THE IMPACT OF A SUPERVISED BRACE (BALANCE, RESISTANCE, AEROBIC, COGNITIVE EXERCISES) PROTOCOL ON THE MOBILITY OF ELDERLY INDIVIDUALS AT RISK OF FALLING.

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ABSTRACT

BACKGROUND: In terms of morbidity and mortality fall is a major concern in older population. Decrease mobility and impaired balance are the main factors that increase prevalence of fall. Balance training along with strength and cognition training has good results in improvement of balance and mobility.

Objective: The purpose of the study was to determine and compare the effects of Supervised-BRACE (Balance, Resistance, Aerobic, Cognition Exercises) versus conventional therapy on functional balance, mobility and fall risk reduction in elderly individuals with moderate fall risk.

Methodology: The study design was Randomized Control Trial and conducted at District Head Quarter Hospital Chakwal from July-Dec 2018. 40 participants were recruited through purposive sampling with inclusion criteria of either gender of age (60-80) years with Berg Balance Score (20-40). Individuals having any neurological impairment, history of fall or fracture were excluded. Participants were divided into two groups through randomization. 12 weeks of supervised training were given to S-BRACE group, 3 days/week for 8 weeks & 2 days/week from 9 to 12 weeks. Unsupervised home plan included balance and resistance exercise was guided to conventional group. The tools used in this study were Berg Balance Scale (BBS), Montreal Cognitive Assessment (MoCA), Timed Up and Go test (TUG), Activities-specific Balance Confidence (ABC), Elderly Mobility Scale (EMS) and Fullerton Advanced Balance (FAB). The data was collected at baseline after 3, 6, 9 and 12 weeks.

Results: The mean age of participants in S-BRACE and control group was 67.17 ± 5.98 and 66.63 ± 5.30 years respectively and 68% (n=23) were male whereas 32% (n=11) were female. The within group analysis showed that there was significant difference from baseline to 12 weeks in both groups (p< 0.01). Between group analysis showed that there was significant improvement on BBS,

TUG, ABC, EMS and FAB after 12weeks (p<0.01) in S-BRACE group as compared to conventional group. Both groups showed similar improvement on MoCA (P<0.05).

Conclusion: It is concluded that supervised balance training has better outcome in mobility and reduction in fall risk as compared to home based training. Cognitive improvement was observed in both groups.

Keywords: Balance training, Berg Balance score, Elderly, Fall risk, Mobility

INTRODUCTION

Aging entails a gradual reduction or deterioration in physiological capabilities and a decrease in adaptability. On the other hand, successful aging involves avoiding illness, maintaining strong physical and cognitive abilities, and actively participating in social, productive, or creative endeavors. A fall is characterized as an unintentional incident resulting in contact with the ground. Numerous factors contribute to falls, which can be categorized as either inherent or external. The risk factors for falls encompass aging-related issues like cognitive impairment, poor balance, or reduced vision, as well as nutritional deficiencies, medication use, environmental elements, and a lack of physical activity. (1). In previous research, it was stated that aging can be described as a gradual loss or decline in physiological functioning and a reduction in adaptability. However, Thomas Flatt argues that while this definition is not entirely incorrect, it lacks precision because it's important to acknowledge that everyone will inevitably experience a decline in survival rates at some point in their lives. However, it would be incorrect to assume that both reproduction and survival rates consistently decrease all the way to zero over time. (2).

Recent research in the field of aging, coupled with the development of various surgical procedures, has played a crucial role in slowing down the aging process. The introduction of innovative surgical techniques and medications has led to increased longevity for people, allowing them to live longer, healthier lives. (3). As people age, they often experience social and emotional changes, and it's quite common for feelings of sorrow and grief to arise in response to such circumstances. (4). In 1997, Rowe and Kohn, along with their colleagues, defined successful aging as the achievement of avoiding disease and the absence of disability while maintaining strong physical and cognitive function and actively engaging in social, productive, or creative activities.(5).

Different medications are used by older adults and they are prone to side effects of medicines and their interaction so they required proper adjustment of drug dosage and monitoring. After injury or critical illness mortality rate is higher in older population as compared to younger population because physiological status declines with aging. (6). As individuals age, the processes of regeneration and degeneration tend to shift towards a decline, with degenerative cellular activity often surpassing regenerative activity. This degeneration process is associated with non-enzymatic glycosylation of proteins and the presence of non-reactive oxygen species. Additionally, the loss of regeneration capability can be influenced by genetic factors, such as telomere shortening and apoptosis. (7).

Aging is a natural reality that is beyond person's control. The sense of aged population or old age is varied from society to society. In developed countries age 60 years and above considered retirement age and the beginning of pension after retirement while in more developed countries age 60 is considered commencement of old age. (8). There are many reasons of fall which can be intrinsic or extrinsic. The risk factors of fall can be aging (e.g. cognitive impairment, poor balance or low vision), nutritional (vitamin D and calcium deficiency), medication (sedatives, antidepressants etc.), environmental factors (improper shoes, poor lightening and unsafe stairs) and lack of exercise. (9)

Research indicates that a substantial number of patient's experience at least one falls per year. Specifically, it is estimated that 34% of patients aged 65 and older, 50% of non-institutionalized individuals in their eighties, 43% of patients residing in nursing homes, and 26% of hospitalized patients experience falls. (10). Furthermore, this research reveals that the frequency of falls tends to

increase with advancing age, and falls are more commonly reported among women than men. (11). Mostly older adults aged 60 and above fall due to cognitive impairment, balance problems and physiological functioning.(12)

