Therapeutic Effects on CoDuSe versus Conventional Group Exercise for the Balance Management Multiple Sclerosis – A Comparative Study

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Abstract. Multiple sclerosis (MS) is a potentially disabling disease of the brain and spinal cord (central nervous system). This damage disrupts the ability of parts of the nervous system to communicate, resulting in a range of signs and symptoms, including physical, mental, and sometimes psychiatric problems. This is to compare conventional physiotherapy treatments with CoDuSe group exercise program for improving balance and reduce falls in subjects with multiple sclerosis. This study used outcomes were BBS and TUG scale. 30 patients were selected who met with the inclusion criteria. Group A-15 patients – conventional physiotherapy techniques and Group B- 15 patients – CoDuSo group exercise program. The Mean difference of BBS for Group A and B is 18.4 & 7.6. The Mean difference of TUG for Group A and B is 45 & 38.6. The present study which concluded that the CODUSE group exercise which is better than conventional for the balance management of multiple sclerosis.

Key words: multiple sclerosis, brain, spinal cord, psychiatric problems, CoDuSe group exercise program.

Introduction

Impaired balance and trunk control and difficulty to perform trunk control and difficulty to perform dual tasks are common in people with multiple sclerosis (Yardley et al., 2005: 614-619). Balance functions can improve by specific exercise thus possibly reducing falls (Sosnoff et al., 2014: 254-263). Multiple sclerosis (MS) is a demyelinating disease in which the insulating covers of nerve cells in the brain and spinal cord are damaged (Butland et al., 1982: 1607-1608). This damage disrupts the ability of parts of the nervous system to communicate, resulting in a range of signs and symptoms, including physical, mental, and sometimes psychiatric problems (Cattaneo et al., 2014: 198-202). Specific symptoms can include double vision, blindness in one eye, muscle weakness, trouble with sensation, or trouble with coordination (Prosperini et al, 2010: 491-499; Hobart et al., 2003: 31-36). MS takes several forms, with new symptoms either occurring in isolated attacks (relapsing forms) or building up over time – progressive forms (Fox et al., 2016: 1170-1178). Between attacks, symptoms may disappear completely; however, permanent neurological problems often remain, especially as the disease advances (Gunn et al., 2015: 1898-1912). Balance function can improve by specific exercise, thus possibly reducing falls. Freeman et al. (2007: 132-139) reported a study in which eight-week core stability exercise programmed balance and mobility skills (Van Vliet et al, 2003: 883-889). Another study compared core stability exercises to standard exercise and relaxation sessions in a randomized controlled trial including 100 MS patients (Hamilton et al., 2009: 1215-1227). The study revealed that the program did not improve walking capacity or perceived balance confidence (Lanzetta et al., 2004: 279-283).

Etiology

Age. MS can occur at any age, but most commonly affects people between the ages of 15 and 60.

Sex. Women are about twice as likely as men are to develop MS.

Family history. If one of your parents or siblings has had MS, you are at higher risk of developing the disease.

Certain infections. A variety of viruses have been linked to MS, including Epstein-Barr, the virus that causes infectious mononucleosis.

Race. White people, particularly those of Northern European descent, are at highest risk of developing MS. People of Asian, African or Native American descent have the lowest risk.

Climate. MS is far more common in countries with temperate climates, including Canada, the northern United States, New Zealand, southeastern Australia and Europe.

Certain autoimmune diseases. You have a slightly higher risk of developing MS if you have thyroid disease, type 1 diabetes or inflammatory bowel disease.

Smoking. Smokers who experience an initial event of symptoms that may signal MS are more likely than nonsmokers to develop a second event that confirms relapsing-remitting MS.

Genetics

The objective of the study is to find the effectiveness of conventional physiotherapy treatments with CoDuSe group exercise program for improving balance and reduce falls in subjects with multiple sclerosis.

