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Effects of Visual Feedback on Balance and Risk of Fall among Geriatric Population

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Abstract

Introduction: Visual feedback training with a mirror is a technique that can improve postural stability by providing feedback on induced movements via a mirror image of the body image in the mirror. Balance training is considered to be an important aspect of a fall prevention program. Damage to balance ability causes difficulty in walking and performing functional activities. Hence, balance ability is the basis for independent movement and functional performance the aim is to find out the effects of visual feedback on balance and risk of fall among geriatric population.
Aim and objectives: The aim and objective of the study is to find the effects of visual feedback on balance and risk of fall among geriatric population.
Methodology: This study is an experimental study. A total of 30 geriatric population were selected based upon the inclusion and exclusion criteria. The participants were separated into two groups, the conventional group and the experimental group, each with 15 members. The detailed procedure was explained to the participants and a written informed consent form was obtained. **Result**: The values were statistically analyzed. The post-test mean value of Berg Balance scale in experimental group was 45.9 and conventional group was 43.2. This showed that Berg Balance Scale in experimental group was comparatively higher than conventional group. The post mean value of fall efficacy scale in experimental group was 4.80 and in conventional group was 5.93. This proves that fall efficacy scale in experimental group was comparatively less than conventional group.
Conclusion: This study concluded that mirror visual feedback of experimental group was found more effective than conventional therapy in reducing risk of fall and increasing balance.

Keywords

Geriatric population, Balance, Visual feedback

Introduction

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Visual feedback training using a mirror is a technique that helps enhance postural control by delivering feedback on induced movements via a mirror reflection of the body image(McCabe C.,2011).According to functional brain imaging studies, visualizing the replica of the moving extremity appears to enhance activation of the primary motor cortex and somatosensory cortex ipsilateral to a unilateral hand or knee movement in healthy adults(Sütbeyaz et al., 2007; Smith et al.,2002).Furthermore, Luft et al., 2005 observed that during lower limb motions in chronic stroke patients, contralateral main motor cortex, supplementary motor cortex, and symmetrical somatosensory cortex were strongly activated.

Observing mirrored motions increases neural activity in motor areas of the injured hemisphere, which might help with cortical remodelling and function restoration (Mohan et al.,2013).Aging impairs postural control due to general age-related degradation of sensory and neuromuscular control systems. Impaired postural control has substantial effects for physical functioning and is a risk factor for falls in older persons (Delbaereet al.,2010).

When their balance is disrupted, older folks have a propensity to over- or under-respond. They also have more trouble maintaining their equilibrium while their nervous system is under additional attentional demands (dual tasking). However, sensory systems are very adaptable, and if older individuals are given with increasingly more difficult physical tasks that require the practice of balance-correcting procedures or changing sensory situations, they can learn to modify postural control strategies appropriately (Howe et al.,2011)

Falls injuries are prevalent among the elderly and can lead to major medical concerns. Serious injuries include bone fractures, brain traumas, and skin rips (lacerations), which frequently necessitate hospitalization. Hip fractures are the deadliest fall-related injury among older people, according to population (epidemiological) study, with 15% dying in hospital and a 3% dying within a year. Several countries have adopted measures to assist the elderly in avoiding falls (McClure et al.,2005)

Physiotherapists can play an important role in the prevention of falls in the elderly. There is strong evidence that carefully administered therapies can help people avoid falling (Sherrington et al.,2015). Treatment procedures incorporating visual feedback exercises necessitate repeated sessions of training; hence, a practice reflect is added, which must be considered when evaluating any rehabilitative effect of therapy. Postural exercises that use visual input on posture have been demonstrated to minimize body sway in some patient populations (Hamman et al.,1992).

