

**A COMPARATIVE STUDY OF SWISS BALL TRAINING VERSUS
CONVENTIONAL PHYSIOTHERAPY IN UNILATERAL NEGLECT**

**A Dissertation Submitted to
Department of Physiotherapy
In Partial Fulfilment of the Requirements for the
Award of the Degree of
Master of Physiotherapy in Neurology**

Supervised by:

Dr. A. Sridhar

Lecturer

Submitted by:

Avneet

MPT Neurology - II Year



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CERTIFICATE

This is to certify that the dissertation work entitled “**A Comparative Study of Swiss Ball Training Versus Conventional Physiotherapy in Unilateral Neglect**” was carried out by **Ms. Avneet, REGISTRATION NO. 11304571**, Department of Physiotherapy, Lovely Professional University, towards partial fulfilment of the requirements of Master of Physiotherapy (Neurology) degree programme.

Dr. JasobantaSethi, MPT, Ph.D, FIAP

Professor & Head,
Department of Physiotherapy.
Lovely Professional University
Phagwara- 144402

Date:

Place:

CERTIFICATE

This is to certify that **Ms. Avneet, Registration No. 11304571** has completed MPT dissertation titled “ **A COMPARATIVE STUDY OF SWISS BALL TRAINING VERSUS CONVENTIONAL PHYSIOTHERAPY IN UNILATERAL NEGLECT**” under my guidance and supervision. To the best of my knowledge, the present work is the result of her original investigation and study. No part of the dissertation has been submitted for any other degree or diploma. The dissertation is fit for the submission and the partial fulfilment of the conditions for the award of **MPT (Neurology)**

Supervisor:

Dr. A. Sridhar

MPT (Neurology), Pursuing Ph.D

Lecturer

Department of Physiotherapy

Lovely Professional University

Punjab

Date:

Place:

DECLARATION

I hereby declare that the dissertation entitled, **“A COMPARATIVE STUDY OF SWISS BALL TRAINING VERSUS CONVENTIONAL PHYSIOTHERAPY IN UNILATERAL NEGLECT”** submitted for the MPT degree is entirely my original work and all the ideas and references have been duly acknowledged. It does not contain any work for the award of any other degree or diploma.

Avneet

Investigator

Regn. NO: 11304571

Date:

Place:

1.1 INTRODUCTION: -

Neglect has been defined as “the failure to report, respond or orient to novel or meaningful stimuli presented to the side opposite a brain lesion , when this failure cannot be attributed to either sensory or motor defects”¹. UNL is a common behavioural syndrome in patients following stroke. The incidence of ULN varies widely from 10% to 82% following right hemisphere stroke and from 15% to 65% following left hemisphere stroke ².

According to the WHO definition of stroke, “rapidly developing clinical signs of focal(at times global) disturbance of cerebral function, lasting more than 24 hours or leading to death with no apparent cause other than that of vascular origin” is the broadly accepted standard³.

Unilateral neglect is also referred to as Hemispacial neglect, hemi-inattention and visual neglect. The presence of unilateral neglect has been strongly related to an increased risk of injury and with poor functional outcome⁴. ULN is one in all the common disabling conditions following unilateral brain damage, notably of the right hemisphere though it may be caused by varied totally different pathological conditions, it’s most frequently discovered when cerebral pathology or hemorrhage and affects up to 2 thirds of cerebral hemisphere stroke patients⁵. ULN could be a poor outcome for recovery from stroke and is related to variety of conditions as well as depression, apraxia, spasticity, anosognosia, prosopagnosia and hemianopia. Patients with neglect are more related to longer hospital stay and are more probably to suffer from incontinence, have less functional independence and have problems with mobility⁶.

The distinction between neglect and visual neglect:- each unilateral neglect and hemianopia may lead patients to miss information on the one side of the body, however each disorders have completely different causes and need different treatment plans. Unilateral neglect reflects an basic cognitive process deficit that’s typically caused by a cortical lesion whereas hemianopia reflects a cut within the visual field that’s caused by a lesion to the geniculate striate pathway, which projects from the retina to the occipital pole of the brain⁶.

Classification of unilateral neglect:-

Unilateral neglect has been classified into two main types².

1. ULN are often described in terms of modality during which the behaviour is induced-
 - a) Sensory neglect
 - b) Motor neglect

c) Representational neglect

2. By the distribution of abnormal behaviour-

d.) Personal neglect

e.) Spatial neglect

a. Sensory neglect: - sensory neglect is defined as being unconsciousness of sensory stimuli or inability to understand sensory stimuli on the aspect of the body or area opposite the brain lesion. Sensory neglect is often classified according to modality in which it presents. Visual neglect, auditory neglect and tactile neglect are the main classifications of the sensory neglect. Sensory neglect is additionally referred to as inattention, input neglect, attentional and perceptual neglect².

b. Motor neglect:- motor neglect is defined as failure to get a movement response to a stimulation even if the person is attentive to the stimulation. The movement failure cannot be attributed to a primary motor deficit or weakness of muscles. Motor neglect is often seen in the eyes, head, limbs or trunk¹. Motor neglect includes a number of movement disorders-

- Movement of reduced amplitude (hypometria)
- Delayed movement initiation (hypokinesia)
- Unreasonable slowness within the execution of movement (bradykinesia)

These disorders might occur in movements performed at intervals in the affected hemispace (e.g. Hemispatial hypometria) or in movements directed toward the affected hemispace (e.g. Directional hypometria)².

c. Representational neglect: - representational neglect is that in which an individual ignores the contralesional half of internally generated images. Internally generated images are the cognitive content or visual image of the task, action or environment. Representational neglect is additionally said to be imagination neglect².

d. Personal neglect: - personal neglect is defined as an absence of awareness or exploration of the one side of the body opposite to brain lesion. Example of

personal neglect is patient may forget to dress on the one ½ of the body or comb hair only one half of the hair. Personal neglect is different from sensory neglect. Personal neglect is refers to reduced awareness of the body or a limb itself, whereas sensory neglect refers to reduced awareness of the sensory stimuli like touch².

- e. Spatial neglect: - spatial neglect is defined as a failure to acknowledge stimuli on the contralesional aspect of space and can be further divided into peripersonal neglect and extrapersonal neglect. Peripersonal neglect refers to neglect behaviours occurring among reaching space (near space). Example of peripersonal neglect is failure to eat the food on one half a plate. Extrapersonal neglect refers is unknowingly contacting obstacles like a entry while walking² however clinically several patients are the combination of these 3.

Unilateral neglect is most typically caused by parietal and frontal lobes that is related to preparation of attention into contralateral area. Neglect is most closely associated with injury to the temporo-parietal junction, posterior parietal cortex, middle frontal gyrus and right inferior frontal gyrus⁷. Other causes are- massive brain injury (tumours, craniocerebral trauma), arteriovenous malformation (AVM), and traumatic brain injury (TBI)⁸.

Many reviews shows the several methods of neglect rehabilitation – caloric vestibular stimulation (CVS), optokinetic stimulation (OKS), trunk orientation(TO), neck muscle vibration (NMV), Transcutaneous electrical nerve stimulation (TENS), space remapping training, feedback training, mental imaginary training, prism adaptation, eye patching, functional electrical stimulation and visual scanning training(VST)⁹.

In this research we are providing the swiss ball for the treatment of unilateral neglect. Moreover swiss ball training is widely used in the vestibular rehabilitation. Swiss ball is that one in all the instrument tool that helps in up the balance and reducing the symptoms in many neurological conditions, whereas no information has been documented relating to swiss ball training in ULN patients. We tried swiss ball to reduce the symptoms and improve the balance following by activity in daily living in unilateral neglect.

Swiss ball and vestibular mechanism- posture and balance both are closely connected through the vestibular system of the brain and the inner ear¹⁰. Swiss ball training is mainly used for:-

- Swiss ball is helpful in reducing the weight of the paralyzed limb so that patient can actively participate.
- Swiss ball helps in increases flexibility, strength and endurance.
- To improve posture, balance and stability.
- To improve nervous system activation¹¹.
- To developing overall control and strength of core body muscles.
- To increase the mobility of lower trunk.
- To increase the strength of the abdominal and back muscles
- To improve proprioception.
- To improve posture and to learn proper body mechanics and posture while lifting objects¹².

1.2 NEED OF STUDY:- unilateral neglect is a major disability after stroke¹³. Patients can experiences severe body image disorder due to severe physical dysfunction following ULN can result in total dependency in ADLs. Unilateral neglect is the negative predictor that can interfere with the patient's rehabilitation and it's treatment is important in the early stage for each individual to stand erect for the balance of trunk is very much important. The trunk muscle should have good strength therefore to enhance the independence of unilateral neglect. We are providing the swiss ball exercises and conventional physiotherapy to encourage the patient to orient on the affected side.

1.3 SIGNIFICANCE OF STUDY: In unilateral neglect, the basic demand and need of the patient is to aware and orient on the contralateral side. The incorporation of swiss ball training can build the patient actively participate in the rehabilitation training. There are various training methods are offered for training the ULN patients. However most of the treatment are expensive and not applicable in our country. But we are planned to use swiss ball in these patients and comparing the effects with the available treatment approaches in our country.

