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The Effectiveness of Proprioceptive & Sensory Reweighing Training in Improving the Balance of Ambulatory Hemiplegics.

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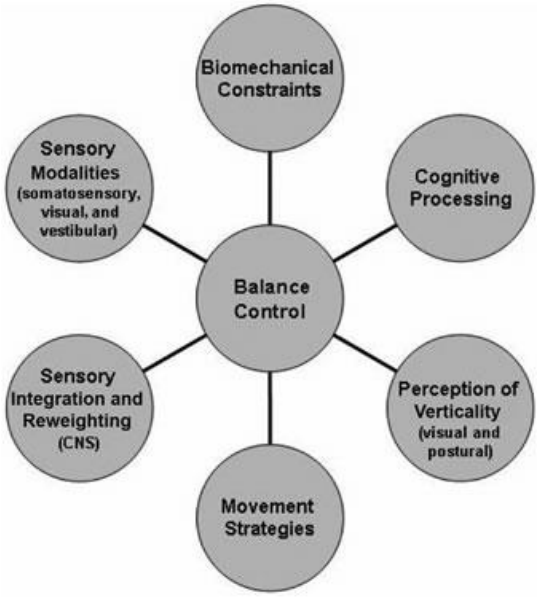
Introduction:

Balance control is a fundamental motor behavior in stance and gait that allows an individual to maintain and adopt various postures, react to external pertubations and use automatic postural responses that precede voluntary movements. Balance control requires the integration of visual, somatosensory, and vestibular inputs and their adaptations to changes in the environment and in the task being performed. Balance is described as the ability to maintain equilibrium in a gravitational field by keeping or returning the centre of mass of body over its base of support[1]



Three sensory modalities are mainly involved in postural control: somatosensory, visual, and vestibular afferents. Integration of information from these systems is crucial for adequate postural control. Sensory information is regulated dynamically and modified by changes in environmental conditions[3]

Despite the availability of multiple sources of sensory information, in a given situation, the central nervous system (CNS) gives priority to one system over another to control balance in the orthostatic position[3,4,5]

The ability to choose and rely on the appropriate sensory input for each condition is called sensory reweighting[8,9]

When one is standing on an unstable surface, for instance, the CNS increases sensory weighting to vestibular and visual information and decreases the dependence on surface somatosensory inputs for postural orientation. **On the other hand, in darkness, balance control depends on somatosensory and vestibular feedback**[2]

Excessive reliance on visual input may be a learned compensatory response that occurs over time [2]. Relying on a single system can lead to inappropriate adaptations and, hence, balance disturbances

Aims/Objectives :

- To Improve the balance of Ambulatory Hemiplegics.
- To increase the reliance of the patient upon the non-visual cues for balance control in Ambulatory Hemiplegics
- To achieve independence from ,walking with Walking Aids(eg:Cane) in Ambulatory Hemiplegics.

Research Design :

- Pre & Post Test Experimental Study Design

Sampling :

- The subjects will be selected through Systematic Random Sampling Techniques .

Sample Size:

Approx 30 stroke patients between 4 mths to 100 mths post onset are included in the study.

Duration of Study:

- 4 weeks.

Inclusion Criteria:

- Diagnosed Cases of Stroke
- Functional and community ambulators with or without ankle foot orthosis and cane.
- Patients with history of Hemiparesis due to stroke and limited ambulation.
- Patients who are able to accept and eligible to undertake balance training on a stability trainer.

Exclusion Criteria:

- No perceptuo – cognitive deficits like hemispatial
- neglect, attention, and memory deficits.
- Any significant radiological findings such as fracture of lower limb.
- Wernicke's or Global aphasia
- Patients who have complications of foot like Diabetic Foot

INSTRUMENTATION / MATERIALS USED

- **Equipments needed for Assessment**
    - Ruler 2 standard chairs (one with arm rests, one without)
    - Footstool or step
    - Berg Balance Assessment form
- **Equipments needed for Treatment**
    - Patients record sheets
    - Chair
    - Watch
    - Blind Fold
    - Stability Trainers(Green,Blue,Black)

Procedure

30 stroke patients ranging between 4 mths to 100 mths post onset were included in the study. All subjects were community and functional ambulators. They were assessed on Berg's Balance Scale. They were divided into control group and experimental group.Control group patients were offered 14 Exercises to improve balance devoid of Proprioceptive Training on Stability Trainers and Experimental Group were offered 14 exercises to improve balance with **Proprioceptive Training on Stability Trainers with Blind Fold Applied covering their eyes.** And Pre And Post Experiment Assessment. 14 exercises were performed on 4 challenge levels(single green, single blue, green on green, blue on green, green on blue, blue on blue) of Stability Trainer depending on their performance. They were on 4 weeks training programme with each challenge level lasting for days of duration each.

Assessment:

Berg Balance Scale:

Berg Balance Scale is a recommended assessment of balance for post stroke rehabilitation.The test consist of 14 balance items, common in everyday life and are graded on a five –point scale ranging from 0 to 4, where 0 indicates the patients inability to perform the task & 4 represent independence.

The test takes about 15 mins to administer & require only a watch & a ruler.

Result & Discussion

Comparision of Mean BBS (Pre & Post) in studied groups

BBS score Range	Group A		Group B	
	Pre	Post	Pre	Post
<20	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
20-40	12 (80.0%)	0 (0.0%)	11 (73.3%)	0 (0.0%)
>40	3 (20.0%)	15 (100.0%)	4 (26.7%)	15 (100.0%)
Total	15	15	15	15

Table 3.2: Comparision of Mean BBS (Pre & Post Intervention)

BBS score	Group A		Group B	
	Pre-Intervention	Post Intervention	Pre-Intervention	Post-Intervention
Mean ±SD	35.40 ±4.137	47.87 ±3.420	36.00 ±4.645	52.13 ±3.159
Significance	t=13.70: P<0.0001		t=11.664: P<0.0001	

Group A-Control Group and Group B-Experimental Group

Description

These tables show the comparison of Pre and Post Interventions BBS score in both studied groups.In group A(Control Group) 80% cases fell in 20-40 score range and 20% fell in >40 score range.Their corresponding post intervention finding showed improvement by 100% ie. Score >40.The mean BBS prior to intervention was 35.40(+4.137).While it was 47.87(+3.420) in post-intervention observation.This showed a significant increase.(P< 0.001)Similarly ,in Group B(Experimental Group) 73.3% cases were in >40 range which after intervention were found 100% with score > 40.The mean BBS score ,pre- intervention in this group was 36.00(+ 4.64) and it improved to 52.13(+3.159) respectively for pre and post intervention.

Conclusion:

The Mean Value of BBS in Control Group in Pre Intervention Assessment was 35.4 which rose to 47.87 in the Post Intervention Assessment.This reflected a marked increment of 22 % in the Mean Score.

However ,the The Mean Value of BBS in Experimental Group in Pre Intervention Assessment was 36 which rose to 52.13 in the Post Intervention Assessment.This reflected a marked increment of 29%in the Mean Score.This reflected a net 7% better performance than the control group as far as the mean values were concerned.

Thus, we can safely conclude that sensory inputs are manipulated by altering the support surface and environments

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