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Short Communication

EFFECT OF CORE STABILITY, DUAL TASKING AND SENSORY STRATEGIES ON BALANCE AND GAIT IN MULTIPLE SCLEROSIS PATIENTS

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ABSTRACT

The study was undertaken to study the effect of core stability, dual tasking and sensory strategies on balance and gait in patients with multiple sclerosis. A survey among 50 patients was done among which 30 patients participated based on inclusion criteria from rehabilitation centers which were divided into Experimental group (core stability, dual tasking and sensory strategies exercise program and Controlled group (conventional exercises). Patients were evaluated pre and post intervention for balance using Berg Balance Scale and gait using Dynamic Gait Index. A six weeks intervention program was given to the patients for 3 alternate days per week. Data was statistically Analyzed, Average value was calculated. Paired and unpaired "t" test was used and level of significance set at 5 % ($p<0.05$.) Between group comparisons showed extremely significant ($p<0.0001$) improvement in Berg Balance Scale (44.733 ± 5.763) and Dynamic Gait Index (22.067 ± 0.961) for Group A as compared to Berg Balance Scale (43.533 ± 5.768) and Dynamic Gait Index (21.200 ± 1.373) for Group B. The present study concludes that there is significant effect of core stability, dual tasking and sensory strategies exercises on balance and gait in multiple sclerosis patients.

Keywords: Multiple Sclerosis, Balance, Gait, Core Stability, sensory Strategies.

1. INTRODUCTION

Inflammation, selective demyelination and gliosis are characteristic features of Multiple Sclerosis. It causes both acute and chronic symptoms and can result in significant disability and impaired quality of life. Individuals with MS have difficulty in walking as a result of muscle weakness, fatigue, spasticity, impaired balance, impaired sensation, visual problems and ataxia [1].

In MS, there is an intermittent burst of focal inflammation resulting in demylenation and transaction of axons throughout the central nervous system. This neuronal conduction delay is associated with functional impairments like muscle weakness, sensory impairments, affects balance and walking [2]. The development of a prevention program for falls requires assessment of different aspects of motor impairment and the accurate determination of factors contributing to falls [3].

Most studies examining the falls of Persons with MS (PwMs) report fall rates of about 50% over a course of year. These high fall rates have been mainly attributed to poor postural control, as balance and gait impairments can be used to distinguish fallers and non-fallers [4]. A higher risk of fall can be seen when Patients with MS performs more than one task at a time which demands cognitive or motor skills along with walking [5].

Gait disturbances of up to 85% is reported by patients having MS. Typical gait pattern of slow walking with a shorter stride length with increased double support time is seen in patients with multiple sclerosis [6]. Imbalance is described as difficulty in maintaining stability while being exposed to external perturbations and delayed response along with decreased ability to maintain a position and slower proactive balance reactions when trying to reach. Also reduced gait speed and small stride length is seen when walking while performing cognitive tasks is done [7].

Lower limb muscle weakness along with postural muscle weakness is common in people with MS that causes walking difficulties [8]. One of the most frequent symptoms in Multiple Sclerosis is of balance disorders which lead to abnormal postural stability that increases the risk of falls and affect the ability to safely perform activities of daily living. Imbalance with difficulties in coordinating body segments during movement can be produced due to transition between movement and an upright posture [9].

2. METHODOLOGY

Experimental study was carried out on 30 Multiple Sclerosis patients taken from various rehabilitative centers. Patients were selected according to the inclusion and exclusion criteria. Inclusion criterias are patients diagnosed with multiple sclerosis since 1-2 years, both males and females, above 20 years having EDSS ≤ 5, Berg Balance Score > 20, Dynamic gait Index ≥ 19. Patients were excluded based on the following criterias such as patient not willing to participate, any recent history of musculoskeletal or cardiac disorder, any recent surgical history,acute exacerbation of symptom in the past 6 months.The participants were assessed using Berg Balance Scale [10] and Dynamic Gait Index [10] for balance and gait respectively before the intervention program and were divided into Group A (Experimental Group) and Group B (Control Group).

The study was approved by institutional ethical committee, Group A was given conventional training along with core stability, dual tasking and sensory strategies exercise program thrice alternate days in a week for 6 weeks along with proper rest periods which included-core stability exercises: Supine- knees bent, than slowly slide 1 heel forward to straighten leg, Inward movement of lower abdominal wall, 4 point kneeling position- slide 1 foot in straight line away from body and lift leg off the floor [7], dual task exercises : Sitting on a chair and picking objects from the floor, sitting on a chair and doing reach outs, Walking while turning head, walking while counting backwards, walking while bouncing ball, walking while carrying a cup and Sensory strategies : Standing and walking on uneven surfaces and standing with eyes closed [7]. Group B followed conventional exercises thrice alternate days in a week for 6 weeks which included-warm up: deep breathing exercises, stretching of upper limb and lower limb muscles and slow active movements of upper limb and lower limb [7] supine, side-lying, quadruped, sitting and standing exercises with 10 repetitions [7], strengthening and balance training exercises and cool down-stretching and relaxation technique [7]. After 6 weeks protocol the balance and gait was reassessed by Berg Balance Scale and Dynamic Gait Index scales respectively. Pre and post intervention values were noted and statistical analysis was done.