1.4 OBJECTIVES OF STUDY:-

- 1 To identify the effect of swiss ball training in improving the unilateral neglect.
- 2 To identify the effect of conventional therapy in improving the unilateral neglect.
- 3 To compare the effectiveness of swiss ball training versus conventional therapy in unilateral neglect.

1.5 HYPOTHESIS:-

- **NULL HYPOTHESIS:** - There is no significant difference between swiss ball training and conventional therapy in unilateral neglect.
- **ALTERNATIVE HYPOTHESIS:** - There is a significant difference between swiss ball training and conventional therapy in unilateral neglect.

1.6 OPERATIONAL DEFINITIONS:-

Unilateral Spatial Neglect (USN):- Neglect has been defined as “the failure to report, respond or orient to novel or meaningful stimuli presented to the side opposite a brain lesion, when this failure can’t be attributed to either sensory or motor defects”¹. Unilateral spatial neglect is also referred to as hemi-inattention, visual neglect and hemi-spatial neglect.

Swiss Ball Training: - Swiss ball training is especially used to enhance neuromuscular and cardiovascular function¹⁴. Swiss ball is additionally known as balance ball, body ball, fitness ball, gym ball, Physioball, pilates ball, sports ball, stability ball, therapy ball or yoga ball¹⁵. Swiss ball is a versatile piece of exercise equipment. Swiss ball exercises are designed to bring movement to the spine in a very controlled manner to assist keep the discs nourish. Swiss ball exercises are in the centre of balance training activities. Exercises on the ball are accompanied by increased proprioception activity, combined with keeping balance on unstable support. Every exercise on swiss ball demands whole body participation- visual perception, vestibular stimulation and muscular reaction¹⁶.

2. REVIEW OF LITERATURE

1. **R. Patole et al., (2015)**¹⁷ studied the effect of task specific treatment in unilateral neglect(ULN) patients. They included the 10 right side stroke patients with unilateral

neglect and all the patients were assessed by Catherine Beregego Scale (CBS) and Functional Independence Measure (FIM). Total 6 weeks thrice a day intervention was given to all the patients with visual scanning, Affolter's guiding technique and compensatory strategies. This study concluded that the task specific treatment was very much effective in reducing the symptoms of neglect.

2. **W. Wang et al., (2015)¹⁸** explained the therapeutic effects of mirror neuron therapy for the movement and language disorders in hemispatial neglect patients. They included 2 treatment protocol with video watching for hand rehabilitation and video containing dynamic landscape of natural scene. The total treatment procedure was 3 weeks. Before and after of each training they assessed the patients to diagnose the Hemispatial neglect with Chinese Behavioural Inattention Test- Hongkong version(CBIT-HK). After the treatment protocol the result showed that protocol A significantly improved the scores at 1st and 3rd week as compared to protocol B.
3. **L. Hyun et al., (2015)¹⁹** explained the treatment system model for unilateral neglect patient. In this author used the smart devices such as tablet PC or smart phone as a visual feedback for the rehabilitation of the ULN patient after stroke. Albert test, line bisection test and star cancellation test have been used to identify the neglect. In this study the tried to improve balance and to reduce the neglect symptoms with smart device as a visual feedback.
4. **C. Guaiglia et al., (2014)²⁰** determined that somatosensory stimulation improve imagery disorders. A 9 patient with unilateral neglect performed a mental imagery task with and without TENS (Transcutaneous electrical nerve stimulation) to the either side of the neck. In the result TENS showed significant improvement on the left side of mental representation of objects as well as on the mental image of space.
5. **Keh-Chung et al., (2013)²¹** investigated the effects of listening to pleasant music on chronic unilateral neglect(ULN). they used the music as a intervention for reducing symptoms in ULN and it had been single subject study. intervention was given on a daily basis for 5 weeks, followed by 2 weeks of follow up assessment and 3 assessment tools were used in this study- line bisection test, star cancellation test and visual exploration task. In result each participants showed significant improvement.
6. **Lisa Parnet et al., (2013)²²** investigated the effectiveness of various treatment modalities for the rehabilitation of unilateral neglect patients. 15 patients were included during this study and divided into 2 groups- experimental and control group. The

interventions were given- TENS, optokinetic stimulation, somatosensory, electro stimulation, mirror therapy and virtual reality training. The authors found that these interventions showed significantly improvement in reducing the symptoms of unilateral neglect.

7. **Akashtha Nayak et al., (2012)**²³ evaluated the trunk performance on swiss ball training after stroke. They used the single blinded quasi experimental study design in 12 subjects. The treatment protocol was conventional therapy in all the subjects and trunk exercises on swiss ball for 45 minutes with 10-15 rest periods, 6 times a week for 3 weeks. The results showed significant improvement in both dynamic balance and coordination in the study group.
8. **Kenneth Fong et al., (2012)**²⁴ in this study the author combined the two treatment protocol- sensory cueing and limb activation on unilateral neglect in subacute left hemiplegic stroke patients. The study design was single blinded randomized controlled pilot study. 40 subacute left hemiplegic stroke patients with unilateral neglect were included in this study. Participants were randomly assigned into 2 groups- experimental and sham group. The experimental group wore a wrist watch cueing device over the hemiplegic arm and sham group underwent the same rehabilitation process, except they wore a sham device. The authors found more significantly improvement in experimental group than the sham group.
9. **Tetsuya Tsuji et al., (2011)**²⁵ determined the effect of prism adaptation therapy in improving the USN and functional outcomes in stroke patients in subacute stage. A total 38 USN patient with right brain damage was included and they divided into prism and control group. A randomized controlled trial was conducted and PA therapy was given for 2 weeks in USN and patients were assessed with behavioural inattention test (BIT), Catherine Bergego Scale (CBS) and Functional Independence Measure (FIM). The results showed that the FIM improved significantly more in prism training.
10. **Kathleen B kortte et al., (2011)**²⁶ explained the rehabilitation interventions for the visual neglect and anosognosia for hemiplegia that occur following right hemisphere stroke. They were included the interventions- prism adaptation therapy, Right half field patching, optokinetic stimulation, motor activation therapy, transcranial stimulation, virtual reality and combinations treatment. The authors concluded that the interventions for these syndromes were significantly effective in visual neglect and anosognosia.

- 11.A. Osama et al., (2010)²⁷** they examined the effect of family participation in improving the symptoms in USN following an acute stroke. 34 stroke patients and USN were included in this study. The severity was measured by using the BIT and laterality index (LI), and Barthel index (BI). The participation of family members and conventional exercise program was given for 3 weeks. They concluded that family participation improved the mobility as well as the symptoms of USN.
- 12.H. Robertson et al., (2010)²⁸** assessed that the rehabilitation by contralateral limb activation improving the function in unilateral neglect. Previously they found that contralateral limb activation reduces the neglect. In the present study they extend and replicate this finding with case of unilateral neglect. The results showed that in recent study the contralateral limb activation showed statistically significant improvement in near peripersonal space but not in far peripersonal and personal space.
- 13.A. Schroder et al., (2008)²⁹** examined the effectiveness of Transcutaneous Electrical Neural Stimulation (TENS) and Optokinetic stimulation (OKS) in neglect therapy after cerebrovascular accident (CVA). 3 groups were included in this study and the neglect was assessed by comparing the treatment outcomes. A control group received only standard exploring training, whilst the second and third group received TENS and Optokinetic stimulation respectively. In the results it was found that, the group who received TENS and OKS showed significant improvements in neglect as compared to control group.
- 14.KNK Fong et al., (2006)²⁹** investigated the effectiveness of voluntary trunk rotation and half-field eye-patching to treat patients with unilateral neglect in stroke. 60 subacute stroke patients with involvement of right hemisphere participated between 2003 and 2005. Participants were randomly assigned into three groups. 19 patients received voluntary trunk rotation (TR) for 1 hour 5 times a week for 30 days. 20 patients received the same treatment with half-field eye patching and 15 patients in control group received conventional training. The results of this study did not support the use of voluntary trunk rotation alone or with half-field eye patching. The author concluded that a single treatment is not much effective in improving the symptoms of unilateral neglect.
- 15. L. Tamar et al., (2006)³⁰** in this study the authors were used the virtual environment for the training of USL to cross streets in a safe and vigilant manner. They included the 12 subjects with age 55 to 75 years, right hemispheric stroke and healthy adults who

had no difficulty in crossing streets. The results showed that virtual environment was suitable for both cognitive and motor deficits patients and it proved that the virtual reality training is beneficial for people who have difficulty with crossing streets.