Dependable Variables
a. BBS
b. TUG SCALE
Independent Variables
1. CoDuSe Group Exercise Program
2. Conventional Physiotherapy Techniques

Material and Methods
Materials
• A ruler
• 2 standard chairs (one with arm rests, one without)
• A footstool or step
• 15 ft walkway
• Stopwatch or wristwatch
• Tape
• Recording sheet
• Pen/pencil
• Couch/mats
• Wobble board
• Therabands/thera tubes
• Cones, obstacles and peg board Methodology
Study Design
Pre and Posttest Experimental Study
Sample Size
30 patients with multiple sclerosis were selected who met with the inclusion cri teria.
Group A- 15 patients – conventional physiotherapy techniques
Group B- 15 patients – CoDuSo group exercise program
Sample Technique

Convenient sample method.

Study Population

The study population selected was 30 patients with multiple sclerosis. Age: 15-60years

Sex: Both GENDERS

Study Duration

The total duration of study is 9 months.

Treatment Duration

The treatment duration is 60minutes

Criteria for Selection

Inclusion Criteria:

• Multiple sclerosis diagnosed according to the Mc Donald criteria.

• Walking ability not exceeding 200m.

• Ability to transfer between a wheel chair and a plinth with only slight assistance

• Subject aged 16 years and above

Exclusion Criteria

• Cognitive symptoms making it difficult to understand the study information, or follow the instructions. Follow.

• Having medical care related to impaired walking during the past 3 months.

• Having participated in the balance exercise administered by the health care personel for the past 30 days

• Having started or changed medication with 4-aminopyridine during the past 30 days

• Subject aged below 16 and above 60years of age

• History of any recent trauma or fracture

• Osteoporosis

Parameters

• BBS [BERG BALANCE SCALE]

• TUG SCALE [TIME UP AND GO SCALE]

General Instruction

Today we are going to take a look at how you are able to improve balance. Let me tell you how we are going to go about this. First, I will give you instructions on how to do the task, and then I will show you how to do it. I will describe and demonstrate each task 2 times. Do not practice the task while I'm describing and demonstrating it. However, I will be happy to clarify any confusing points. Then I will say

‒ Ready, set, go‖ and you will do the task.

It is important that you do not start until I say ‒ go, otherwise, we will need to repeat the entire task. Each of the activities you will be asked to do should be carried out as rapidly as possible. You can work on each task for up to two minutes. We ask that you attempt each part of the test even if you do not think that you can do it. If you are unable to carry out a task, then we will go on to the next one. Again, try to do each task as rapidly as possible.

Procedure

Subjects were selected by convenient sampling method. 30 subjects who fulfilled inclusion criteria and exclusion criteria were selected by random sampling method, out of them 15 were allotted in Group A and 15 in Group B.

Subjects were clearly explained about the study about written informed consent was obtained from the subjects who fulfilled the criteria.

After completing the informed consent and they were explained about the scales and the scales were administered.

Proper instructions such as purpose, safety measures, comfort, precautions and psychological support were given to the subjects.

All vitals were checked

While doing the assessment, the subjects willingness to continue the procedure with or without rest was given preference. Both group A and B subjects were involved for pre-test assessment. Group A underwent CoDuSe group exercise program, Group B underwent conventional physiotherapy techniques were performed for 60 minutes, 2 days per week for 7 weeks. The total duration is 60 minutes.

Group A:

The subjects in the group A receives CoDuSe balance exercise including core stability exercise, dual tasking and sensory strategies.

The first 30 minutes were primarily focused on core stability exercises that is controlled leg movements.

The participants were then encouraged to maintain focus on core stability while performing the remaining exercises, which include dual tasking and sensory strategies such as carrying something while walking or walking in an uneven surface.

The participants perform exercises such as pelvic bridging, prone on elbow, single leg bridging etc.

The participants performed dual task training by performing walking by controlled leg movements and by walking with carrying an object in an uneven surface.

The participants perform sensory tasks like clay modelling, walking in ir regular surfaces like walking over pebble stones, sands etc.

The participants were encouraged and instructed by the therapist to progress to more challenging exercises when suitable.

In addition, subjects were given individually tailored home exercise program with two or five exercises.

Progression of the exercises was continuously adjusted by the therapist (Fig. 1, Fig. 2).

