence of the patients to sign the informed consent.

Finally, after the evaluation of the patients according to the inclusion and exclusion criteria, a final group of six patients with multiple sclerosis, recurrent remission form was chosen, all patients in the group signed an informed consent. The patients with multiple

sclerosis who were participants in this study were evaluated from a angle, but also from a mental angle, which allowed the outline of a complex evaluation. Later the patients were divided into two groups: a control group that did not practice physical exercises and which continued its routine activities as before and another group that practiced physical exercises. The time during which this study took place was 6 months, during which time, patients were evaluated multiple times, monthly, in order to be able to measure their physical, but also their mental state. The physical exercises that were practiced by the sport group of patients targeted the improvement of the: strength- the patients were taught to do wall squats, with their shoulders, torso, and hips flat against the wall, using softly sliding against the wall, with their knees bent for strengthening their leg muscles. Also, exercises as planks and modified planks were used, being a good exercise for strengthening the patient's core muscles (the abdominals, the obliques, and the back muscles), the patients were advised to hold in the plank position firstly for 10-15 seconds and then, secondary to increase the time to 30-60 seconds, depending on their consent. The bridge exercise was used for the strengthening of the legs, glutes, lower back, and abdominal muscles. Exercises like standing- or seated wall push-ups are upper-body exercises that help build strength in the patient's upper body muscles (triceps, pectorals, and deltoids). Also, balance training exercises like: marching in place were used. Range-of-motion exercises, for example, moving the arms, legs, wrists and ankles in wide circles were used in the training of patients. Precautions were presented, safety measures like warming up and cooling down to protect the patients against injury or making any muscle problems they may experience worse. The patients were advised to do gentle stretching, before any strenuous activity. If they were to do aerobic exercise, the start should be slow, to build the heart rate gradually. To avoid muscles becoming tight and stiff, stretching should also be done as a 'cool-down' afterwards. More exercises, examples, techniques, informations, key pointers were given both in an paper format and in a CD format for the patients and their family to use during the training.

For every patient from the both groups, in every month, during the study, was calculated the Expanded Disability Status Scale, an instrument that classifies the disability in multiple sclerosis. Also, the Hamilton Anxiety and Depression scales were displayed in the period of the study for every patients. In addition, the Modified Fatigue Impact Scale was performed, in the duration of the study. A test was executed monthly, with the connexion of the distinguish of the unlikely perceptions and feelings that multiple sclerosis patients have in the most of time. On the activity of the sphincters, that is often modified in patients with multiple sclerosis, we displayed the further tests: the Bladder Control Scale and the Bowel Control Scale during the period of the study. About to

the visual impairments, the Impact of Visual Impairment Scale test was executed during the study. The Perceived Deficits Questionnaire was also a tool for our complex diagnose of the patients during the study. Finally, the Mental Health Inventory was ruled, with the aim of classify each patient's feelings.

### Results

The first patient from the sport group of patients, named C.B., 29 year old, male, had two typical attacks of multiple sclerosis in the central nervous system, with objective confirmation of the lesions at the clinical examination. He was diagnosed three years ago. At the incipit of the study, the patient had tremor at the upper left limb and paresthesia located to the upper limbs. Therewith, the patient had lack of energy, dizziness and sleepiness. He presented also nervousness and increased irritability. The Expanded Disability Status Scale score was two points. The patient obtained 20 points at the Hamilton Anxiety Rating Scale test, classifying him for moderate anxiety. The patient obtained 17 points at the Hamilton Depression Rating Scale test, classifying him for mild-moderate depression. His result on Fatigue Impact Scale test was 22 points, having a severe fatigue. The patient's result of the Bladder Control Scale test was 2 points, meaning a level of mild dysfunction of the bladder. The result of the Bowel Control Scale test was 3 points with a mild level of affectation of the bowel. The Impact of Visual Impairment Scale test's result was 4 points, with a mild impairment of the sight, with double vision on occasions and blurriness of sight. The patient had 38 points at the Perceived Deficits Questionnaire test, with a moderate frequency of problems of retrospective memory and attention. The patient had 75 points at the Mental Health Inventory scale, with a moderate impairment of the cognitive function. Regards to the family and personal support, the patient had 72 points at the Mos Modified Social Support Survey being socially supported on the physical, mental and emotional levels almost all the time. The patient practiced physical exercises for 6 months. After the 6 months, the patient related a change in his memory, now being able to recall more information, with an increase with 20% by his statements, he felt more energetic, mostly in the morning time, after performing his exercises, he reported also a beneficial change in his appetite. The patient's result on the Expanded Disability Status Scale score was similar and the result obtained at the Hamilton Anxiety Rating Scale test was reduced with 8 points, with the improvement of the nervousness that he experienced. The patient has improved his depressed state, fact releaved in the score of Hamilton Depression Rating Scale test that was decreased with 5 points after the six months of sport practice. After the six months, his result on Fatigue Impact Scale test was lowered by 10 points, being the most significant change that he stated after the six months. At the Bladder and Bowel Control Scale test was 3 points, the result remained the same. The