16. **Philippe Azouvi et al., (2006)**³¹ used the method of battery test including paper and pencil tests as assessment of personal neglect. The battery was given to healthy subjects and to stroke patients with right or left hemisphere. The authors concluded that a battery test and standardised tests should use to assess the unilateral neglect. Some patients may show clinically significant while obtaining a normal performance on paper and pencil measures in UN in everyday life.
17. **Van Nes et al., (2004)**³² examined the short term effects of whole-body vibration on postural control in unilateral chronic stroke patients. 23 chronic stroke patients were included in this study. While standing on commercial platform patients received 30- hz oscillations at 3mm of amplitude in the frontal plane. Balance was assessed 4 times after every 45 min with eyes open and eyes closed. Between the second and third assessments 4 repetitions of 45 second whole body vibration were given. The author concluded that the proprioceptive control of posture was improved with whole body vibration in stroke patients and no adverse effect was observed due to whole body vibration.
18. **E. Meg et al., (2003)**³³ in this journal the authors were reviewed the various assessment tools for unilateral neglect assessment. The following assessment tools are reviewed extensively and their uses and drawbacks were analysed and given suggestions for the assessment, Line bisection tests (LIB), Star cancellation tests (SC), copying and drawing tests, and Behavioural inattention test (BIT), semi-structured scale for functional evaluation of Hemi-inattention and Catherine Bergego Scale (CBS).
19. **A. Maravita et al., (2003)**³⁴ showed that prism adaptation can reduce the tactile inattention in stroke patients with unilateral neglect. 4 patients with visuospatial neglect and tactile extinction underwent 10 minute application of 20 degree right-shifting prismatic lenses during pointing. This PA therapy improved contralateral tactile perception in all patients. This finding suggests that the prism adaptation plays potential role in the rehabilitation of multisensory modality in patients with unilateral neglect.
20. **R. Pierce et al., (2002)**³⁵ in this study the author investigate the different treatment protocol for unilateral neglect patients. The treatments are- mental imaginary treatment, prism therapy, half eye-field patching and hemi-spatial glass, Caloric stimulation (CS), Optokinetic stimulation(OKS), Neck muscle vibration, Trunk rotation training. A

number of treatment methods were appearing potentially successful in treating the neglect. In some patient's optokinetic and vestibular stimulation treatment effects were limited in duration and efficacy of repeated treatment was not investigated. The author concluded that one treatment is not much efficient. The different subtypes of neglect may respond to different treatment.

21. J Maggie et al., (2002)³⁶ evaluated the use of 2 approaches to reduce UVN (unilateral visual neglect) in people who had stroke. 7 elderly severe left unilateral visual neglect (UVN) patients with age 60 to 85 years were recruited from a stroke rehabilitation unit. Five subjects received a scanning and cueing approach and 2 subjects received a contralesional limb activation approach for one-hour sessions. UVN was examined by using the Star cancellation test, Line bisection test, and Baking tray task. Data was analyzed using visual and inferential statistical techniques. Both approaches limb activation and cueing showed positive effect in UVN.

22. Kerkhoff et al., (2002)³⁷ evaluated the effect of neck vibration in spatial neglect. A two matched groups of 10 patients suffering from left sided neglect received a treatment of visual exploring alone or in combination with neck muscle vibration. The result showed significant improvement in combination treatment. A specific and lasting reduction in symptoms of neglect was achieved in the visual mode. The improvement was evident after two months completion of treatment. In contrast, isolated exploration training resulted in only minor therapeutic benefits in visual exploration without any significant transfer effects to other tasks.

23. Jefferson D. Grubb et al., (2002)³⁸ in this study the author resolved the effects of body orientation on spatial neglect with the help of covert attention task which allowed the evaluation of the effects of trunk orientation on the performance on attention to space and ability to shift that attention to new locations. 18 undergraduates students 15 females and 3 males were participated in this study and the participants were received the trunk orientation treatment. The result indicated that trunk orientation induces directional biases in ability to shift attention in neglect patients.

24. S. Jeffrey et al., (2001)³⁹ investigate the effects of computer assisted training (CAT) program for patients with unilateral neglect. 20 patients with left unilateral neglect were assigned in CAT program and 20 patients were assigned to a control group. The CAT group received the 12 to 20 sessions of treatment for 45 minutes. The main outcome measures- video tracking test, video obstacle course test and real life wheelchair

obstacle course (WCOC) were used in this study. The results showed that the CAT group performed significantly better on the WCOC and had fewer incident reports than control group during hospitalisation.

- 25. S Ishiai et al., (2000)**⁴⁰ the authors clarified the mechanism of left unilateral neglect. 8 patients with typical unilateral neglect underwent line bisection and representational bisection task on computer display with a touch panel. The performances of two bisection tasks were compared when the length and position of stimulus lines were varied. The results showed that the error in the representational were greater than or equivalent to in the line bisection with cueing.
- 26. Geminiani et al., (1998)**⁴¹ studied the effects of acute dopaminergic stimulation in patients with neglect. Two tasks were evaluated before and after subcutaneous administration of apomorphine and placebo and two test- crossing test and a test of target exploration was performed in both perceptual and in perceptual motor conditions for neuropsychological evaluation. Four patients with neglect was included in this study. The authors found the significant improvement after dopaminergic stimulation. Three of the patients had a more marked improvement in the perceptual-motor condition of the task than the perceptual condition.
- 27. C. Guariglia et al., (1998)**⁴² in this study 9 patients right brain damaged with unilateral neglect were included and they performed a set of tasks involving mental imagery with or without TENS (Transcutaneous electrical neural stimulation) to both sides of the neck. The results showed that TENS on the left side of the neck produced significant improvements on the left side of mental representations of objects- in drawing and shape comparison as well as on the left side of mental images of space- description of squares. The results suggest that the modification induced by TENS may affect the imagery systems involved in objects as well as in space representation.
- 28. G. Rade et al., (1998)**⁴³ studied the effect of vestibular stimulation on motor performance in 2 groups of hemiplegic patients, one included 9 right brain damaged (RBD) patients with neglect, the other 9 left brain damaged (LBD) patients without neglect. They observed that RBD group showed significant improvement of motor performance after stimulation but LBD group was not improved with vestibular stimulation but motor scores were unchanged in both the cases. A moderate improvement was noticed in one patient who had shown transient sign of neglect at the acute stage.

- 29. Sumio Ishiai et al., (1997)⁴⁴** identified that unilateral neglect disappeared after following simple instructions. 4 patients with typical USL was included and patients were instructed to arrange small circles all around the printed circle to performed copying and arrangement task to make the figure. The author concluded that unilateral neglect patient can draw the figure satisfactory if they use a special strategy to arrange small circles.
- 30. Laurent Wiart et al., (1996)⁴⁵** assessed the rehabilitation of unilateral neglect by trunk rotation and scanning training. 2 studies were included and in the study 1, twenty two patients with UNS (unilateral neglect syndrome) were randomly assigned into a two groups- experimental and control group. Patients in group E followed the experimental program 1 hour a day for 1 month (20 hours) and group C followed usual rehabilitation during the same time. In the study 2, five patients with USN followed the experimental program 1 hour a day for 1 month (20 hours). Assessment was done at 0, 30 and 60 day by using a quantitative battery test. The results showed significantly improvement in experimental group than in control group in study 1 but in study 2 improvement was seen in 2 patients.
- 31. Giuseppe Vallar et al., (1995)⁴⁶** assessed the effects of Optokinetic stimulation on the disorders of position sense in both the horizontal and vertical planes. 24 patients with visuo-spatial neglect were included. Both the contralateral side and ipsilateral side of lesion were stimulated in both the horizontal and vertical plane. They found that stimulation with direction of movement improved the lesion of contralateral side, whereas stimulation with an ipsilateral direction worsened the deficit.
- 32. M. Jane Riddoch et al., (1983)⁴⁷** assessed the effect of cueing in unilateral neglect. 5 patients with unilateral neglect and hemianopia took part in two experiments. Cueing was accomplished by placing letters at both ends of the line and instructed to subjects to identify wither the right or left hand letter prior to bisecting line. The results showed a marked decrease in neglect when subjects were cued and forced to report stimuli in their neglected field.

3. MATERIAL AND MEHODS

3.1 STUDY DESIGN: -Experimental

3.2 STUDY SETTING: -

- a) Lovely professional university
- b) Pingla ghar
- c) Tagore Neuro Hospital
- d) NASA Neuro Care

3.3 POPULATION SIZE AND SAMPLING: - 30 (15 Group A and 15 Group B) and Convient Sampling

3.4 SELECTION CRITERIA: -

3.4.1 Inclusion criteria: -

1. Age- 32-60 years
2. Gender- Both males and females
3. Side of stroke- both side with unilateral neglect
4. Able to understand verbal instructions and follow one step commands.

3.4.2 Exclusion criteria: -

1. Haemorrhagic stroke
2. According to American Heart Association Class C and D
3. Significant impairments in visual acuity caused by cataract, diabetic retinopathy, hemianopia.
4. History of other neurological diseases such as psychotic disorders or alcoholism.

Inforemed consent was obtained from each participants and study was approved by the local ethics committee of the Lovely Professional University Department of Physiotherapy.

3.5 PARAMETERS: -

1. Line Bisection Test(LBT)
2. Star Cancellation Test (SCT)
3. Berg Balance Scale (BBS)
4. Functional Independent Measure (FIM)

3.6 INSTRUMENTS AND TOOLS: -

1. Swiss ball



2. TENS



3.7PROCEDURE: -

Informed consent forms are given to the participants and after given their concern the following procedure has been implemented.

