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Original Article

ALTERNATIVE METHODS FOR IMPROVING BALANCE IN STROKE RECOVERY: VISUAL AND VERBAL CUES AS COST-EFFECTIVE MODALITIES

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ABSTRACT

Objective: Stroke is a significant global health concern, leading to high mortality and disability rates. Prompt assessment, management, and rehabilitation are crucial for improving clinical outcomes. Balance impairment is a common consequence of stroke, affecting the majority of survivors and increasing the risk of falls and disability.

Methods: The study included 30 post-stroke hemiplegic individuals, randomly assigned to a control group and an experimental group. The control group received conventional physical therapy, while the experimental group received additional visual and verbal feedback. The Berg Balance Scale was used to assess balance on days 1, 15, and 30.

Results: Both groups showed improvements in balance scores over time. However, the experimental group consistently had higher scores, indicating a greater effect of incorporating visual and verbal cues with conventional therapy.

Conclusion: Our study demonstrates that the combination of visual and verbal cues with conventional therapy leads to improved balance outcomes in stroke recovery. These findings support the benefits of visual feedback, verbal feedback, and mirror therapy in stroke rehabilitation. Incorporating these alternative methods can be cost-effective and accessible interventions to enhance balance, reduce fall risk, and improve the overall recovery and quality of life in stroke survivors.

Keywords: Stroke rehabilitation, Balance impairment, Visual and verbal cues, Conventional therapy

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INTRODUCTION

Stroke, defined as a rapidly developing disturbance of cerebral function, continues to be a significant global health concern, with high mortality and disability rates. It ranks as the second most prevalent cause of mortality worldwide and holds the top position in terms of disability rates. The economic burden of stroke is substantial, with a significant portion of healthcare expenditures allocated to stroke-related costs in Western nations. Prompt assessment, management, and rehabilitation are crucial for maximizing clinical outcomes and reducing the overall burden of stroke [1].

The two primary types of stroke, ischemic and hemorrhagic, have distinct etiologies but share the potential for significant neurological recovery if treated promptly. Ischemic strokes, resulting from disrupted blood flow to the brain, account for the majority of stroke cases. The concept of "time is brain" emphasizes the importance of early intervention in stroke cases to mitigate neurological damage. Preventing strokes requires addressing various risk factors, including advanced age, hypertension, diabetes mellitus, smoking, established cardiovascular disease, atrial fibrillation, and left ventricular hypertrophy. Hypertension, in particular, plays a significant role as the most influential risk factor for stroke. Uncontrolled hypertension can lead to lacunar infarcts and hypertensive intracerebral hemorrhages, while atherosclerosis predominantly contributes to ischemic strokes. Furthermore, gender-specific risk factors, such as pregnancy-related complications and hormone use in women, must be considered in stroke prevention strategies [2].

Balance impairment is a common consequence of stroke, affecting approximately 83% of stroke survivors. It leads to reduced supporting time, asymmetries between the body's sides, decreased walking speed, and an increased risk of falls. The fear of falling further contributes to a sedentary lifestyle, increased disability, and diminished quality of life. Falls result in extended hospital stays, higher medical expenses, and economic losses [3].

Gait impairments in stroke survivors, including decreased speed and asymmetries, contribute to falls and compromised independent mobility. Auditory and visual cues have shown the potential in improving gait coordination in stroke survivors. While auditory cues appear effective in adjusting gait during straight walking, visual cues may be more effective for triggering gait adjustments in healthy individuals. Visual information plays a crucial role in maintaining dynamic stability during walking, and stroke survivors heavily rely on visual cues [4].

The Berg Balance Scale (BBS) is a widely used assessment tool for evaluating functional balance in stroke patients and other populations with balance impairments. It consists of 14 tasks that assess both static and dynamic balance and has demonstrated validity and reliability across various neurological conditions. The BBS has proven to be a convenient and cost-effective tool in predicting fall risk, outcomes, and length of stay in rehabilitation settings [5].

Considering the limited availability and high cost of Balance Master equipment in the Indian healthcare setting, this manuscript aims to explore alternative methods for improving balance in stroke recovery. Specifically, it investigates the efficacy of visual (mirror) and verbal cues as cost-effective modalities for enhancing balance during the recovery stage of stroke. By utilizing these alternative methods, stroke survivors in India could potentially benefit from accessible and affordable interventions to improve their balance and reduce the risk of falls, ultimately enhancing their overall recovery and quality of life [6].

MATERIALS AND METHODS

Sample size

A group of 30 individuals who had experienced post-stroke hemiplegia were chosen as participants for the study. Prior to their involvement, all patients were provided with information regarding the study and were required to provide signed consent forms for record-keeping purposes. Subsequently, the 30 participants were

randomly assigned to two groups: a control group and an experimental group, with each group consisting of 15 patients.

Subjects: 30 subjects (includes male and female subjects) Males-25, Females-5 of age group 30 to 85 y.

Study design: Experimental study

Source of data: OPD of Pacific medical college and hospital.

Inclusive criteria

1. Recovery stage of stroke.
2. Unilateral hemiparesis as a result of the stroke.
3. Sustain an unassisted standing position for a duration of one minute.
4. Capability to comprehend and comply with basic directions.
5. Individuals without any orthopaedic or neurological impairments.
6. Brunnstrom recovery stage of lower limb (stage 5)

Exclusion criteria

1. Bilateral stroke.
2. Visual impairment.
3. Absence of active movements in paretic limb.
4. Medically unstable (uncontrolled hypertension).
5. Uncooperative patients in hospital.
6. Perceptual, Cognitive and Comprehensive impairment.

Data collection

After completing the inclusion criteria, subjects were randomly assigned to either control group or an experimental group.

