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TO SEE THE EFFECT OF VESTIBULAR REHABILITATION EXERCISE ON BALANCE IMPROVEMENT AND REDUCTION OF FALL IN ELDERLY PEOPLES

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ABSTRACT:

KEYWORDS:

INTRODUCTION

Balance is complex required for maintaining a position, remaining stable while moving from one position to another, and performing acts of daily living and moving freely in the community. The ability to balance can be compromised by disease, medication and the processes of ageing[1]. Deterioration of balance is well documented hallmark of the ageing process[2]. Poor balance is initially detectable in the sixth decade of life but then accelerates so that it becomes the rule rather than the exception by one's late eighties[3]. Balance disturbance frequently cause elderly people to seek medical advice and admission to hospitals and residential homes[4]. Impaired balance has been correlated with an increased risk for fall. Approximately 35-40% of generally healthy, community dwelling person aged 65 or older fall annually[5]. Falls are the major health concern for elderly peoples and their impact is a significant public health problem. Annually about one-third of community dwellers over age 65 falls, and half of those will have repeat fall[6-8]. Falls are responsible for two-third of all unintentional injury death in older adults[9, 10]. Fear of falling affect confidence in performing daily activities, causing self-limitation and a less active lifestyle[11]. This results in muscle atrophy and a loss of strength, especially in lower extremities, which exacerbates the risk for fall[12].

When the set of visual, labyrinthic and proprioceptive is not properly integrated by the Central Nervous System, there is disturbance in balance status, which can be manifested by body imbalance, and leads to falls[13]. Aging may be responsible for these disorders. Horak et al[14] considered balance as a nervous system skill to detect any instability either in advance and immediately to generate coordinated response that could restore the supporting base of body mass core; preventing falls. Effective maintaince of balance involves a number of central nervous system and peripheral nervous system structure[15]. According to Woollacott[16], vestibular system one of the mean structure to maintain balance, given that it is considered as an absolute reference in relation to the others that also participate in this function, such as visual and soma to sensory system.

System in our body has physiological reserves that are characterized in the nervous system by their capability to reorganization, known as Neuroplasiticity[17,18]. As a result of ageing, reserves are reduced, but not depleted; therefore, the creation of an ideal environment for motor may determine a significant improvement of the function[19]. Phol and Winstein[20] stated that practice improves neural processing skills in the elderly as well. Vestibular exercises, such as the ones described by Caw throne and Cooksey, may serve as support for new arrangement of peripheral sensorial information, allowing new vestibular stimulation patterns necessary for new experiences to become automatic. This practice of balance would be capable would be capable of promoting improvement in reactions of balance and, consequently, reduce falls[21].

Keeping this in mind this study was designed with the purpose to check a specific therapeutic approach for the vestibular system by the application of Caw throne and Cooksey exercises, to see if they generated motor learning and contributed to improving balance and reducing the possibility of falls elderly.

Two balance scales were used to assess the outcomes of both the interventions. They were the Timed Up and Go Test[22] and the Berg Balance Scale[23]. These scales have good reliability and validity which will be discussed in detail in the literature review chapter.

THESE SCALES HAVE BEEN SELECTED FOR THE STUDY BECAUSE:

1. They are very simple to administer.
2. They are quick and practical.
3. They are easy to be conducted in an Indian clinical

setting.

4. The content of these scale closely mimic the day to day activities and are easy for the patient to understand.

METHODOLOGY

SAMPLE

A sample of convenience of 100 elderly aged peoples took part in this study. The subjects were collected through an association. Subjects who fulfilled the inclusion criteria and were ready to attend the exercise program regularly were selected.

INCLUSION CRITERIA

1. Age group: 60-70yrs.
2. muscle power 4/4+

EXCLUSION CRITERIA

1. Presence of neurological disorders
2. ENT disorder
3. Vascular disorder
4. Metabolic disorder
5. Osteoarthritis patients
6. Neoplastic disorders, which are confirmedly known to cause balance disorder.

DESIGN

An experimental study pre-test and post-test study design.