GROUP A

The trunk control not only helps us remain upright but also allows weight transfer to free an arm or leg for function. Trunk movement in sitting and standing are initiated from the upper trunk or lower trunk according to the demand of the task. Subjects will be assessed before starting the treatment for balance using Berg balance scale and for functional activity using functional independence measure. The subjects will be performing trunk muscle exercises using swiss ball therapy Swiss ball is very much effective in static and dynamic strengthening of joint and spinal mobility, dynamic trunk control. Fifteen of this group will be giving swiss ball training.

Patient preparations: - The patient has to wear loose clothing during treatment session.

Patient position:- sitting over the swiss ball with both the legs flat on the ground.

Therapist position: - stride standing behind the patient and guarding the patient.



Procedure: - The patient has to sit over the swiss ball and maintain the sitting position. The therapist instructed the patient to turn the trunk towards the affected side and pick objects from the ground and place it on the unaffected side on the table. It is progressed by doing the functional activities, reaching activities, weight shifting in all the direction (anterior-posterior, side to side and pelvic tilting) on swiss ball.

The swiss ball training will be given for 1:30 min including rest period. The activity repetition is based on the patient's performance but the baseline we were kept as 15 repetitions.

GROUP B

15 subjects of this group will be given the conventional therapy that included the:-

- a. Auditory cueing along with manual tapping were given to the affected side upper limb, lower limb and trunk to aware the patient on affected side.
- b. Environmental setup :- We alter the environmental by involving the patient's relative in order to change the environment in such a way that the instruments of daily living placed on the affected side to forcefully making the patient to do the activity on the affected side.
- c. Conventional Transcutaneous electrical nerve stimulation (TENS) given for 15 minutes on the unilateral neglect side for both upper and lower limb to increase the awareness on the neglect side.
 - a. Placement of electrodes- one over the superior trapezium muscle
 - b. Diameter of silicon electrode- 30mm
 - c. Frequency- 100 Hz
 - d. Pulse duration- 100 μ s
 - e. Mean intensity- 0.5 μ A/mm

3.8 STATISTICAL TOOL: - Independent t- test was used to compare the both the groups and paired t- test was used to compare the pre and post value within the groups. Data analysis was done by using the SPSS version of 20.

Table 1

Comparison of Mean and Standard Deviation between both the Groups

Outcome measures	GROUP	MEAN	Std. Deviation
BBS	SBT	18.13	1.727
	CPT	17.73	1.668
LIB	SBT	8.67	.724
	CPT	8.60	.737
SCT	SBT	27.40	1.882
	CPT	27.47	1.807
FIM	SBT	19.20	1.521
	CPT	19.33	1.543

Fig. 1

Comparison of Meand and Standard Deviation of both the groups

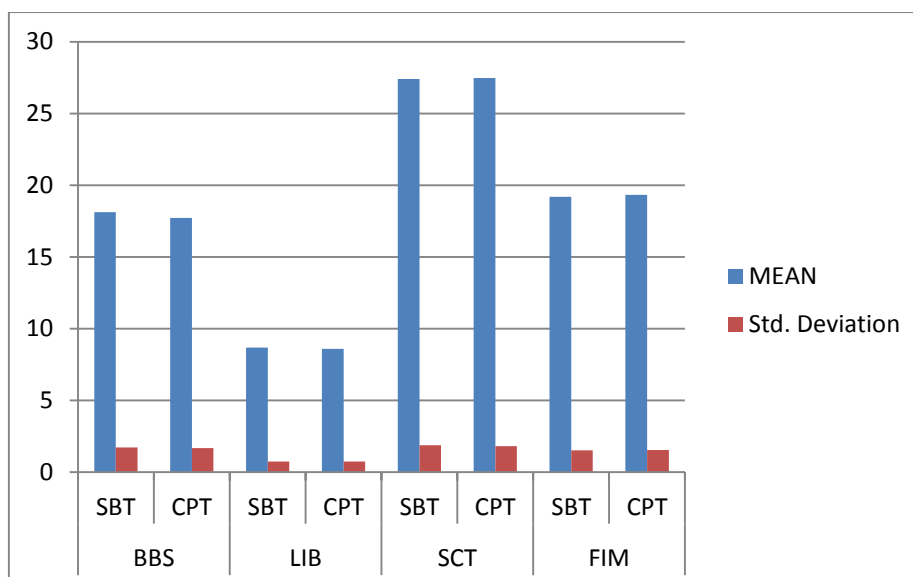


Table 2

Comparison of Mean and Standard Deviation of BBS

	Mean	Std. Deviation
Pre BBS	17.93	1.680
Post BBS 1 ST WK	26.40	4.673
Pre BBS	17.93	1.680
Post BBS 2 nd WK	33.73	3.695
Pre BBS	17.93	1.680
Post BBS 3 rd WK	39.77	5.090
Pre BBS	17.93	1.680
Post BBS 4 th WK	48.63	3.643

Fig. 2

Comparison of Meand and Standard Deviation of BBS

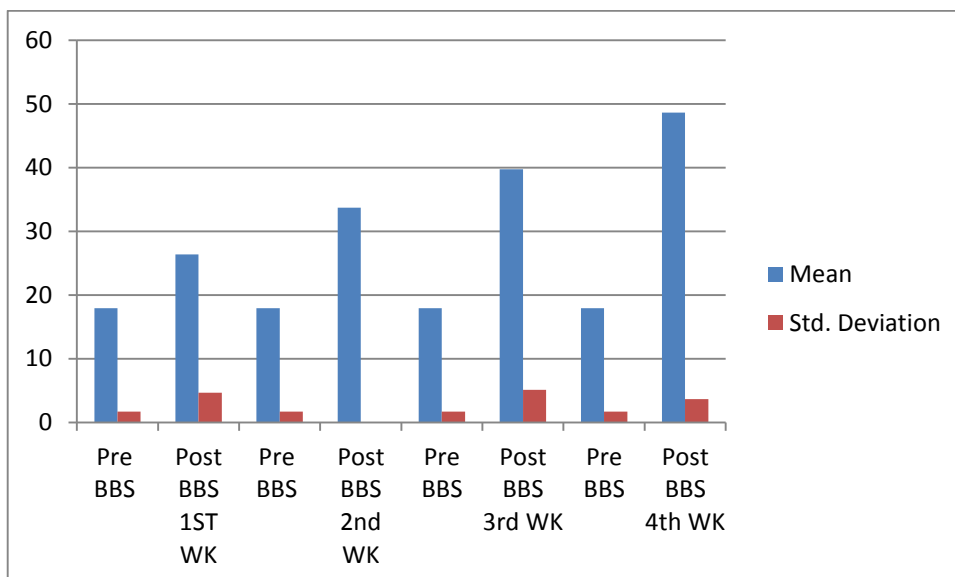


Table 3

Comparison of Mean and Standard Deviation of Line Bisection Test

	Mean	Std. Deviation
Pre LIB	8.63	.718
Post LIB 1ST WK	6.33	1.184
Pre LIB	8.63	.718
Post LIB 2nd WK	4.70	1.022
Pre LIB	8.63	.718
Post LIB 3rd WK	3.40	.855
Pre LIB	8.63	.718
Post LIB 4th WK	2.23	1.104

Fig. 3

Comparison of Mean and Standard Deviation of Line Bisection Test

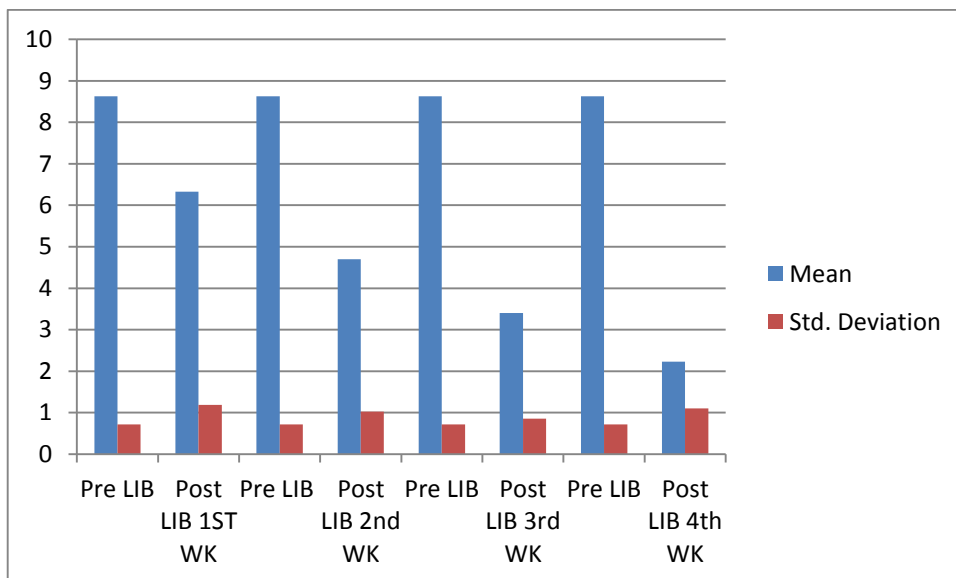


Table 4

Comparison of Mean and Standard Deviation of SCT

	Mean	Std. Deviation
Pre SCT	27.43	1.813
Post SCT 1st WK	36.07	1.946
Pre SCT	27.43	1.813
Post SCT 2nd WK	42.70	1.915
Pre SCT	27.43	1.813
Post SCT 3rd WK	48.20	1.562
Pre SCT	27.43	1.813
Post SCT 4th WK	52.80	1.157

