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Research Article

**A RANDOMIZED CONTROL TRIAL TO ASCERTAIN THE  
OUTCOMES OF BETTER OCULAR RESPONSE TRAINING BY  
DYNAMIC AND INERT BIODEX BALANCE SYSTEM**<sup>1</sup>Sarah Azam Ghumman, <sup>2</sup>Imran Khawaja, <sup>3</sup>Malik Atif Khan<sup>1</sup>Services Institute of Medical Sciences Lahore, <sup>2</sup>Ayub Teaching Hospital Abbottabad<sup>3</sup>Zubeda Khaliq Memorial Free Hospital Sermik, Skardu Baltistan.

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**Abstract**

**Objective:** The purpose of the research was to conclude the results of balance training with the ocular response using inert and dynamic biodex balance system for the hazard of fall as well as mobility in elderly individuals.

**Material and Methods:** The mode of the research was pilot RCT (Randomized control trial) carried out at Jinnah Hospital, Lahore from August 2017 to February 2018. The research contains society habitants aged personals having batter health state. The mode of selecting the individual was non-verisimilitude purposive sampling. Individuals irregularly distributed into two balanced categories. The controlled category does not get any training whereas the intervention category passes through training of eight weeks on biodex balance system. Berg balance scale, biodex fall risk score, Go & timed up test prior and after the therapy was used for composition of facts and the data were further analyzed on SPSS software.

**Results:** The researcher made two groups comprising of nine (50%) individuals in each group. Evaluation of the groups presented substantial betterment in intervention category with P-value < 0.001 whereas no substantial improvement noticed in control group with P-value > 0.05. Post-intervention, the findings remain constant while comparison of both the categories (P-value < 0.05).

**Conclusion:** Dynamic postural training through inert as well as dynamic biodex balance system had categorical consequences on mobility as well as equilibrium in aged individuals.

**Key Words:** Mobility, Biodex Balance System (BDEX), Static & Dynamic (SD), Biodex Fall Risk Score (BFRS), Berg Balance Score (BBS), Timed Up and Go Test (TUG).

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## INTRODUCTION:

Balance is the usage of numerous body arrangements to maintain the centre of gravity within the base of support [1]. Balance is sustained by several system combinations comprising the vestibular and ocular somatosensory system. Any of these systems detriment result elderly which can steer to complication in balancing [2]. The detriment balance system of body consequences in huge chances of fall which is primary factor of demise and bitterness in aged individual [3]. This steers to huge expansive and demands for restoration services [4]. In 2014, the numbers of aged personals in Pakistan, above sixty years were almost eleven million and this calculation is anticipated to increase to greater than seventeen million up till 2025 [5]. With respect to the research, thirty to fifty percent of the public aged sixty-five and more have a complication with their balance [1]. Globally fall has been marked as the 2<sup>nd</sup> foremost factor of accidental as well as un-accidental wounds. Almost twenty to thirty percent of falls induce normal to severe injuries that consequences in reducing working accomplishments. Fall has been recognized as the main factor of hospitalization among the aged personals as compare to any additional disease or wound. Falls consequences substantially reduce flexibility, impairment, working confidence and maximized precocious demise hazard. Falls consequences also appeared as psychological affects for prolong duration, such as the tension of recurrent falls and despondency resultantly become factor of less social works environment as well as disturbance of routine work. One out of three aged individual falls every year, among them (6%) experienced fracture and (24%) undergone through severe injuries. The review of national injuries in Pakistan narrate that the occurrence rate of falls concerning to causalities (8.5/1000) [7]. However, in the Mediterranean zone, it was identified as (2.9/100000) [8]. The following hazard could be minimized by balance training along with exercise interventions [4]. Preventive interventions on number of hazardous agents of falls are the most powerful technique for minimizing fall ratio in aged individuals. These preventive interventions comprise fall risk evaluation and outpatient balance training [9]. Traditional balance training course generally comprises of mobility, functional and flexibility training, Pilates, yoga strengthening exercises as well as tai chi [10]. Normal home base practices protocols are also utilized rather than these; some computerized response, postural control training system, as well as advance machinery for exercise, are also accessible for balance training [12, 13]. Component of VFB (visual feedback) such as mirrors and forced plates