Fig. 1. Dual task training

Fig. 2. Core strengthening

Group-B

The subjects in the group b receives conventional physiotherapy exercises as follows for a session of 60 minutes:

- Strengthening exercises.
- Stretching exercises.
- Gait training.
- Balance and coordination exercises.
- Obstacle training.
- Subjects were only concentrated in physical exercises.

Table 1 shows the information relating to the age group among the patients in the study (see also Fig. 3).

Table 1: Mean Average Age Group of Group A and Group B

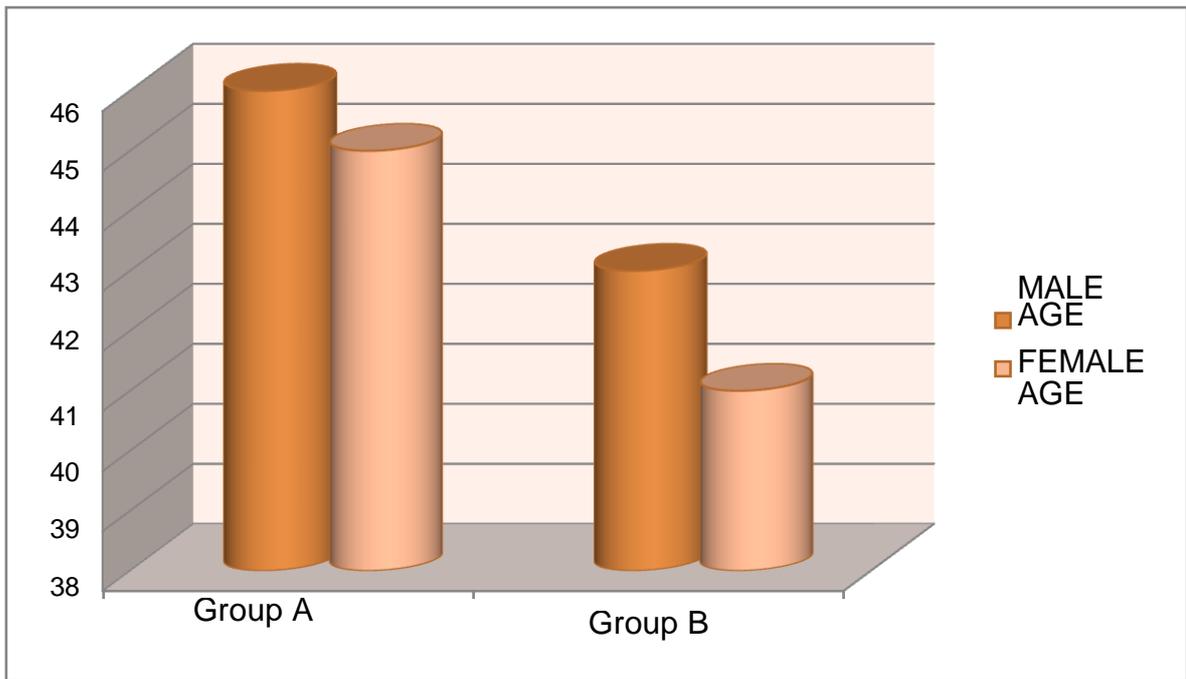| Mean Age Group	Group A	Group B
Male's	46	43
Female's	45	41

Fig. 3. The mean average age of group A and Group B

Table 2 shows the sex distribution among the study. There are 60%of males and 40% of females in both Groups (see also Fig. 4).