Fig. 4

Comparison of Mean and Standard Deviation of SCT

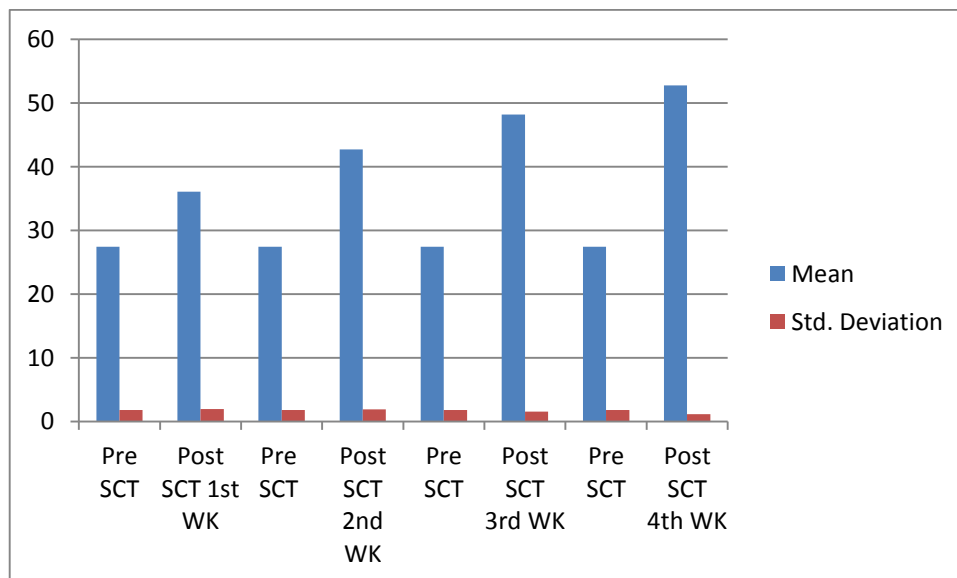


Table 5

Comparison of Mean and Standard Deviation of FIM

	Mean	Std. Deviation
Pre FIM	19.27	1.507
Post FIM 1 st WK	36.73	4.283
Pre FIM	19.27	1.507
Post FIM 2 nd WK	58.83	3.687
Pre FIM	19.27	1.507
Post FIM 3 rd WK	73.47	4.946
Pre FIM	19.27	1.507
Post FIM 4 th WK	100.87	9.183

Fig. 5

Comparison of Mean and Standard Deviation of FIM

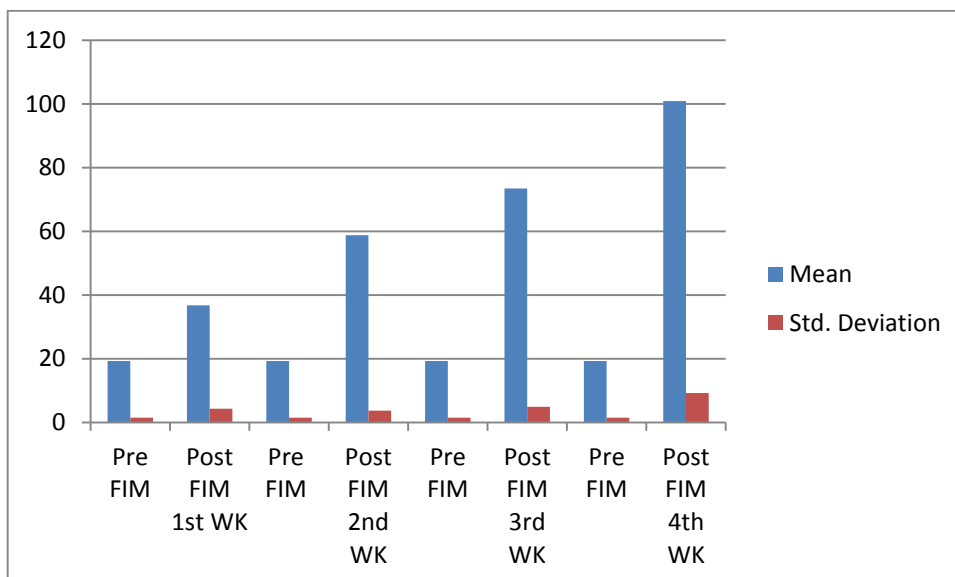


Table 6

Independent Sample test to compare the Various Outcome Measures

Outcome measures	Levene's Test for Equality of Variances		t- test for Equality of Means
	F	Sig.	Sig. (2 –tailed)
1 to 4 weeks			
Pre BBS TEST	.006	.938	.524
Post BBS 1 st WK	3.093	.090	.102
Post BBS 2 nd WK	.699	.410	.011
Post BBS 3 rd WK	.524	.475	.005
Post BBS 4 th WK	.295	.592	.000
Pre LIB TEST	.022	.882	.804
Post LIB 1 st WK	.116	.736	.028
Post LIB 2 nd WK	2.161	.153	.047
Post LIB 3 rd WK	3.826	.060	.088
Post LIB 4 th WK	4.330	.047	.000
Pre SCT	.044	.836	.922
Post SCT 1 st WK	.334	.568	.583
Post SCT 2 nd WK	.097	.757	.302
Post SCT 3 rd WK	1.366	.252	.493
Post SCT 4 th WK	.014	.907	.353
Pre FIM TEST	.048	.828	.813
Post FIM 1 st WK	.328	.571	.000*
Post FIM 2 nd WK	15.061	.001	.083
Post FIM 3 rd WK	7.288	.012	.001
Post FIM 4 th WK	5.145	.031	.000

The table 6 showed the significant improvement in all the outcomes(.000) but in SCT not showed much improvement as compared to other outcome measures, (p<0.001)

RESULTS

Total 30 participants were included in this study and data analysis was done. This study found that swiss ball training is improved drastically as compared to conventional physiotherapy in unilateral neglect patients.

In the table 1 mean and standard deviation of both the groups were calculated. Table 2 showed significantly improvement in pre BBS with (M=17.93, Std = 1.680) than to post BBS 4th week (M=48.63, Std= 3.643).

Difference between pre and post test scores of LIB were recorded and are shown in table 3, pre LIB (M=8.63, Std = .718) and post LIB 4th week (M=2.23, Std= 1.104). LIB showed significantly improvement after the treatment of swiss ball.

Table 4 showed the comparison of SCT in pre and post test. In pre SCT(M= 27.43, Std= 1.813) and in post SCT 4th week (M= 52.80, Std= 1.157). As comparing with the other outcome measures SCT not showing that much improvement after the treatment of swiss ball in unilateral neglect.

Table 5 showed gradually improvement in FIM scoring after the treatment of swiss ball in ULN when compared the pre FIM (M= 19.27, Std = 1.507) with post FIM 4th week (M= 100.87, Std= 9.183).

Independent sample t- test for all the outcome measures was calculated in table 6 and showed significant improvement in all the outcome measures (sig.=.000) but in SCT (sig.= .353) not showing that much improvement when compared with other outcome measures.

The only test that not scored close to significant result was star cancellation test (SCT) but other test berg balance score (BBS), line bisection test (LIB) and functional independence measure (FIM) were close to significant result ($p < 0.001$).

DISCUSSION

The result shown that after the swiss ball training there was a significant improvement in balance and functional activities by reducing the symptoms of ULN. After calculating the significant result the data from this study indicate not much significant improvement in Star cancellation test(SCT) after the treatment of swiss ball in unilateral neglect but the other result that was close to the significant value in swiss ball group ($p < 0.001$) showed significant improvement. This data indicates that swiss ball training helpful to reducing the symptoms and improving the balance and also increase the independency of the patient with unilateral neglect. swiss ball is the one of the instrument tool that helps in improving the balance and reducing the symptoms in various neurological conditions and also widely used in the vestibular rehabilitation. But in this study we utilizing the swiss ball in unilateral neglect patients to aware the patients on the neglect side and also for the balance training. Memory of movement awareness is lost following stroke by means of swiss ball training the neural circuitry of the affected area is restricted effectively compared to conventional physiotherapy and forced recovery has been implemented and this might be the result of swiss ball training following stroke. We tried the swiss ball training and conventional physiotherapy and we found that the swiss ball showed drastic improvement in unilateral neglect as compared to conventional physiotherapy. Another possible mechanism of swiss ball training in ULN patients will enhance the movement sense which was not there in ULN. The mechanism behind the swiss ball training made the endolymph fluid in semicircular canal will fire the neurons and this will create the patient to aware the movement of trunk and there by patient will turn to the affected side and start reducing the neglect symptoms.