The measurements were taken through Berg balance scale. On 1st day, 15th day and on 30th day as the study is for 30 d or 4 w.

Group I: Control Group of 15 has received only conventional physical therapy for 4 w.

Group II: Experimental group of 15 has received conventional physical therapy and additional of visual and verbal feedback for 4 w.

Procedure

Conventional physical therapy for stroke patients focuses on enhancing muscle strength, range of motion, balance, and mobility. The therapy includes alignment training, re-educating balance and coordination through various exercises. Strategies to improve balance involve exploring stability in different directions and learning to position the center of gravity within the base of support. Symmetrical weight-bearing and activities that shift weight onto the affected side are emphasized. Postural perturbation and voluntary movements are used to stimulate normal balance synergies. Functional activities with destabilizing influences, dual-task training, and varied sensory conditions are incorporated. Computerized force-plate systems and biofeedback help enhance balance and stability. Safety education and active problem-solving skills are emphasized. The intervention includes stretching, strengthening, weight-bearing, and balance exercises, as well as functional activities. Visual training using mirrors and a vertical stripe on the patient's shirt is also employed. Physical therapy sessions are provided four days a week for four weeks, while visual training is conducted twice a week for four weeks. Pacific Medical University, Institute's ethical approval obtained dated 29/08/2022, PMU/PMCH/IEC/2022/239. All participants completed the information and consent form at recruitment.

RESULTS

The table 1 shows the initial mean value 43.6000 with the SD of 1.95667 in Group I and initial mean value of 45.0667 with SD of 2.01660 in Group II with the "t" value of 2.01660 and (p=.054) which was statistically found to be non-significant.

Table 1: Shows the inter group comparison of berg balance scale for group I and group ii on day 1

Group	N	Mean	STD. deviation	t
Group–I	15	43.6000	1.95667	2.01000
Group-II	15	45.0667	2.01660	p = 0.054 ns

Table 2 shows the difference of 15 d of Group I with the mean value of 3.6667 with SD of 2.46885 and Group II with mean value of 5.5333 with SD 1.72654 with "t" value 2.4000 and (p=.023) which was statistically found to be significant.

Table 2: Comparison of berg balance scale for group I and group II on day 15

Group	N	Mean	STD. deviation	T
Group–I	15	3.6667	2.46885	2.40000
Group-II	15	5.5333	1.72654	p = 0.023 ns

The difference of 30TH day of Group I with the mean value of 7.0667 with SD 1.46306 and Group II with mean value of 8.1333 with SD 1.45911 with "t" value 2.23000 and (p=.048) which was statistically found to be significant.

Table 3: Comparison of berg balance scale for group I and group II on day30

Group	N	Mean	STD. deviation	t
Group–I	15	7.0667	1.46306	2.23000
Group-II	15	8.1333	1.45911	p = 0.048 ns

DISCUSSION

The aim of our study was to examine and compare the efficacy of conventional therapy alone versus conventional therapy combined with the use of verbal and visual cues in improving balance during the recovery stage of stroke. We randomly assigned 30 stroke patients into two groups and assessed their balance using the Berg balance scale, which has a maximum score of 56 [7].

The results of our study demonstrated improvements in both groups. Group I, receiving conventional therapy alone, showed a progressive improvement in balance scores. The initial mean value of 43.6000 increased to 47.2667 on the 15th day and further progressed to 50.6667 on the 30th day. Similarly, Group II, receiving conventional therapy along with visual and verbal cues, also showed progressive improvements. The initial mean value of 45.0667 increased to 50.6000 on the 15th day and further progressed to

53.2000 on the 30th day. Importantly, Group II consistently had higher scores on the Berg balance scale compared to Group I, indicating that the addition of visual and verbal cues to conventional therapy had a greater effect on balance training [8].

Our findings align with previous studies that have investigated the benefits of visual feedback training on balance following stroke. Geiger *et al.* (2001), L Hollands *et al.* (2013), S. Jandaghi *et al.* (2016), and Shreya Upadhyay, Neha Verma (2022) have all reported improved balance outcomes with visual feedback training. These studies provide additional support for the effectiveness of incorporating visual cues in balance rehabilitation for stroke patients [9].

Furthermore, the study conducted by Nicole K Rendos *et al.* (2021) suggests that personalized verbal feedback during gait training can enhance the learning of specific gait parameters in individuals with stroke. This finding supports the idea that verbal cues can play a significant role in improving balance and motor function in stroke recovery [10].

Incorporating rhythm and music-based interventions in motor rehabilitation, as emphasized by T. B. Janzen Koshimori *et al.* (2022), holds promise for supporting and restoring motor functioning. This suggests that incorporating auditory cues, along with visual and verbal cues, may further enhance balance training outcomes in stroke recovery [11].

The studies conducted by Madhurjya Krishna Debnath, Milan Anand (2022) and Dorcas BC Gandhi *et al.* (2020) also provide evidence for the effectiveness of combining visual and verbal feedback in improving functional outcomes and rehabilitating post-stroke survivors [12].

Additionally, the study by Lisa Blum and Nicole Korner-Bitensky (2008) highlights the usefulness of the Berg balance scale in stroke rehabilitation, further validating its effectiveness as an assessment tool for measuring balance outcomes [13].

CONCLUSION

In conclusion, our study shows that incorporating visual and verbal cues in addition to conventional therapy leads to improved balance outcomes in stroke recovery. These findings align with previous research emphasizing the positive impact of visual feedback, verbal feedback, and mirror therapy. By highlighting the effectiveness of these alternative methods, our study emphasizes their potential as cost-effective and accessible interventions for enhancing balance, reducing fall risk, and improving the overall well-being of stroke survivors.

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Nil

AUTHORS CONTRIBUTIONS

All the authors have contributed equally.

CONFLICT OF INTERESTS

Declared none

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