outcome at the Impact of Visual Impairment Scale test was changed by lowering with 1 point, he experienced less blurred vision episodes. The patient lowered his score with 5 points at the Perceived Deficits Questionnaire test, with improvement of the mental activity, remembering more facts. The patient had a 70 points result at the Mental Health Inventory scale test. The social support of the patient was the same according to the Mos Modified Social Support Survey.

The second patient from the sport group of patients, named M.M., 40 year old, female, had four typical attacks of multiple sclerosis located in the central nervous system, with the imagistic confirmation of the lesions at the clinical examination. She was diagnosed 10 years ago. At the initial time of the study, the patient presented pain in the upper part of the body, with stiffness in her muscles and balance problems. In addition, the patient had nausea and loss of balance. The Expanded Disability Status Scale score was three points. The patient obtained 25 points at the Hamilton Anxiety Rating Scale test, classifying him for moderate anxiety. The patient obtained 18 points at the Hamilton Depression Rating Scale test, classifying him for moderate depression. His result on Fatigue Impact Scale test was 17 points, having a moderate fatigue. The patient's result of the Bladder Control Scale test was 2 points, meaning a level of mild impairment of the bladder. The result of the Bowel Control Scale test was 3 points with a mild impairment of the bowel, with the alternate of constipation with accelerate bowel movements. The Impact of Visual Impairment Scale test's result was 4 points, with a mild impairment of the sight, predominantly by eye movement pain. The patient had 38 points at the Perceived Deficits Questionnaire test, by the problems that she had with the pain and her muscle stiffness. The patient had 77 points at the Mental Health Inventory scale, with a moderate impairment of her mental function. The family and personal support was unconditional, the patient had 74 points at the Mos Modified Social Support Survey. The patient practiced physical exercises for 6 months. After the 6 months, the patient remarked a loss in the stiffness of her muscles, that changed the feelings that the patient experienced, giving her a boost of self-confidence to participate in more activities. The patient's result on the Expanded Disability Status Scale score was still three points and the result obtained at the Hamilton Anxiety Rating Scale test 20 points, with the improvement of the anxiety attacks that the pain in her muscle was causing her. The result of Hamilton Depression Rating Scale test that was decreased with 4 points after the six months of sport. Her result on Fatigue Impact Scale test was lowered by the physical strength that she gained in the six months, now being able to spend more time standing up and doing chores. At the Bladder Control Scale test the result remained the same. The result of the Bowel Control Scale test was improved with one point, by the bowel movements. The outcome at the Impact of Visual Impairment Scale test was

unchanged. The patient lowered his score with 8 points at the Perceived Deficits Questionnaire test. The patient had an improvement by 10 points result at the Mental Health Inventory scale test after the six months. The social support of the patient was the same according to the Mos Modified Social Support Survey.

The third patient from the sport group of patients, named V.B., 38 year old, male, had three typical attacks of multiple sclerosis located in the central nervous system, with the objective confirmation of the lesions at the clinical examination. He was diagnosed three years ago. At the initial time of the study, the patient presented functional weakness at the lower limbs. In addition, the patient had blurry vision and increased frequency of urination. He presented also difficulties in concentration while performing different acts or chores. The Expanded Disability Status Scale score was two points. The patient obtained 29 points at the Hamilton Anxiety Rating Scale test, classifying him for moderate to severe anxiety. The patient obtained 22 points at the Hamilton Depression Rating Scale test, classifying him for severe depression. His result on Fatigue Impact Scale test was 20 points, having a severe fatigue. The patient's result of the Bladder Control Scale test was 4 points, meaning a level of mild-moderate dysfunction of the bladder. The result of the Bowel Control Scale test was 2 points with a mild level of affectation of the bowel. The Impact of Visual Impairment Scale test's result was 4 points, with a mild impairment of the sight. The patient had 40 points at the Perceived Deficits Questionnaire test, with a moderate frequency of problems of concentration and attention. The patient had 82 points at the Mental Health Inventory scale, with a moderate impairment of the mental function. In regard with the family and personal support, the patient had 70 points at the Mos Modified Social Support Survey being socially supported on the physical, mental and emotional levels most of the time. The patient practiced physical exercises for 6 months. After the 6 months, the patient's result on the Expanded Disability Status Scale score was still two points and the result obtained at the Hamilton Anxiety Rating Scale test was reduced with 10 points, with the improvement of the anxiety attacks and vegetative symptoms that the patient experienced before. On the other perspective of the somatic part of the test, the patient improved his bruxism. The patient has improved the initial depressed mood, lowering the frequency of his crying and lamentation symptoms fact showed in the result of Hamilton Depression Rating Scale test that was decreased with 7 points after the six months of sport. After the six months, his result on Fatigue Impact Scale test was lowered by the significant improvement of the mental activity, concentration and physical strength. At the Bladder Control Scale test was 3 points, the result remained the same. The result of the Bowel Control Scale test was lowered with one point, with the improvement of the bowel movements. The outcome at the Impact of Visual Impairment Scale test was unchanged. The