W. Wang et al., 2015¹⁸ explained the therapeutic effect of mirror neuron therapy (MNT) as a brain rehabilitation for motor function and language function in neglect patients. Mirror neuron is an important neural substrate for action understanding, imitation, language learning and empathy. Mirror neuron system (MNS) includes inferior frontal gyrus (BA44), premotor cortex (BA6) and inferior parietal lobule (BA39,40). It has been found that mirror neuron system activation lead to improvement in motor as well as language function of stroke patients with aphasia and Hemispatial neglect is also due to the dysfunction of inferior parietal lobule (MNS area). In the result they found that with MNT reduces the hemispatial neglect symptoms. R. R Patole et al., 2015¹⁷ studied the effect of task specific treatment in 10 right side stroke patients with ULN. All the patients were assessed by using the Functional Independence Measure (FIM)

outcome measures and all the patients received intervention for 6 weeks with visual scanning technique, Affolter's guiding technique and compensatory strategies. After the treatment FIM showed significant improvement ($p=0.005$). In the present study we included swiss ball training and FIM it showed significant improvement in functional activity ($p= 0.000$). S. Pitzalis et al., 2013⁴⁸ studied the effects of Transcutaneous electrical nerve stimulation (TENS) on neglect patients. 6 left unilateral spatial neglect(USN) patients were included on the basis of line bisection test and stimulation was given over neck for 15 minutes and measures was taken before and after the treatment protocol. The result showed significant effect of TENS in LIB ($p <0.005$) but in our study LIB ($p =0.00$) showed significant effect of swiss ball training and conventional physiotherapy in reducing the symptoms of ULN. K. Mizuno et al., 2011²⁵ determined the effect of prism adaptation therapy for the rehabilitation of unilateral spatial neglect (USN). BIT and FIM were evaluated to measure the USN and the PA therapy was given for 2 weeks and the result showed that BIT and FIM showed significant improvement in prism group. M. Chan et al., 2006³⁰ investigated the effect of voluntary trunk rotation and half-field eye patching to treat patients with ULN. Patients were assessed on days 0, 30 and 60 by using the BIT and FIM. 19 patients received voluntary trunk rotation(VTR) training for 1 hour 5 times a week for 30 days and 20 patients received both half eye field patching and VTR and 15 patients was in control group. The result of this study do not support the use of VRT and eye patching to improve functional performance or reduce neglect in stroke patients but in present study the swiss ball training was very much effective in improving the functional performance nad reduces the neglect in stroke patients. D. Chin et al., 2013⁴⁹ investigated the effect of primary caregiver participation in vestibular rehabilitation for unilateral neglect patients with right hemispheric stroke on improving the measures of neglect, activities of daily living (ADLs) and balance. The author of this study also explained the mechanism of vestibular rehabilitation in ULN patients. The vestibular system contributes to a wide range of functions from postural and oculomotor reflexes to spatial representation and cognition. They found that healthy subjects may also showed the similar symptoms of ULN after unilateral vestibular stimulation, such as deviation of the eyes or head to the ipsilateral side. Both spatial neglect and vestibular processing at the cortical level show dominance in the right hemisphere and involve common brain areas. Therefore ULN highly related to the dysfunctions of the vestibular system or of various types of sensory inputs. L. Pizzamiglio et al., 2003⁵⁰ investigated the use of optokinetic stimulation in rehabilitation of the hemineglect disorder. The standard line bisection test was used to identify the neglect and FIM for the daily activities. The result showed that optokinetic stimulation helps in reducing the neglect symptoms but it

was not showing improvement in the FIM score but in our study we used the FIM measures to identify the functional activity and after the treatment of swiss ball training our result showed significantly improvement in the FIM scores. Rubens et al., 1985 described the prototypical stimulation. An injection of ice water in the outer ear canal of neglect patients produced vestibular stimulation with two main consequences:-a) nystagmus with a slow phase toward the left side, b) reduction of neglect disorders on the left side of space. L. Johannsen et al., 2003⁵¹ evaluated that neck muscle vibration has the potential to reduce spatial neglect. spatial neglect was diagnosed with the Letter cancellation test and they found the significant improvement after the treatment periods for the letter cancellation test ($p= 0.02$) but in our study we diagnosed the ULN with star cancellation test (SCT) and we didn't find that much improvement in SCT ($p= 0.353$) as compared to other outcome measures after the swiss ball training.

The limitation of this study are small sample size and the study did not specified the side of unilateral neglect,the type of stroke patients

CONCLUSION

The result of this study indicates that the neglect, functional activity and balance of ULN patients can be improved through the swiss ball training. The physiotherapy protocol for rehabilitating the ULN patients need to include swiss ball training in order to reduce the disability and movement deficits.

FUTURE SUGGESTIONS

1. Randomized controlled study need to be implement.
2. Specific type of ULN can be analysed.
3. Comparison of swiss ball training and virtual reality training can be done.

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8.3 APPENDIX

3. MASTER CHART

S.NO	Group	PRE BBS	POST BBS 1st WK	POST BBS 2nd WK	POST BBS 3rd WK	POST BBS 4th WK	PRE LIB	POST LIB 1st WK	POST LIB 2nd WK	POST LIB 3rd WK	POST LIB 4th WK	PRE SCT	POST SCT 1st WK	POST SCT 2nd WK	POST SCT 3rd WK	POST SCT 4th WK	PRE FIM	PRE FIM 1st WK	POST FIM 2nd WK	POST FIM 3rd WK	POST FIM 4th WK
1	1	20	35	41	48	54	8	6	5	3	1	25	32	40	46	52	18	36	50	72	100
2	1	18	25	33	38	48	9	7	4	3	2	28	38	45	50	54	20	40	62	80	110
3	1	20	36	40	47	54	10	6	4	2	1	26	34	42	48	52	18	38	52	70	100
4	1	17	22	33	38	48	9	7	4	3	1	28	37	44	49	53	22	40	60	74	115
5	1	18	25	35	41	50	8	7	5	4	2	25	34	42	48	54	18	36	55	72	100
6	1	20	34	39	49	53	9	5	4	3	1	30	38	45	50	54	18	38	52	71	110
7	1	15	24	34	40	52	8	4	3	3	2	28	38	45	49	54	20	45	62	84	120
8	1	19	28	35	42	50	10	5	4	2	1	27	36	42	47	53	19	42	60	80	115
9	1	18	26	34	40	50	8	6	5	4	3	25	35	40	46	52	18	38	56	74	105
10	1	15	23	32	40	52	9	8	6	4	2	30	38	44	50	54	18	36	52	71	100
11	1	18	25	34	39	49	8	6	4	3	2	29	38	45	50	53	22	42	64	82	112
12	1	17	25	32	37	48	9	5	4	3	1	27	36	43	48	52	20	40	60	78	105
13	1	20	33	39	48	54	8	6	5	4	2	25	34	40	45	50	18	36	57	75	105
14	1	20	34	40	49	55	8	5	4	3	1	30	38	45	50	54	21	45	63	82	115
15	1	17	22	30	38	49	9	5	4	3	1	28	38	44	50	54	18	41	60	80	110
16	2	17	21	31	35	44	8	7	5	4	2	27	36	43	48	52	19	35	60	70	92
17	2	16	25	29	32	41	8	6	4	2	2	25	32	40	47	52	18	32	59	70	91
18	2	18	21	32	38	45	9	7	5	4	4	28	38	45	50	54	18	31	60	68	91
19	2	19	28	31	39	47	8	6	5	4	3	30	37	43	48	53	19	33	59	71	93
20	2	20	32	38	46	50	9	8	6	5	3	27	35	41	46	52	19	32	57	70	91
21	2	15	25	28	38	49	9	7	5	4	4	30	37	43	48	53	21	38	61	72	95
22	2	15	22	29	35	48	10	9	7	5	5	28	37	42	47	51	22	41	65	80	100
23	2	16	25	30	29	41	9	8	6	4	4	25	35	40	47	52	19	33	61	72	93
24	2	18	22	34	36	46	8	5	4	3	2	29	38	45	50	54	18	30	59	68	92
25	2	19	27	32	40	49	8	6	3	3	2	28	37	44	50	54	17	31	57	65	89
26	2	17	21	29	32	43	10	8	7	5	4	26	35	42	48	53	19	32	60	69	91
27	2	18	21	32	39	45	8	5	4	2	2	30	38	45	50	54	18	30	58	69	90
28	2	19	25	34	37	48	8	6	5	3	2	25	32	40	46	51	22	39	62	73	105
29	2	19	27	33	39	48	9	7	6	4	3	28	36	42	48	53	20	35	60	71	93
30	2	20	33	39	44	49	8	7	4	3	2	26	35	40	47	51	21	37	62	71	98

BBS- Berg Balance Scale;LIB- Line Bisection Test;SCT= Star Cancellation Test;FIM- Functional Independence Measure

8.1 APPENDIX-1

CONSCENT FORM

PERSONAL DETAILS:

Name:

Address:

Phone No:

Email Address:

Date of Birth:

Occupation:

Please carefully read and sign this form.