3. RESULTS AND DISCUSSION

Core stability is achieved when the trunk muscles work coherently. This project is based on the effect of core stability, dual tasking and sensory strategies on balance and gait in multiple sclerosis. Trunk sway is noted when in standing which further increases by adding a dual task. Moreover, sensory disturbances evoke difficulties in balance control in quiet standing with increased postural sway. It is supported in a study by Cattaneo et al. which shows larger improvements on the BBS and DGI for combined motor and sensory strategies exercises compared to solely motor exercises or non-specific exercises. Challenging exercises that promote sensory compensation seem to have an impact on dynamic and static balance and also reduce risk of fall [7].

Table 1: Baseline Demographic and Clinical Characteristics of the Participants

	Group A (n=15)	Group B (n=15)
Age (in years)	43.46±8.70	41.33±7.35
Male	4(27%)	7(47%)
Female	11(73%)	8(53%)
Years since diagnosed	11.933±5.351	11.200±4.784
EDSS	3.667±1.012	3.367±1.043

Table 2: Comparison between the pre and post values of Berg Balance Scale in Group A and Group B

	Group A	Group B
BBS Pre (Mean±SD)	40.467±5.730	41.867±5.842
BBS Post (Mean±SD)	44.733±5.763	43.533±5.768
P value	P<0.0001	P<0.0001

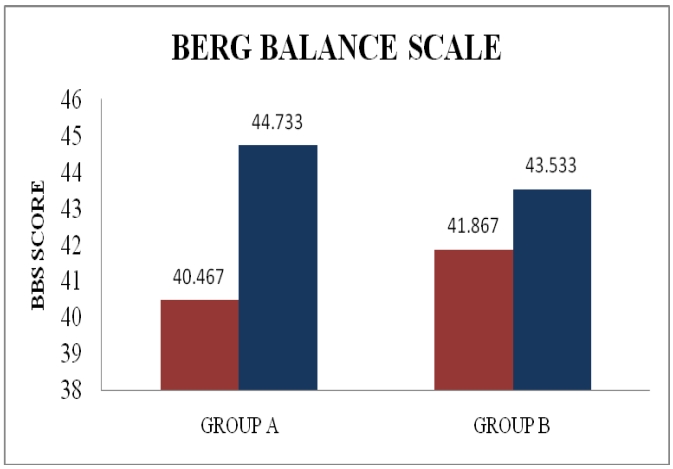

Fig.1: Comparison between pre and post values of Berg Balance Scale in Group A and Group B

Table 3: Represents the comparison between pre and post values of Dynamic Gait Index in Group A and Group B

	Group A	Group B
DGI Pre (Mean±SD)	20.067±1.280	20.533±1.642
DGI Post (Mean±SD)	22.067±0.961	21.200±1.373
P value	P<0.0001	P<0.0001

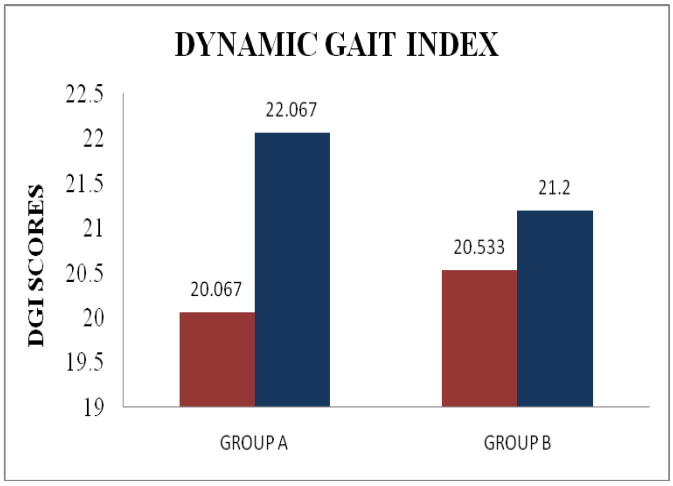

Fig. 2: Comparison between pre and post values of Dynamic Gait Index in Group A and Group B.

Our study shows that there is more improvement in balance and gait of individuals who were undergoing the experimental exercises along with conventional training than those following only conventional training program. Core stability, i.e. the ability to control the trunk in response to disturbances generated by movement of the limbs, or other perturbations is one of the components of balance. A study by JA Freeman et al. states that, a key role in creating core stability is done by the activity of the transverse rectus abdominis, during reaching stepping and unexpected pertubations prior to activation of other trunk muscles and limb muscles [8].

To prevent falls the body stabilizes its Center of Mass (COM) by central integration of inputs from the visual and vestibular sensory systems when the orientation information from different sensory systems is inaccurate. Hence central integration process allows us to select a specific response strategy to maintain postural control according to external postural displacement, goals and prior experience [9]. In studies by Marialuisa Gandolfi et al and Jeffrey R. Hebert et al states that balance control is a complex skill [9] and basis of effective upright postural control [11] involves the integration of incoming sensory information from the somato sensory, visual and vestibular systems, which is processed to maintain the body control [9]. Reduced upright postural control is because of impaired central sensory integration [11].

In our study there was improvement in balance and gait after the intervention which showed that the patients were able to perform the activities with more confidence and the fear of fall also reduced. In a study done by Anna Carling et al. the CoDuSe intervention led to a reduction of falls which is important, as falls can lead to injury and activity curtailment [12].

4. CONCLUSION

The present study concludes that there is more significant effect of core stability, dual tasking and sensory strategies exercises on balance and gait in multiple sclerosis patients.

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