Methodology

A total of 30 subjects were selected based on inclusion and exclusion criteria at Saveetha Medical College and Hospital (SMCH) for the study. All participants provided informed consent after being informed about the study's goal, nature, potential risks, and benefits. The patients were split into two groups (Group A- 15, Group B- 15). Group A was treated with visual feedback a mirror is placed in front of the subjects and the subjects performed following exercises such as: single limb stance, walking on heel to toe, heel rise with support of chair, flamingo stand, standing on one leg the other leg raised side way with chair supporter Group B, the exercises were performed without the mirror and the performed exercises were single limb stance, walking on heel to toe, heel rise with support of chair, standing on one leg and the other leg raised side way with chair support. The patients were pre and post assessed with berg balance scale and short fall efficacy scale. Exercise program was given for four weeks (5 sessions per week) with duration of 30 minutes per day. The selected exercise protocol was taught to the patient with appropriate repetition and rest, lastly the outcome measures were calculated.

The acquired data was tabulated and evaluated using statistics and continuous variation. The mean and standard deviation (SD) were applied to all parameters. The unpaired t-test was performed to examine significant differences between the pre- and post-test.

Results and Discussion

Table 1: Pre and post values of berg balance scale in group A and B

BBS		Mean	Sd	T	P
Group a	Pre test	35.6	4.15	11.314	<0.0001
	Posttest	45.9	1.98		
Group b	Pre test	36.4	3.66	8.025	
	Posttest	43.2	1.28		

Table 2: post values of berg balance scale in group A and B

	Mean	Sd	T-value	p-value
Experimental group	45.93	1.98	4.379	<0.001
Conventional group	43.26	1.28		

Table 3: Pre and post values of fall efficacy scale in group A and B

Fall efficacy scale		Mean	Sd	T	P
GROUP A	pre test	10.67	1.29	13.1601	<0.0001
	post test	4.80	1.37		
GROUP B	pre test	10.67	1.29	8.6464	
	post test	5.93	1.03		

From the results, it is shown that both experimental group and conventional group have significant effect on outcome measures, however experimental group shown to have more improvements than conventional group.

The purpose of the study was to find the effects of mirror visual feedback among balance and risk of fall among geriatric population. This comparison was shown during a four-week period. BBS and FES were used to assess outcomes before and after the therapy. The beneficial benefits were much stronger in mirror visual feedback than in non-mirror visual feedback.

The main idea behind mirror neurons' functional role is that they display behaviors corresponding to those input into the auditory and visual senses during exercise. Understanding the recorded exercise goal and projecting it during activity is required. The ventral premotor cortex and the inferior parietal lobe govern these reactions. The second assumption is that the imagined emotional state is converted into a muscular response. The insula and the rostral cingulate regulate these responses (Sütbeyazet al., 2007). MVF employs the visual system to repair a sensory-motor mismatch, but other sensory modalities, such as hearing or taste, might be addressed (McCabe, C. 2011).

A significant decrease in postural sway was seen in amputee research that evaluated the impact of sensory information via a mirror. This was attributed to the improved balance ability offered by the mirror's visual information, which functioned as a sensory replacement for the injured limb's reduced proprioception. In addition, visual feedback from a mirror assists in the learning of accurate motions by allowing for the rectification of flaws discovered during job performance (Bataviaet al., 1997). Research that employed visual feedback to conduct balance training in stroke patients found that it improved weight distribution and balance abilities (Chenget al., 2004).

Previous studies discovered that as the terrain became more unstable, they did the dependence on vestibular systems and vision for balance control. The effect of providing more somatic sensory input for balance in the elderly found that bigger improvements were made on a more unstable surface with more postural sway (Jung et al., (2016).

In post-test values, there was a significant difference between the experimental group and the conventional group. The experimental group's mean post-test difference was 45.93, whereas the conventional group was 43.26. For BBS and fall effectiveness scale, the experimental group's mean post-test value was 4.80, while the conventional group was 5.93. Thus, both mirror visual feedback and conventional exercise showed significance difference in the mean value.

Thus, participants who were given mirror visual feedback had a considerable gain in balance and reduced risk of fall. Mirror visual feedback provided substantially more benefits than traditional workout.

Conclusion

According to the findings, mirror visual feedback in the intervention group was more effective than traditional therapy in decreasing the risk of falling and boosting balance, resulting in a faster recovery in enhancing balance.

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