Table 2. The sex distribution among the study

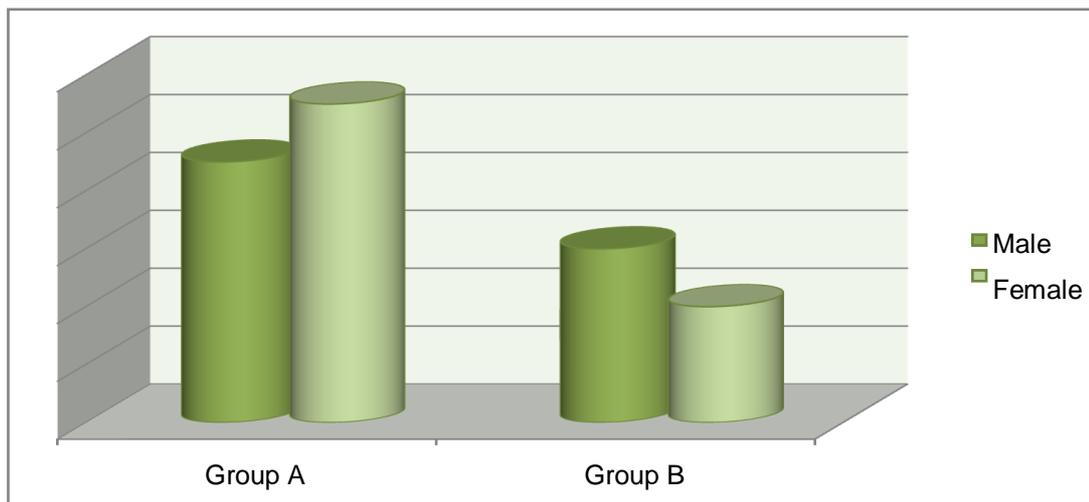| Sex Distribution	Group A	Group B
Male's	9	11
Female's	6	4

Fig. 4. Sex Distribution of Group A and Group B

Table 3 shows Mean difference of BBS for Group A and B is 18 and 7.6. Mean difference of TUG for Group A and B is 45 and 38.6 respectively (see also Fig. 5).

Table 3. Mean Difference Between Group A and Group B of BBS and TUG

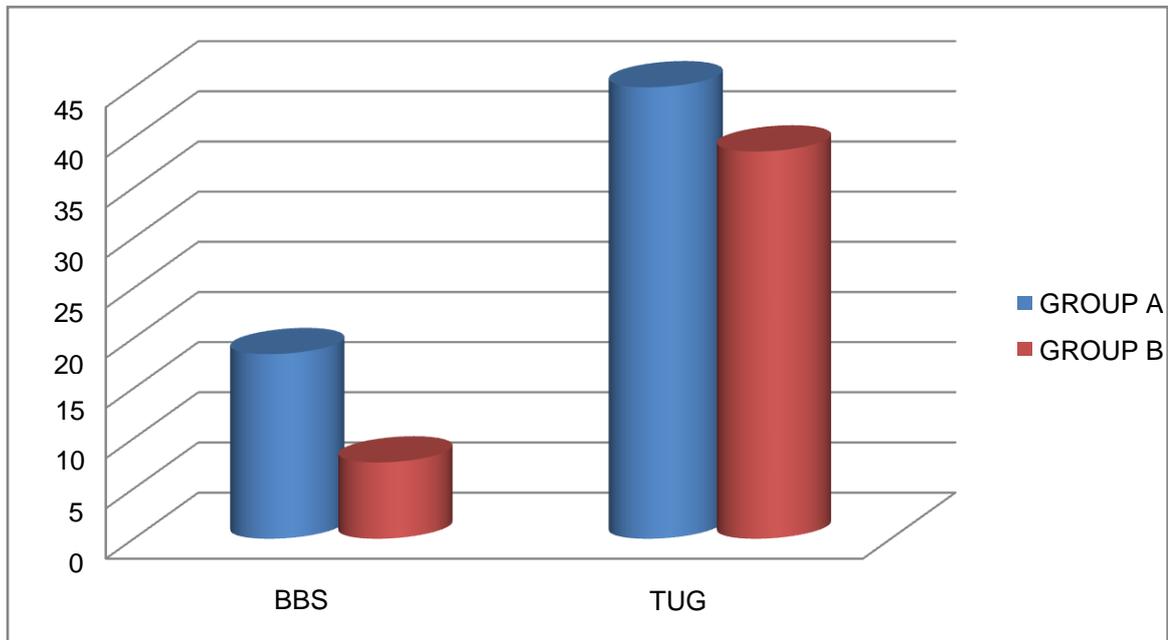| GROUPS	Mean Difference	
	BBS	TUG
Group-A	18.4	45
Group-B	7.6	38.6

Fig. 5. Mean Difference of BBS and TUG Scale

Table 4 shows Standard Deviation Between Group A and Group B of BBS and TUG Scales: Group A standard deviation value is 2.4 and 2.7 respectively. Group B standard deviation value is 1.7 and 2.4 respectively (see also Fig. 6).