INSTRUMENTATION

1. Chair of 46cm.seating height
2. Markers
3. Standard measuring tape
4. Weighing machine
5. Stopwatch
6. Chair of different height with and without arm rest
7. Ball of various size and weight
8. Foam
9. mirror
10. bed sheets

PROTOCOL

A sample of convenience of 100 elderly people took part in this study. These subjects were then randomly divided into two groups which received different balance training interventions. Group A constitutes 50 subjects treated with Caw throne and Cooksey exercise and static & dynamic balance training, while Group B constitutes 50 subjects treated with static & dynamic balance training exercises[37]. Demographic data of the subject was collected in the demographic data collection form. These include the sex, age, height and the weight. Following this the subject were assess on the two balance scale: The Time Up and Go test (TUGT) and the Berg Balance scale (BBS). After assessing the initial balance scores, the specific intervention was applied for each group for three months, three times a week, during 60 minutes.

PROCEDURE

The subjects in Group A were treated with Caw throne and Cooksey exercises and static & General Balance and Mobility exercise. These exercises involved head, neck and eye movements, postural control exercise in different positions (seated in two leg and one positions, walking) use of soft surfaces to reduce proprioceptive inputs and exercises with eyes closed to exclude visual cues, while static balance training exercises involves training on the firm, broad surface, sway slowly in antero-posterior direction, right & left, standing near the wall with a table in front, swaying forward to touch the table, standing on an unstable surface such as foam. A General Balance and Mobility exercise involves walking on the carpet, ramps, stairs; difficulty is added by putting glass & gravels in the path etc. The subjects in Group B were treated with General Balance and Mobility exercise program.

TIME UP AND GO TEST

The Time Up and Go test measures the time it takes a subject to stand up from an arm chair, walk a distance of 3m, turn, walk back to the chair and sit down. A chair of 46cm of seat height was used for the study. A 3m distance was marked off on the floor in front of the chair. A large board was placed on the mark at the end of 3m. The test began with each subject sitting, back against the chair, arms resting on the lap and feet just behind-marker on the floor. The subject is allowed to wear his shoes and use his walking aid, if any. The subject was instructed that on the word "GO" he should stand up, walking comfortably and safely to the board on the floor, walk around the board, come back and sit in the chair. They were informed that the trial would be timed. Timing began with the word "GO" and ended when the subject's back rested against the chair upon returning. A practice trial was performed for all subjects before the recording of scores. This was to make the subject familiar with the procedure. Average of three trials was done and used for data analysis.

BERG BALANCE SCALE

Berg Balance Scale was developed as a performance oriented measure of balance in elderly individuals. It consists of 14 items which are scored on a scale of 0 to 4. A score of 0 is given if the participant is unable to complete the task and a score of 4 is given if the participant is able to complete the task based on the criteria assigned to it. The maximum score of the test is 56. Elements of the test are supposed to be representative of daily activities that require balance. They are sitting to standing, standing unsupported, sitting with back unsupported on the floor or on the stool, transfers, standing unsupported eyes closed, standing unsupported with feet together, reaching forward with outstretched arm while standing, picking up an object from the floor in standing position, turning to look behind over the left and right shoulders while standing, turning 360^0, placing alternate foot on step or stool while standing

unsupported with one foot in front and standing on one leg. Scores obtained during the assessment were used in data analysis.

DATA ANALYSIS

Statistics were performed using SPSS software.

A student t-test was used to analyze the difference between the balance improvements in group A and group

B. Intra group analysis between pre-intervention and post-intervention scores was also done for both the groups. A significance level of $p \leq 0.05$ was fixed.

RESULT

This chapter deals with the results of the data analysis of the two intervention group scores on the two balance measures.

The group receiving Caw throne and Cooksey exercises (Group A) consisted of 25 males and 25 females with a mean age of 66.8 ± 2.0 years while the Group B receiving General Balance and mobility exercise program consisted of 25 males and 25 females with a mean age of 67.2 ±2.1 years. Both the groups were matched in terms of age, height and weight.

A student's t-test was used to compare the performance of subjects of group A and B on Timed up and go test (TUGT) and Berg balance scale (BBS) prior to the intervention program. The analysis of Pre-intervention scores of TUGT between group A (X=12.59, S.D.=1.19) and group B (X=12.47, S.D.= 1.30) did not show any significant difference (t-value=0.25, p=0.80) indicating that both groups were matched in terms of TUGT scores. The BBS scores also showed no significant differences between both the groups (Group A: X=50.93, S.D.=2.98, Group B: X=50.73, S.D.=2.28) with t-value=0.20 and p=0.83.