patient lowered his score with 6 points at the Perceived Deficits Questionnaire test, with improvement of the mental activity. The patient had a 64 points result at the Mental Health Inventory scale test, his limitations were decreased in work or other regular activities. The social support of the patient was the same according to the Mos Modified Social Support Survey.

The first patient from the control group of patients, named N.D., 32 year old, female, had two typical attacks of multiple sclerosis located in the central nervous system, with the imagistic confirmation of the lesions at the clinical examination. She was diagnosed six years ago. At the initial time of the study, the patient presented functional weakness at the upper limbs, accompanied with burning and aching sensations in the same territory. Also, the patient had limitations in regular activities. She also presented difficulties in thinking. The Expanded Disability Status Scale score was three points. The Hamilton Anxiety Rating Scale test result was 28 points, classifying her for moderate to severe anxiety. The patient obtained 23 points at the Hamilton Depression Rating Scale test, classifying her for moderate depression. Her result on Fatigue Impact Scale test was 24 points, having a severe fatigue, with influences in her daily activities. The patient obtained the 5 points result at the Bladder Control Scale test representing a level of moderate dysfunction of the bladder, with more frequent and urgent urination. The result of the Bowel Control Scale test was 2 points with a mild affectation of the bowel movements. The result on Impact of Visual Impairment Scale test was 2 points, with a mild impairment of the sight and blurred vision especially at night. The patient had 36 points at the Perceived Deficits Questionnaire test, with a moderate frequency of problems of emotional changes and mood changes that affected her daily routine. The patient had 77 points at the Mental Health Inventory scale, with a moderate impairment of the mental function. In regard with the family and personal support, the patient had 71 points at the Mos Modified Social Support Survey being socially supported on the physical, mental and emotional levels most of the time. The patient continued her routine for 6 months. After the 6 months, the patient's result on the Expanded Disability Status Scale score was still two points. The result obtained at the Hamilton Anxiety Rating Scale test, the Hamilton Depression Rating Scale test increased with two points with the aggravation of the insomnia. After the six months, her result on Fatigue Impact Scale test was increased with one point due to the insomnia. At the Bladder Control Scale test and the Bowel Control Scale test the results remained the same. The outcome at the Impact of Visual Impairment Scale test was unchanged. The patient increased her score with 2 points at the Perceived Deficits Questionnaire test. The patient had two more points at her result regarding to Mental Health Inventory scale test, her limitations were increased in work or other regular activities due to the tiredness. The social support of the patient was the

same according to the Mos Modified Social Support Survey.