Table 4. Standard Deviation Between Group A and Group B of BBS and TUG Scales

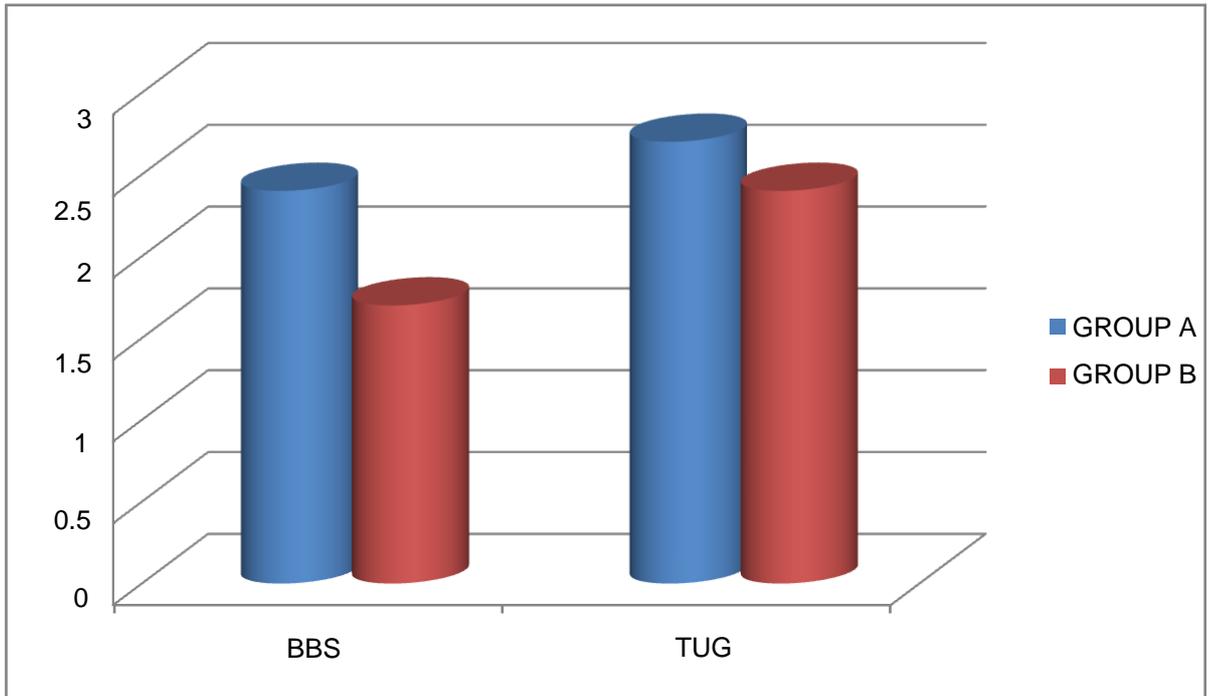| GROUPS	Standard Deviation	
	BBS	TUG
Group A	2.4	2.7
Group B	1.7	2.4

Fig. 6. Standard deviation of BBS and TUG scales

Table 5 shows a comparison of the paired "T" Test and table value between group A and group B. For 9 degree of freedom and at 5%level of significance, the table value is 2.15 and the calculated group A t value is 29.13 and 63, the group B t value is 16.9 and 61since the calculated t values was greater than the table t value, null hypothesis is rejected (see also Fig. 7).