The comparison of Post-intervention scores TUGT between group A (X=10.96, S.D.=1.38) and group B (X=12.50, S.D.=2.34) revealed a significant difference with a t-value of 2.20 and p=.03. Subjects in group A showed significantly better results on TUGT. This was also seen for BBS scores (Group A: X=53.46, S.D.=3.39, Group B: X=50.80, S.D.=2.93), as they showed a high level of significance (t-value=2.30, p=0.02) for group A.

Within the group there was significant difference in the pre-intervention and post-intervention TUGT scores of group A (t-value=4.12,p=0.001) and group B (t-value=.064,p=0.95). BBS score pre-intervention and post-intervention also showed significant difference for both group A (t-value=2.69, p=0.017) and group B (t-value= .14, p= 0.89). Thus, indicating that the group A showed marked improvement in the balance scores.

TABLE 5.1: COMPARISON BETWEEN AGE, SEX, HEIGHT & WEIGHT OF GROUP A AND B

	Age	Sex	Height	Weight
Group A	66.8±2.0	No. of males-25 No. of females-25	158.1±7.8	68.1±9.3
Group B	67.2±2.1	No. of male-25 No. of females-25	160.0±9.4	68.1±12.5

TABLE 5.1: ILLUSTRATES THAT ALL THE SUBJECTS WERE MATCHED IN TERMS OF AGE, SEX, HEIGHT AND WEIGHT PRIOR TO INTERVENTION.

TABLE 5.2: COMPARISON OF MEAN AND STANDARD DEVIATION OF TUGT OF GROUP A AND GROUP B.

	TUGT0 Mean± S.D	TUGT90 Mean± S.D	t	P
Group A	12.5± 1.19	10.9±1.38	4.12	.001
Group B	12.4±1.3	12.5±2.34	.06	.950

TABLE 5.2: ILLUSTRATES THAT MEAN AND STANDARD DEVIATION OF TUGT AT DAY 0 AND DAY 90 OF GROUP A AND GROUP B.

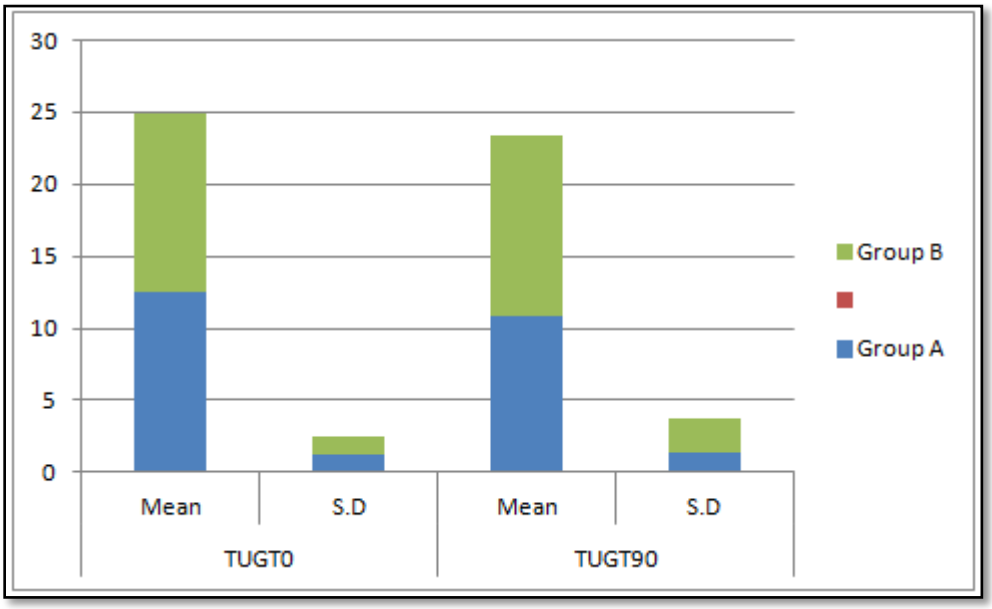

FIGURE 5.1: ILLUSTRATES THAT MEAN AND STANDARD DEVIATION OF DAY 0 AND DAT90 OF TUGT OF GROUP A AND GROUP B.

TABLE 5.3: COMPARISON OF MEAN AND STANDARD DEVIATION OF BBS OF GROUP A AND GROUP B

	BBS0 Mean±S.D	BBS90 Mean±S.D	t	P
Group A	50.93±2.98	53.4±3.39	2.69	.017
Group B	50.73±2.28	50.8±2.93	.141	.890

TABLE 5.3: ILLUSTRATES THAT MEAN AND STANDARD DEVIATION OF BBS AT DAY 0 AND DAY 90 OF GROUP A AND GROUP B.