The second patient from the control group of patients, named V.S., 40 year old, male, had four typical attacks of multiple sclerosis with the location in the central nervous system, with the imagistic confirmation of the lesions at the clinical examination. He was diagnosed 12 years ago. At the initial time of the study, the patient presented intentional tremor located at the upper limbs with postural instability and dizziness. Also, the patient had limitations in regular activities. He also presented difficulties in thinking because of the moderate insomnia that he experienced. The Expanded Disability Status Scale score was three points. The Hamilton Anxiety Rating Scale test result was 24 points, classifying him for moderate anxiety. The patient obtained 25 points at the Hamilton Depression Rating Scale test, classifying him for moderate depression. His result on Fatigue Impact Scale test was 20 points, having a moderate fatigue. The patient obtained the 3 points result at the Bladder Control Scale test representing a level of mild dysfunction of the bladder, with hesitance at starting urination. The result of the Bowel Control Scale test was 2 points with a mild affectation of the bowel movements by constipation. The result on Impact of Visual Impairment Scale test was 2 points, with a mild impairment of the sight. The patient had 34 points at the Perceived Deficits Questionnaire test, with a moderate frequency of tiredness and blurred cognition. The patient had 75 points at the Mental Health Inventory scale, with a moderate impairment of the mental function, with processing new information and organizing information and problem-solving. In regard with the family and personal support, the patient had 71 points at the Mos Modified Social Support Survey being socially supported on the physical, mental and emotional levels most of the time. The patient continued his routine for 6 months. After the 6 months, the patient's result on the Expanded Disability Status Scale score was still three points. The result obtained at the Hamilton Anxiety Rating Scale test, the Hamilton Depression Rating Scale test increased with three points with the aggravation of the loss of interest in everyday activities and behavioral changes. After the six months, her result on Fatigue Impact Scale test was increased with three points due to the insomnia and the weakness experienced. At the Bladder Control Scale test and the Bowel Control Scale test the results remained the same. The outcome at the Impact of Visual Impairment Scale test was unchanged. The patient increased his score with 4 points at the Perceived Deficits Questionnaire test. The patient had four more points at his result regarding to Mental Health Inventory scale test, his limitations were increased in work or other regular activities due to the fatigue. The social support of the patient was the same according to the Mos Modified Social Support Survey.

The third patient from the control group of patients, named T.S., 33 year old, female, had three

typical attacks of multiple sclerosis located in the central nervous system, with the imagistic confirmation of the lesions at the clinical examination. She was diagnosed four years ago. At the initial time of the study, the patient presented fatigue, numbness of the face and extremities. Also, the patient had vertigo. She also presented unstable mood. The Expanded Disability Status Scale score was two points. The Hamilton Anxiety Rating Scale test result was 24 points, classifying her for moderate anxiety. The patient obtained 27 points at the Hamilton Depression Rating Scale test, classifying her for moderate depression. Her result on Fatigue Impact Scale test was 28 points, having a severe fatigue, with influences in her daily activities. The patient obtained the 2 points result at the Bladder Control Scale test representing a level of moderate dysfunction of the bladder, with the inability of emptying the bladder. The result of the Bowel Control Scale test was 4 points with a mild affectation of the bowel movements with constipation. The result on Impact of Visual Impairment Scale test was 2 points, with a mild impairment of the sight. The patient had 38 points at the Perceived Deficits Questionnaire test. The patient had 78 points at the Mental Health Inventory scale, with a moderate impairment of her mental function. In regard with the family and personal support, the patient had 75 points at the Mos Modified Social Support Survey being socially supported on the physical, mental and emotional levels most of the time. The patient continued her routine for 6 months. After the 6 months, the patient's result on the Expanded Disability Status Scale score was still two points. The result obtained at the Hamilton Anxiety Rating Scale test, the Hamilton Depression Rating Scale test increased with three points with the aggravation of the anxiety attacks and thoughts of depression. After the six months, her result on Fatigue Impact Scale test was increased with one point due to the insomnia. At the Bladder Control Scale test and the Bowel Control Scale test the results remained the same. The outcome at the Impact of Visual Impairment Scale test was unchanged. The patient increased her score with 3 points at the Perceived Deficits Questionnaire test. The patient had two more points at her result regarding to Mental Health Inventory scale test, her limitations were increased in work or other regular activities due to the heaviness in the limbs. The social support of the patient was the same according to the Mos Modified Social Support Survey.

### **Discussion**

Our attempt to demonstrate that physical exercise has the ability to improve the condition of patient with multiple sclerosis has shown greater changes rather in the mental and emotional status of the patients than in the physical charts of symptomatology. In extenso, biological outcomes of multiple sclerosis will be the subject of further studies especially the outcomes of immune and inflammatory parameters and brain plasticity on MRI, which aim the mechanism's pathogenesis of the disease.

## Conclusions

A very useful tool in the non-pharmaceutical management, both physically and mentally of patients with multiple sclerosis is represented by physical activity through sport. In the past, the conclusions of Uthoff's research and observations were based on the belief that physical activity would deteriorate the symptomatology of patients with multiple sclerosis due to the increase in body temperature. Despite of previous beliefs, exercise is great tolerated and promotes beneficial effects in multiple sclerosis patients.

Physical activity has been correlated with a decreased rate of relapse in multiple sclerosis. Also, it has reduced the mobility disability and the progression of it, the lesion volume. Beneficial factors of physical activity are the improved neuroperformance and the gait and walking outcomes.

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