Table 5. Comparison of the paired "T" test and table value between Group A and Group B

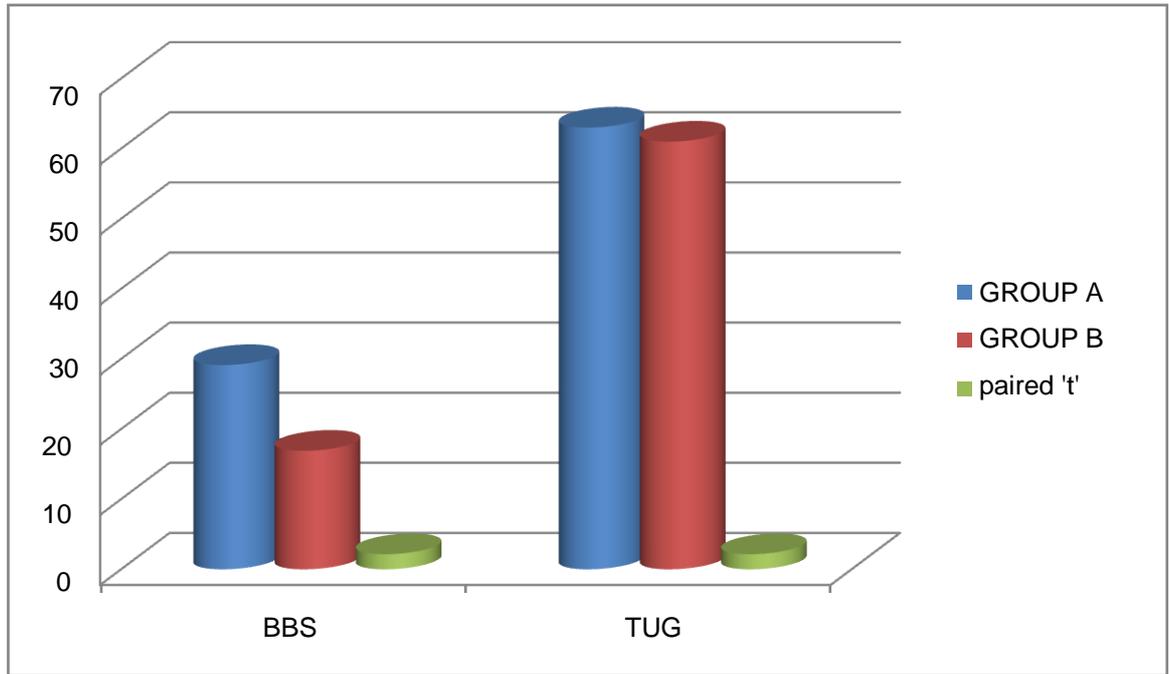| GROUPS	Calculated "T" Value		Table Value	Significance
	BBS	TUG		
Group A	29.13	63	2.15	Significant
Group B	16.9	61	2.15	Significant

Fig. 7. Paired "T" Test and Table Value of BBS and TUG Scales

Table 6 presents a comparison of unpaired "T" test and table value between BBS and TUG. For 9 degree of freedom and at 5% level of significance, the table value is 2.05 and the calculated BBS unpaired t value is 14.59 and the TUG unpaired t value is 7.1 since the calculated unpaired t value was greater than the table t value, null hypothesis is rejected (see also Fig. 8).

Table 6. Comparison of unpaired "T" test and table value between BBS and TUG

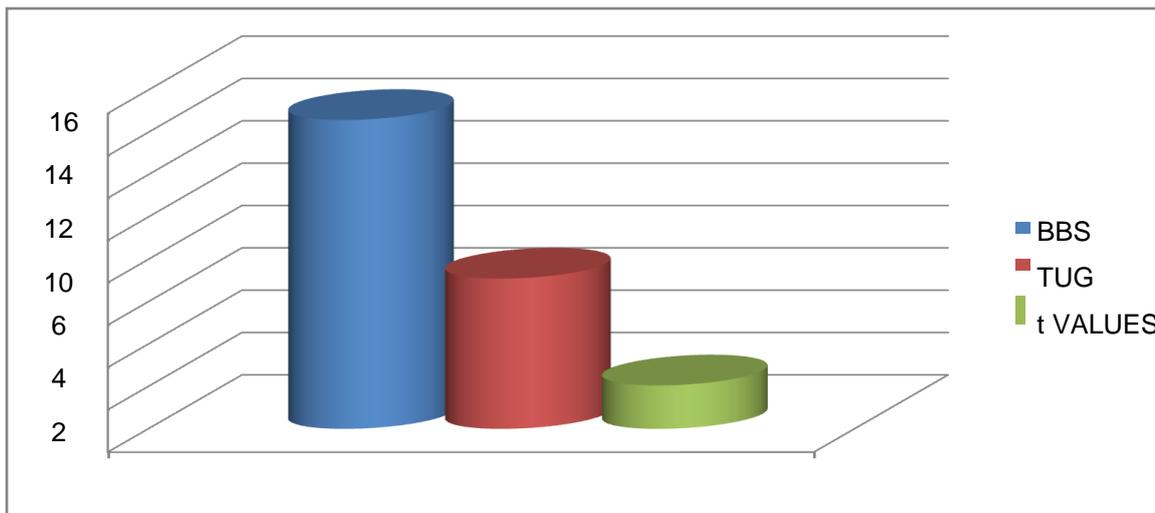| Group	Unpaired "T" Test		Table Value	Significant
Group A & Group B	BBS	TUG	2.05	Significant
	14.59	7.1		