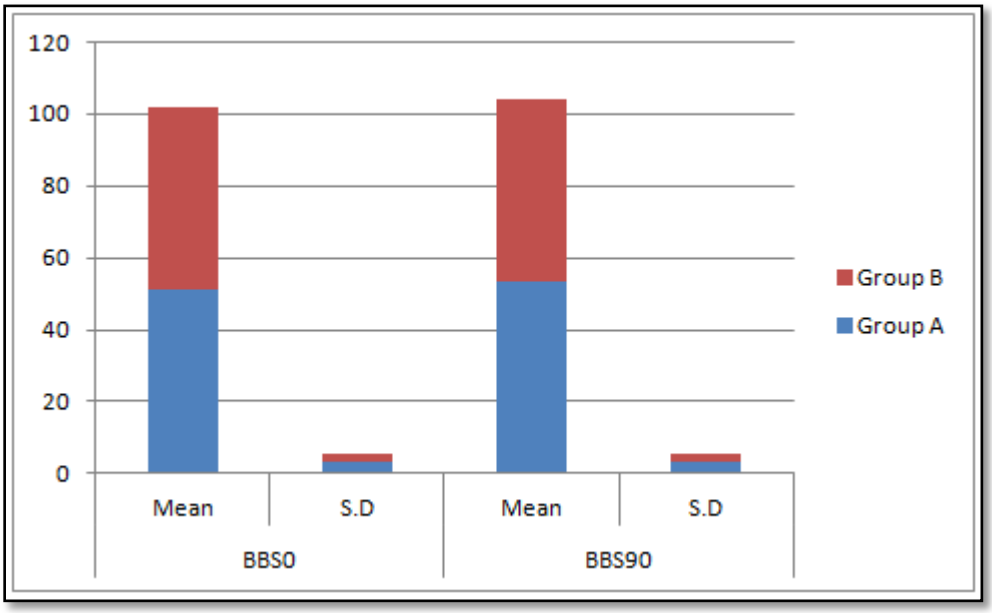

FIGURE 5.2: ILLUSTRATES MEAN AND STANDARD DEVIATION OF DAY0 AND DAY 90 OF BBS OF GROUP A AND GROUP B.

TABLE 5.4: COMPARISON OF MEAN AND STANDARD DEVIATION OF BBS AND TUGT OF GROUP A AND GROUP B.

	Group A Mean±S.D	Group B Mean±S.D	t	P
TUGT0	12.59±1.19	12.47±1.30	.25	.80
TUGT90	10.96±1.38	12.50±2.34	2.20	.03
BBS0	50.93±2.98	50.73±2.28	.20	.83
BBS90	53.46±3.39	50.80±2.93	2.30	.029

TABLE 5.4: ILLUSTRATES THAT MEAN AND STANDARD DEVIATION OF TUGT AT DAY 0 AND DAY 90 OF GROUP A AND GROUP B AND MEAN AND STANDARD DEVIATION OF BBS AT DAY 0 AND DAY 90 OF GROUP A AND GROUP B.