1. I understand that it is important that I give the most accurate health history and information to my physiotherapist so that any planned treatments and therapies are in by best interest.
2. I understand that my physiotherapist will discuss any assessment and treatment plans with me before they are administered.
3. I understand the risk of physiotherapy treatment can include but it is not limited to an exacerbation of symptoms, strains, sprains allergic reactions, electrical shocks and burns.
4. I understand the consequences of not receiving treatment can include but is not limited to a continued exacerbations of symptoms or no improvement of symptoms.
5. I understand that I can discuss my interest or disinterest in the treatments with my physiotherapist.
6. I have read and understand the contents of this form. I hear by grant permission to my physiotherapist to perform the assessment and treatments that may that may be necessary to treat my condition or injury.
7. I understand that my physiotherapist will also provide further details regarding the benefits, risks, consequences, and availability of alternative and adjunctive therapies specific to my symptoms during the course of the assessment and treatment.
8. I also understand that I can withdraw consent to any component of the assessment or treatment at any time.

DATE: _____

PATIENT SIGNATURE:

8.4 APPENDIX-4

TREATMENT PROTOCOL

GROUP A

Swiss ball training (1hour and 30 minutes with rest period)

- a. Picking the objects from the affected side floor.
- b. Placing the objects on the unaffected side for 15 repetitions.
- c. Trunk rotation to the both side on sitting on swiss ball 15 repetitions.
- d. Side to side weight shifting 15 repetitions.
- e. Antero-posterior weight shift on affected side 15 repetitions.

GROUP B

- a. Auditory cueing and manual tapping on the affected side upper, lower limb and trunk.
- b. Conventional TENS 15 minutes depending upon the patient perception over the affected side of neck and both upper and lower limb.
 - i. Placement of electrodes- one over the superior trapezium muscle
 - ii. Diameter of silicon electrode- 30mm
 - iii. Frequency- 100 Hz
 - iv. Pulse duration- 100 μ s
 - v. Mean intensity- 0.5 μ A/mm
- c. We alter the environmental by involving the patient's relative in order to change the environment in such a way that the instruments of daily living placed on the affected side to forcefully making the patient to do the activity on the affected side.

Berg Balance Scale

The Berg Balance Scale (BBS) was developed to measure balance among older people with impairment in balance function by assessing the performance of functional tasks. It is a valid instrument used for evaluation of the effectiveness of interventions and for quantitative descriptions of function in clinical practice and research. The BBS has been evaluated in several reliability studies. A recent study of the BBS, which was completed in Finland, indicates that a change of eight (8) BBS points is required to reveal a genuine change in function between two assessments among older people who are dependent in ADL and living in residential care facilities.

Description:

14-item scale designed to measure balance of the older adult in a clinical setting.

Equipment needed: Ruler, two standard chairs (one with arm rests, one without), footstool or step, stopwatch or wristwatch, 15 ft walkway

Completion:

Time: 15-20 minutes

Scoring: A five-point scale, ranging from 0-4. "0" indicates the lowest level of function and "4" the highest level of function. Total Score = 56

Interpretation:

41-56 = low fall risk

21-40 = medium fall risk

0 -20 = high fall risk

A change of 8 points is required to reveal a genuine change in function between 2 assessments.

Berg Balance Scale

Name: _____ Date: _____

Location: _____ Rater: _____

ITEM DESCRIPTION	SCORE (0-4)
Sitting to standing	_____
Standing unsupported	_____
Sitting unsupported	_____
Standing to sitting	_____
Transfers	_____
Standing with eyes closed	_____
Standing with feet together	_____
Reaching forward with outstretched arm	_____
Retrieving object from floor	_____
Turning to look behind	_____
Turning 360 degrees	_____
Placing alternate foot on stool	_____
Standing with one foot in front	_____
Standing on one foot	_____

Total _____

GENERAL INSTRUCTIONS

Please document each task and/or give instructions as written. When scoring, please record the lowest response category that applies for each item.

In most items, the subject is asked to maintain a given position for a specific time. Progressively more points are deducted if:

- the time or distance requirements are not met
- the subject's performance warrants supervision
- the subject touches an external support or receives assistance from the examiner

Subject should understand that they must maintain their balance while attempting the tasks. The choices of which leg to stand on or how far to reach are left to the subject. Poor judgment will adversely influence the performance and the scoring.

Equipment required for testing is a stopwatch or watch with a second hand, and a ruler or other indicator of 2, 5, and 10 inches. Chairs used during testing should be a reasonable height. Either a step or a stool of average step height may be used for item # 12.

COMPARATIVE STUDY OF SWISS BALL TRAINING VERSUS CONVENTIONAL PHYSIOTHERAPY IN UNILATERAL NEGLECT

Berg Balance Scale

SITTING TO STANDING

INSTRUCTIONS: Please stand up. Try not to use your hand for support.

- 4 able to stand without using hands and stabilize independently
- 3 able to stand independently using hands
- 2 able to stand using hands after several tries
- 1 needs minimal aid to stand or stabilize
- 0 needs moderate or maximal assist to stand

STANDING UNSUPPORTED

INSTRUCTIONS: Please stand for two minutes without holding on.

- 4 able to stand safely for 2 minutes
- 3 able to stand 2 minutes with supervision
- 2 able to stand 30 seconds unsupported
- 1 needs several tries to stand 30 seconds unsupported
- 0 unable to stand 30 seconds unsupported

If a subject is able to stand 2 minutes unsupported, score full points for sitting unsupported. Proceed to item #4.

SITTING WITH BACK UNSUPPORTED BUT FEET SUPPORTED ON FLOOR OR ON A STOOL

INSTRUCTIONS: Please sit with arms folded for 2 minutes.

- 4 able to sit safely and securely for 2 minutes
- 3 able to sit 2 minutes under supervision
- 2 able to sit 30 seconds
- 1 able to sit 10 seconds
- 0 unable to sit without support 10 seconds

STANDING TO SITTING

INSTRUCTIONS: Please sit down.

- 4 sits safely with minimal use of hands
- 3 controls descent by using hands
- 2 uses back of legs against chair to control descent
- 1 sits independently but has uncontrolled descent
- 0 needs assist to sit

TRANSFERS

INSTRUCTIONS: Arrange chair(s) for pivot transfer. Ask subject to transfer one way toward a seat with armrests and one way toward a seat without armrests. You may use two chairs (one with and one without armrests) or a bed and a chair.

- 4 able to transfer safely with minor use of hands
- 3 able to transfer safely definite need of hands
- 2 able to transfer with verbal cuing and/or supervision
- 1 needs one person to assist
- 0 needs two people to assist or supervise to be safe

STANDING UNSUPPORTED WITH EYES CLOSED

INSTRUCTIONS: Please close your eyes and stand still for 10 seconds.

- 4 able to stand 10 seconds safely
- 3 able to stand 10 seconds with supervision
- 2 able to stand 3 seconds
- 1 unable to keep eyes closed 3 seconds but stays safely
- 0 needs help to keep from falling

STANDING UNSUPPORTED WITH FEET TOGETHER

INSTRUCTIONS: Place your feet together and stand without holding on.

- 4 able to place feet together independently and stand 1 minute safely
- 3 able to place feet together independently and stand 1 minute with supervision
- 2 able to place feet together independently but unable to hold for 30 seconds
- 1 needs help to attain position but able to stand 15 seconds feet together
- 0 needs help to attain position and unable to hold for 15 seconds

Berg Balance Scale continued...

REACHING FORWARD WITH OUTSTRETCHED ARM WHILE STANDING

INSTRUCTIONS: Lift arm to 90 degrees. Stretch out your fingers and reach forward as far as you can. (Examiner places a ruler at the end of fingertips when arm is at 90 degrees. Fingers should not touch the ruler while reaching forward. The recorded measure is the distance forward that the fingers reach while the subject is in the most forward lean position. When possible, ask subject to use both arms when reaching to avoid rotation of the trunk.)

- 4 can reach forward confidently 25 cm (10 inches)
- 3 can reach forward 12 cm (5 inches)
- 2 can reach forward 5 cm (2 inches)
- 1 reaches forward but needs supervision
- 0 loses balance while trying/requires external support

PICK UP OBJECT FROM THE FLOOR FROM A STANDING POSITION

INSTRUCTIONS: Pick up the shoe/slipper, which is in front of your feet.

- 4 able to pick up slipper safely and easily
- 3 able to pick up slipper but needs supervision
- 2 unable to pick up but reaches 2-5 cm(1-2 inches) from slipper and keeps balance independently
- 1 unable to pick up and needs supervision while trying
- 0 unable to try/needs assist to keep from losing balance or falling

TURNING TO LOOK BEHIND OVER LEFT AND RIGHT SHOULDERS WHILE STANDING

INSTRUCTIONS: Turn to look directly behind you over toward the left shoulder. Repeat to the right. (Examiner may pick an object to look at directly behind the subject to encourage a better twist turn.)

- 4 looks behind from both sides and weight shifts well
- 3 looks behind one side only other side shows less weight shift
- 2 turns sideways only but maintains balance
- 1 needs supervision when turning
- 0 needs assist to keep from losing balance or falling

TURN 360 DEGREES

INSTRUCTIONS: Turn completely around in a full circle. Pause. Then turn a full circle in the other direction.