Fig. 8. Unpaired „t" test and table value of BBS and TUG

Results

The study sample comprised 30 patients, of which 20 were male and 10 were female patients with multiple sclerosis disease. Among 30 patients 15 were treated with C and other 15 patients were treated with conventional therapy. The pre and posttest values were assessed by berg balance scale and mini mental state examination scale in group A. The mean difference value of BBS is 18. TUG is 45 respectively. The standard deviation of BBS is 2.4, TUG is 2.7 the paired t-test value for BBS is 29.13, TUG is 63 respectively. The paired t-test value is more than the table value 2.15 or 5% level of significance at 14degrees of freedom.

The pre and posttest value were assessed by BBS and TUG in group B. the mean difference value of BBS 7.6, TUG is 38.6 respectively. The standard deviation of BBS 1.7, TUG is 2.4 respectively. The t- test for BBS is 16.9, TUG is 61 respectively. The paired t-test value is more than the table value 2.15 or 5% level of significance at 14 degree of freedom.

The calculated t value by unpaired t test for group A and B were 14.59 for BBS, TUG is 7.1. The calculated t value was more than the table value 2.05 for 5% level of significance at 28 degrees of freedom.

Discussion

The study sample comprised 30 patients of both gender. The mean age of patient was 50 years (Martin et al., 2006: 620-628). The groups differed at baseline in terms of age, sex and MS subtypes. This study suggests that the CoDuSe balance group exercise program improves balance, as BBS and TUG scale and perceived limitation in walking due to MS as compared to the conventional physiotherapy treatments (Nilsagard et al., 2015: 92-100; Verheyden et al., 2006: 66-76). It also reduces the number of falls as well as near falls. These discussions are in line with those presented in previous study and imply that CoDuSe intervention is a promising intervention in disease stages characterized by significant loss of walking ability (Sturnieks et al., 2011: 63). This result is in line with that reported after twelve 30-minutes exercise sessions during 12 weeks of

Pilates group study exercise, enhanced with individualized daily home exercise home exercise program.

The CoDuSe intervention led to a reduction of falls which is important, as falls can lead to injury and activity curtailments. The ability to reproduce these results in a new sample strengthens that the intervention is effective to reduce risk of falls at least in a shorter time period. The number of prospectively reported that near falls also reduced. Being able to manage imbalance without falling can be seen as a successful strategy. The participants also learnt to maintain stability in situations where they had lost balance.

This study proved that CoDuSe group exercise program improves balance and reduce risk of falls in people with Multiple Sclerosis.

Conclusion

The multiple sclerosis is one of the most important neuromuscular disease. About two third of the population experiences this disease. Impaired balance and trunk control and difficulty to perform dual tasks are common with multiple sclerosis patients. Due to imbalance and trunk instability many people are under risk of fall. The CoDuSe intervention led to a reduction of falls which is important, as falls can lead to injury and activity curtailments. The ability to reproduce these results in a new sample strengthens that the intervention is effective to reduce risk of falls at least in a shorter time period. The study could be concluded that there is a significant difference between "CODUSE group exercise program and conventional physiotherapy exercises in improving balance and reduce risk of falls in patients with multiple sclerosis".

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