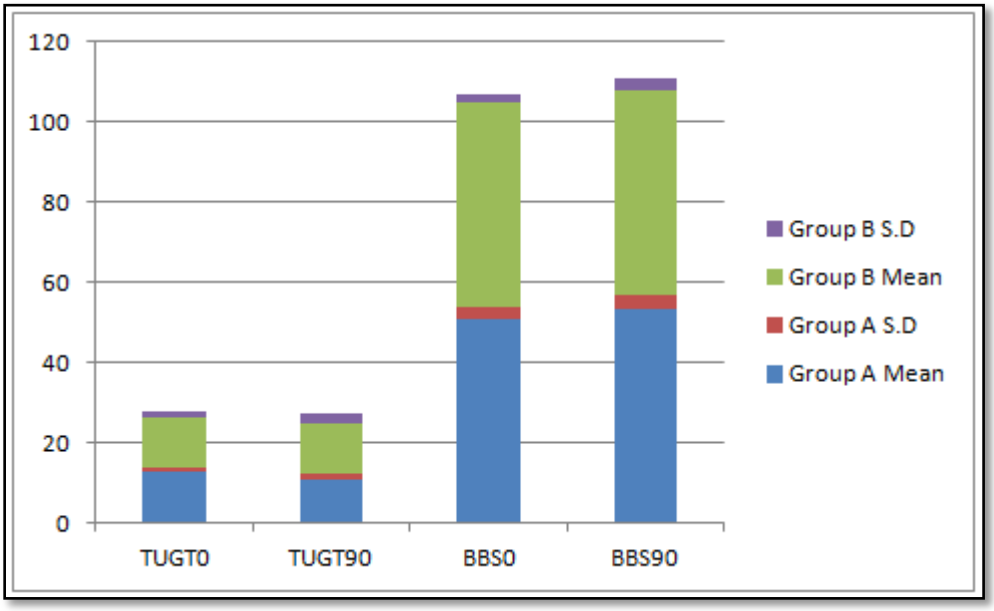

FIGURE 5.3: ILLUSTRATES MEAN AND S.D OF DAY 0 AND DAY 90 OF BBS AND TUGT OF GROUP A AND GROUP B.

DISCUSSION

The results obtained reveal that subjects in experimental group A: Benefited from the balance training interventions with Caw throne and Cooksey exercises and a significant improvement in post-intervention balance scores on Timed Up and Go Test (Group A: p=.036, Group B: p=.038) and Berg Balance scores (Group A: p=.029, Group B: p=.029) as compared to their pre-intervention scores.

On comparison of Group A and Group B it was seen that although there was no statistically significant difference between pre-intervention Timed Up and Go Test (TUGT) scores of Group A and B, the post-intervention TUGT scores revealed high level of significance with performance of subjects in Group A better than Group B. Similar results were obtained from Berg Balance scores which showed no statistically significant difference in Pre-intervention scores but the Post-intervention scores showed a highly significant improvement in group A.

Thus, indicating that those participants receiving the Caw throne and Cooksey exercises did better on both outcome measures (Timed up and Go Test and The Berg Balance Scale) than the general balance and mobility training group. One factor that might have contributed to improved scores in the Group A participants was the composition of tasks they practiced. These exercises involved head, neck and eye movements, postural control exercise in different positions (seated in two leg and one positions, walking) use of soft surfaces to reduce proprioceptive inputs and exercises with eyes closed to exclude visual cues, while static balance training exercises involves training on the firm, broad surface, sway slowly in antero-posterior direction, right & left, standing near the wall with a table in front, swaying forward to touch the table, standing on an unstable surface such as foam. The general balance and mobility exercise involves walking on the carpet, ramps, stairs; difficulty is added by putting glass & gravels in the path etc. Such interventions encouraged speed and size of movements which may have

increased strength and endurance in addition to improving flexibility and reaction time for the balance group. This could have resulted in more efficient movement in the improved functional ability to balance, ambulate in the environment and at a faster velocity. Support for this view comes from the improved outcomes from a similar balance training program delivered by Angela dos and Joao demonstrate that Caw throne and Cooksey exercises were able to promote significant improvement in the balance of this sample and they can be applied as prevention and treatment in balance disturbances in elderly peoples[123]. Lucia et al also conclude that the personalized vestibular rehabilitation is an effective resource in the treatment of otoneurologic symptoms of patients, consequently improving their quality of life.

On the other hand, the general balance and mobility exercise program also showed significant improvements unlike previous studies of general exercise programs aimed at seniors which did not show significant results [(78-80)].

The improvement shown in group B was less than that shown in group A. A possible explanation could be that movement to the limits of stability was not an integral component nor were walking on different surfaces, turning and other rotational elements.

CLINICAL IMPLICATIONS

These data suggest that the Caw throne and Cooksey exercises are more effective in improving balance in elderly peoples as compared to the general balance and mobility exercise. This helps us to choose a better balance training program elderly population above 60 years in order to improve balance significantly even in short time duration. The ultimate effect of this study is to improve balance with the aim of reducing injurious falls in the fall prone elderly population.

CONCLUSION

This study thus concludes that the Caw throne and Cooksey exercises show significant improvement on balance outcome scales than the subjects who participated in the General Balance and Mobility exercise program. Thus group A showed a significantly better improvement in balance as compared to Group B.

Thus, concluding that the Caw throne and Cooksey exercises are superior to a General Balance and Mobility exercise program

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