- 4 able to turn 360 degrees safely in 4 seconds or less
- 3 able to turn 360 degrees safely one side only 4 seconds or less
- 2 able to turn 360 degrees safely but slowly
- 1 needs close supervision or verbal cuing
- 0 needs assistance while turning

PLACE ALTERNATE FOOT ON STEP OR STOOL WHILE STANDING UNSUPPORTED

INSTRUCTIONS: Place each foot alternately on the step/stool. Continue until each foot has touched the step/stool four times.

- 4 able to stand independently and safely and complete 8 steps in 20 seconds
- 3 able to stand independently and complete 8 steps in > 20 seconds
- 2 able to complete 4 steps without aid with supervision
- 1 able to complete > 2 steps needs minimal assist
- 0 needs assistance to keep from falling/unable to try

STANDING UNSUPPORTED ONE FOOT IN FRONT

INSTRUCTIONS: (DEMONSTRATE TO SUBJECT) Place one foot directly in front of the other. If you feel that you cannot place your foot directly in front, try to step far enough ahead that the heel of your forward foot is ahead of the toes of the other foot. (To score 3 points, the length of the step should exceed the length of the other foot and the width of the stance should approximate the subject's normal stride width.)

- 4 able to place foot tandem independently and hold 30 seconds
- 3 able to place foot ahead independently and hold 30 seconds
- 2 able to take small step independently and hold 30 seconds
- 1 needs help to step but can hold 15 seconds
- 0 loses balance while stepping or standing

STANDING ON ONE LEG

INSTRUCTIONS: Stand on one leg as long as you can without holding on.

- 4 able to lift leg independently and hold > 10 seconds
- 3 able to lift leg independently and hold 5-10 seconds
- 2 able to lift leg independently and hold \geq 3 seconds
- 1 tries to lift leg unable to hold 3 seconds but remains standing independently.
- 0 unable to try of needs assist to prevent fall

TOTAL SCORE (Maximum = 56)

LINE BISECTION TEST

The Line Bisection Test is a test is a quick measure to detect the presence of unilateral spatial neglect (USN). To complete the test, one must place a mark with a pencil through the center of a series of horizontal lines. Usually, a displacement of the bisection mark towards the side of the brain lesion is interpreted as a symptom of neglect.

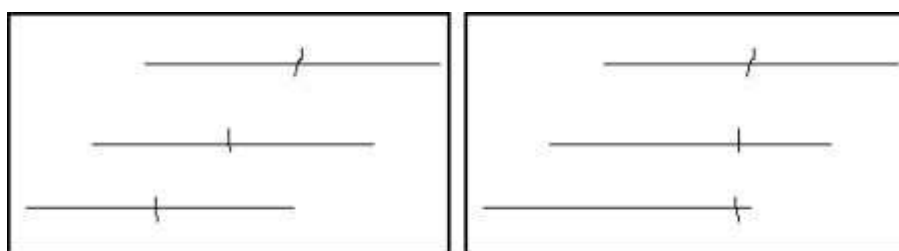
Features of the measure

Items:

Patients are asked to place a mark with a pencil (with their preferred or unaffected hand) through the center of a series of 18 horizontal lines on an 11x 8.5-inch page.

Scoring:

The test is scored by measuring the deviation of the bisection from the true center of the line. A deviation of more than 6 mm from the midpoint indicates USN. Omission of two or more lines on one half of the page indicates USN.



A. Normal line bisection

B. Highly impaired line bisection

Subscales:

None.

Equipment:

- 11x 8.5-inch page of paper with 18 horizontal lines
- Pencil

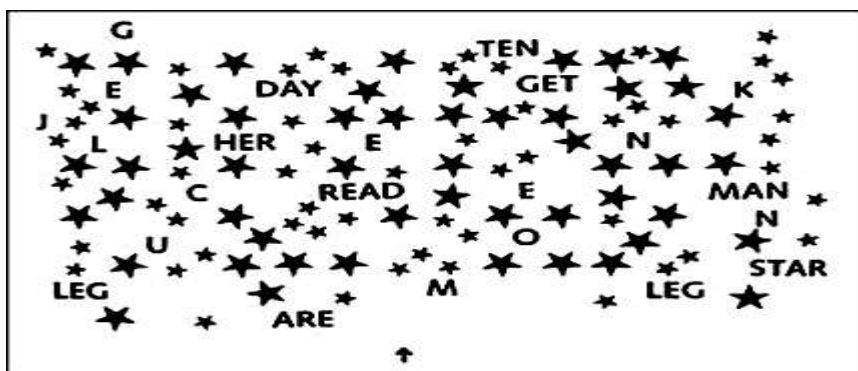
http://strokengine.ca/assess/module_lbt_intro-en.html

Star Cancellation Test

The Star Cancellation Test is a **screening** tool that was developed to detect the presence of unilateral spatial neglect (USN) in the near extrapersonal space in patients with stroke.

Items:

There are no actual items to the Star Cancellation Test. In the Star Cancellation Test, the stimuli are 52 large stars, 13 letters, and 10 short words interspersed with 56 smaller stars (see figure below). The patient must cross out with a pencil all the small stars on an 8.5" x 11" piece of paper. Two small stars in the centre are used for demonstration. The page is placed at the patient's midline.



Scoring:

The maximum score that can be achieved on the test is 54 points (56 small stars in total minus the 2 used for demonstration). A cutoff of < 44 indicates the presence of USN. A Laterality Index or Star Ratio can be calculated from the ratio of stars cancelled on the left of the page to the total number of stars cancelled. Scores between 0 and 0.46 indicate USN in the left hemispace. Scores between 0.54 and 1 indicate USN in the right hemispace

Time:

Less than 5 minutes.

Training:

None typically reported.

Subscales:

None.

Equipment:

- The test paper (8.5"x11" page with 52 large stars, 13 letters, and 10 short words interspersed with 56 smaller stars).
- Pencil

http://strokengine.ca/assess/module_sct_indepth-en.html#section4

FUNCTIONAL INDEPENDENCE MEASURE

	ADMISSION	DISCHARGE	FOLLOW-UP
SELF CARE			
A. Eating			
B. Grooming			
C. Bathing			
D. Dressing-upper body			
E. Dressing- lower body			
F. Toileting			
SPHINTER CONTROL			
G. Bladder Management			
H. Bowel Management			
TRANSFER			
I. Bed, Chair, Wheelchair			
J. Toilet			
K. Tub, Shower			
LOCOMOTION			
L. Walk/Wheelchair			
M. Stairs			
Motor subtotal score			
COMMUNICATION			
N. Comprehension			
O. Expression			
SOCIAL COGNITION			
P. Social Interaction			
Q. Problem Solving			
R. Memory			
Cognitive subtotal score			
TOTAL FIM SCORE			

Independence 7 Complete Independence (Timely, Safely) 6 Modified Independence (Device)	NO HELPER
Modified Dependence 5 Supervision (subject- 100%) 4 Minimal Assist (subject- 75%) 3 Moderate Assist (subject- 50%) Complete Dependence 2 Maximal Assist (subject- 25%) 1 Total Assist (subject- less than 25%)	HELPER

ABSTRACT

A COMPARATIVE STUDY OF SWISS BALL TRAINING VERSUS CONVENTIONAL PHYSIOTHERAPY IN UNILATERAL NEGLECT

Avneet^{a*}, Dr. A. Sridhar^{b*}

^aMPT Neurology , Final Year, Department of Physiotherapy,
Lovely Professional University, Punjab.

^bMPT Neurology, Pursuing Ph.D, Lecturer, Department of Physiotherapy,
Lovely Professional University, Punjab.

Background: - The Unilateral neglect (ULN) is a common behavioural syndrome in patients following stroke. It is the one of the common disabling condition following unilateral brain damage, particularly of the right hemisphere. Swiss ball is the one of the instrument tool which helps in improving the balance and reducing the symptoms in several neurological conditions, whereas no information is available regarding the use of Swiss ball training in unilateral neglect patients. Unilateral neglect is the negative predictor that can interfere with a patient's rehabilitation and its treatment is important in the early stage. We are providing the swiss ball exercises and Conventional therapy to encourage the patient to orient on the affected side.

Methods: - The study used an experimental design. This study compared the improvement at 4 weeks among patients treated with swiss ball training and conventional therapy. The severity of ULN was measured by using the line bisection test (LBT), mobility was assessed by using the functional independence measure (FIM) and balance was assessed by berg balance scale (BBS).

Participants: - Total numbers of participants are 30, which are divided into 2 groups (swiss ball and conventional therapy group). Selection criteria for the patients are inclusion criteria age between 32 to 60 years, both males and females, stroke with unilateral neglect were included. Exclusion criteria haemorrhagic stroke, any visual impairment and other psychotic disorders were excluded from the study.

Result:-The result showed that post intervention in both the groups improved in all the outcome measures (LBT, BBS and FIM) but the swiss ball training group improved more significantly than the conventional group. The level of significance was set at $P < 0.05$

Conclusion: - The result of this study indicates that the neglect, functional activity and balance of ULN patients can be improved through the swiss ball training. The physiotherapy protocol for rehabilitating the ULN patients need to include swiss ball training in order to reduce the disability and movement deficits.

Keywords: - unilateral neglect, swiss ball, balance and trunk control