EFFECT OF EXERCISE ON STANDING BALANCE OF MULTIPLE SCLEROSIS PATIENTS

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Multiple sclerosis (MS) is a chronic demyelinating disease of the CNS in which there are numerous patches of demyelination throughout the white matter. The disorder affects sensory and motor functions and in most cases is characterized by exacerbations and remissions over a period of many years. One of the most devastating motor problems of MS patients is the deterioration of balance. Several researchers indicated that exercise would help to improve overall physical condition of the patients. Therefore, the purpose of this research is to investigate the effect of an exercise program on standing balance of multiple sclerosis patients. The results of the case studies of 3 patients for 9-week exercise program indicate that balance measurements were remained the same. Therefore, we can conclude that the balance measurements of those patients did not deteriorate with the level of exercise/activity that they received during the program.

KEY WORDS: multiple sclerosis, balance, demyelination, exercise training

INTRODUCTION: Multiple Sclerosis (MS) is a progressive disease characterized by disseminated demyelination of nerve fibers of the brain and spinal cord that develop throughout the white matter (Williams, Roland, Yellin, 1997). This disease is believed to be auto-immune in origin, mediated by activated T-cells, which penetrate the blood-brain barrier and attack myelin. The resulting pathophysiology is impairment in saltatory conduction, specifically, slowing of conduction speed (Petajan and White 1999). MS begins slowly, usually in young adulthood, and continues throughout life with periods of exacerbation and remission. The first signs are abnormal sensations in the extremities or on one side of the face. Other early signs are muscle weakness, vertigo, nystagmus, diplopia, partial blindness, dysfunctions of walking and balance (Sandyk R 1997; Williams, Roland, & Yellin 1997). During later stages of the disease, there may be extreme emotional lability, ataxia, and abnormal reflexes (Petajan & White, 1999).

A history of exacerbation and remission of symptoms and the presence of greater than normal amounts of protein in cerebrospinal fluid are characteristics of multiple sclerosis. As the disease progresses, the interval between exacerbations grow shorter, the disability becomes greater. There is no specific treatment for the disease, but overall health can be improved through physical fitness activities. According to Petajan and White (1999), muscular fitness can be progressed through passive range of motion and specific and integrated strengthening exercises. Overall physical activity may be increased according to functional levels by performing activities of daily living following a structured exercise program. Physical therapy, which includes stretching and an appropriate strengthening protocol may help to postpone or prevent specific disabilities and improve balance and posture as well as activities of daily living (Lord, Halligan & Wade 1998; Consroe, Musty, Rein, Tillery, & Pertwee, 1997).

Standing is an active motor behavior, which has profound effect on the posture, speed and the direction of locomotion. While standing, the body has its own continuous periodic sway motion. If the periodic sway motion deviates from the normal indicates that the individual has or will develop problems balancing the body during gait. Multiple Sclerosis patients present with poor standing and dynamic balance (Tesio, Perucca, Franchignoni, & Battaglia, 1997). This results in increased energy consumption and inefficient movement pattern. Inman (1981) indicated that variation in standing posture from the normal would contribute to the abnormal walking pattern of an individual. Therefore, functional integration of neural structures involved in postural control and locomotion control is essential in efficient gait pattern. The sway motion is not controlled by the muscle contraction but it is controlled by the reflex mechanism of the nervous system as long as the muscles can provide sufficient counter reaction force. In essence, the exaggerated sway motion can be balanced by the

muscle action to maintain the standing posture.
It has been recognized that walking involves a cognitive component and dual task or simultaneous cognitive and motor operations that may interfere with normal ambulation. This explains why combinations of activities and tasks such as walking while talking for MS patients are impaired. Impaired dual-task performance during walking may compromise the patient's gait, which explains why in some circumstances, MS patients unexpectedly lose their balance and fall. This is caused by frontal lobe dysfunction combined with de-conditioning and immobilization, which commonly occurs in MS patients (Sandyk 1997).
The primary function of rehabilitation training is to improve efficiency of activities of daily living through increased strength and coordination of proximal muscle groups. This type of training may improve standing balance due to changes in motor control patterns in the central nervous system. Several tests are used to assess standing balance. Dynamic posturography facilitates measurement of standing balance and permits a quantification of the role of proprioception, vision and the vestibular system in the maintenance of standing balance (Parker, 1993). Therefore, the purpose of this research was to investigate the effect of an exercise program on standing balance.

METHOD: Multiple Sclerosis Society of Tidewater area and the Department of Physical Therapy at Hampton University coordinated an exercise program for 9 weeks for MS patients. Three patients volunteered to be the subjects for this case study. All three subjects were signed the consent form. Upon initiation into the exercise program, the subjects underwent a balance assessment using the balance machine. A Balance System manufactured by Chattanooga Group, Inc. Model/Serial 1198 was used to collect data and assess balance. This system assesses balance anterio-posteriorly and medio-laterally. Balance measurements were taken with the eyes open and closed. The pre-treatment results were recorded. An exercise program consisting of specific and integrated stretching exercises will be implemented for 9 weeks. The subjects performed the exercise program ½ hour each week. Only open and closed eyes static balance measurements were taken due to the physical condition of the patients.
The subjects were instructed on the methods of balance measurement to be used on the machine. The static balance measurements were recorded during closed and open eyes for a period of one minute. During the 9-week program, the subjects also were attended educational seminars focusing on topics related to maintaining their health. At the end of the program, a final balance assessment is made to compare the results.

Table 1 Results of Balance Pre- and Post-test

	Pre-test (second)	Post-test (second)
Subject 1		
Open eyes	7.78	8.10
Closed eyes	8.37	6.23
Subject 2		
Open eyes	7.63	7.47
Closed eyes	17.90	17.93
Subject 3		
Open eyes	7.45	7.35
Closed eyes	5.59	6.84

CONCLUSION AND RECOMMENDATIONS: Comparison of pre and post-exercise balance measurements was made individually. The data indicates that the balance measurements remained almost the same and for one subject the balance for closed eyes has increased substantially. This indicates that the static balance has not deteriorated for the 9-week period but we cannot conclude that it is due to the exercise program. We recommend continuing this program for longer than 9 weeks or increasing the exercise/activity level using a group of subjects rather than a case study. Further, we need to emphasize specific exercise programs

to improve balance rather than just physical conditioning and stretching exercise program. All three participants indicated that they enjoyed being in the program.

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