MATERIALS AND METHOD

The study design used for this study was randomized controlled trial. The study was conducted in District Head Quarter Hospital Chakwal, Pakistan from July 2018 to December 2018. Purposive sampling technique and consecutive random assignment through sealed envelope method to randomly allocate the participants into S-BRACE group and control group. Sample size was calculated through epitool software, 46 individuals were screened for participation in this study. 4 participants were excluded due to not meeting inclusion criteria while 2 participants were declined to participate. There were total 40 individuals participated in research and they were selected after applying inclusion criteria. 20 were in S-BRACE group and 20 were in control group. In S-BRACE group 2 participants did not continued treatment plan due to their personal reasons. In control group out of 20 participants, 4 participants left the treatment, 2 participants left because of aggravating shoulder pain and 2 were left due to unable to come for follow up. Data was collected by using Berg Balance Scale, MoCA, Timed up and go Test (TUG), Activities of Balance Confidence, Elderly mobility scale and Fullerton Advanced Balance (FAB) scale.

Descriptive analysis of age and gender were computed. To assess the homogeneity of a sample normality test was applied to all variables at baseline. The P value of all variables was ($p>0.05$) so, the parametric test was used to measure the difference. IBM SPSS-23 was used for all statistical analyses.

RESULTS

Table 1. Showing Frequency of male and Female genders in this study. Male population was 23 which comprises 67.60% and female population was 11 which comprises 32.40%

Gender	Frequency	Percentage
Male	23	67.60%
Female	11	32.40%
Total	34	100%

Table 2. Group wise Gender Allocation which shows that in S-BRACE group out of total 18, 12 (66.7%) were males and 6 (33.3%) were females. In Control group out of 16, 11 (68.8%) were males and 5 (31.3) were females

Group	Gender		
	Male Frequency (%)	Female Frequency (%)	Total Frequency (%)
S-BRACE group	12 (66.7%)	6 (33.3%)	18 (100%)
Control group	11 (68.8%)	5 (31.3%)	16 (100%)

Table 3. Table 3 showing Comparison of Different Interventions on S-BRACE and Control group with Mean and Standard Deviation and P-value after 12 weeks of intervention

VARIABLE	S-BRACE GROUP Mean±S.D	CONTROL GROUP Mean±S.D	P.Value
Berg Balance Scale at 12 Weeks between S-BRACE and Control Group	51.7±1.74	40.062±4.419	0.000
MoCA after 12 weeks between S-BRACE and Control Group	27.000±2.67	25.750±2.48	0.170
TUG after 12 weeks between S-BRACE and Control Group	10.916±2.49	15.219±1.94	0.000
ABC after 12 weeks between S-BRACE and Control Group	82.700±7.22	67.687±11.92	0.000
EMS after 12 weeks between S-BRACE and Control Group	19.389±1.03	16.187±1.79	0.000
FAB after 12 weeks between S-BRACE and Control Group	34.277±2.16	23.25±5.87	0.000

DISCUSSION

In the present study, a comparison was made between supervised and unsupervised balance training interventions for the elderly population aimed at enhancing balance, mobility, and reducing the risk of falls. The study's results indicate a significant improvement in dynamic balance and mobility in the group that received supervised training for the elderly. A similar study conducted by Lacroix A et al in 2017 corroborates these findings, showing that balance and strength/power improve more substantially with supervised balance and strength training in contrast to unsupervised home-based plans. (13)

In current study with supervised BRACE training there was significant upgrading in berg balance scores over the period of 12 weeks of training as compared to control group. Results showed that there was significant upgrading in both groups but improvement was more reflective in supervised Brace group than control group with mean score difference of berg balance score as 51.76 & 40.06 respectively, the study supported the results of another RCT results conducted by Bieryla K. A et.al on balance training via Wii Fit. They provided 03 weeks of balance training via Wii Fit and then balance assessed on BBS. This study results are in line with current study results that there was significant improvement in balance on BBS.(14).

The findings of the current study align with another research conducted by Ogaya. S et al., which examined the effects of wobble board exercises on both static and dynamic balance. In this study, 23 subjects (with an average age of 84.2 ± 5.9 years) residing in a nursing home participated in a 9-week program involving twice-weekly balance training sessions using a wobble board. The results of this investigation suggest that wobble board exercises are effective for improving the static balance on stable surfaces and dynamic balance on uneven surfaces in elderly individuals. (15)

Activities-specific Balance (ABC) scale was used in current study for the assessment of balance confidence in participants. Result showed that there was remarkable improvement in balance confidence of participants. ABC scores was increased in supervised group with mean =82.70 and

control group mean=67.68. Score was statistically more improved in supervised group as compared to control group. Level of balance confidence was increased and fear of fall decreased with training. Likewise, this study results another study was conducted by Janine Hatch et.al to assess the fear of fall and balance confidence in elderly. It was concluded that with balance training balance confidence can improved.(16)

This study result supported by literature of Robert E.Dustman et.al ,a study as title "Aerobic exercise training & improved function of elderly". Study showed the impacts of a 4 months aerobic training on neuropsychological functioning, stress management and cognition of age 55 and above with diseases. The older adults with aerobic exercises showed fundamentally great improvement in neuropsychological functioning and memory. (17)

CONCLUSION
In conclusion, the study suggests that supervised BRACE training leads to more favorable outcomes in terms of enhancing dynamic balance, mobility, and reducing the risk of falls. Additionally, cognitive improvement was observed in both groups, indicating that the intervention had positive effects on cognitive function.

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