system are mostly utilized for balance complication therapy but are identified to have no contrast in educating with respect to common administration [14]. Additionally, it has been proclaimed that general balance training programs are less adhered [15]. With improvements in science and engineering and a developed system able of quantifying balance have come out which gives trustable and conformed data concerning to balance. These systems could also be utilized for treatment objectives and also have VFB (visual feedback) for extra educational advantages. BDEX (biodes balance system) is utilized for balancing postural reeducation, somatic sensory, neuromuscular central and best proprioception; BDEX also recognized training as well as analysis in SD (static and dynamic) pattern. It utilized consolidated system which comprises individual in reeducation activities with association to VFB (visual feedback) to adjust body respectively [16]. Effectuality of biodes balance system has been evaluated in diverse neurological states such as numerous sclerosis in developing balance [17]. Several researches analyze the consequences of balance training through biodes balance system on various balance frame work of diabetic neuropathy patients establish positive effects [18]. Additionally, this structure was also found to develop balance in aged persons, in research inquiring motor competency training as observational focus functioning [19]. As a developing state, Pakistan is still not able to provide services for health care. The purpose of the research was to conclude the results of balance training with the ocular response using inert and dynamic biodes balance system for the hazard of fall as well as mobility in elderly individuals.

## MATERIAL AND METHODS:

The mode of the research was pilot RCT (Randomized control trial) carried out at Jinnah Hospital, Lahore from August 2017 to February 2018. Recommendation for the research was taken from Institutional ethics review committee of Foundation University, Islamabad. The research contains society habitants aged personals having batter health state. The mode of selecting the individual was non-verisimilitude purposive sampling. The individuals selected for the research having age fifty to sixty years and have the capability of standing for more than ten seconds with eyes open state. Those subjects having, vestibular complications, Parkinson's disease, musculoskeletal state such as critical arthritis and fractures, individuals with neurological state such as epilepsy, Alzheimer's and systemic disease, impaired cognition, primary co-morbidities as well as those patients who are taking medicines which influence

balance, osteoporosis, along with those having previous record of fall in the current year were not included in the research. The researcher divides the individuals into two groups as a control group and biodex balance training group and written approval were taken from ever individual. The allocation was carried out applying simple randomization through coin toss technique. The enrolled subjects for research are healthy; biodex balance training group performed thirty to forty-five minutes of exercise, three days in a week up to eight weeks whereas control group performed no exercise. This activity was supervised by an expert physical therapist. All individuals start with five minutes warm up exercise prior to balance training intervention, pursued by exercise of twenty to thirty minutes supported by five minutes cool down period. Balance intervention in biodex balance training group was given by using biodex balance training group static and dynamic system, which is cost-effectively obtainable dynamic balance training and analysis system. Biodex balance training group static and dynamic system has a balanced platform which moves circularly like wobble board which gives a surface tilt of  $20^\circ$ , in direction of  $360^\circ$ . Spring resistance gives tilt from inert to moving surface ranging from one to twelve levels; however, the 12<sup>th</sup> level is the minimal moving while one is greatly moving level. The individuals were needed to ménage that platform through feet to control that specific dot which was appeared on screen in front of the individuals. Biodex balance training group contains static and dynamic elements of balance training beginning from static training and developing to dynamic elements within eight weeks interval to maximize the balance challenge. This challenge was also extended personally in every BDEX training technique which comprises of training of weight switching, individuals are demanded to switch weight in anterior-posterior as well as mediolateral direction with narrow motility domain shown on screen, confines of stability training demand participants to switch weight in  $360^\circ$  space to get the end of sway window as well as percentage weight bearing training demanded from participants to uniformly carry weight in whole direction. Facts were composed at baseline by

utilizing BFRS, BBS and TUG after interventions of eight weeks. Biodex fall risk score was examined with biodex balance system (BDEX), static & dynamic (SD) utilization. Objected measures of balance is given by biodex fall risk score and assumed as much trustable [20]. The entire individuals were examined by utilizing biodex fall risk score for twenty second interval of trail on level eight mobility on biodex balance system SD. The subjected were requested to stand on circular platform and make efforts to hold the markers in the centre of Biodex fall risk score bull's eye screen. Meanwhile, the platform was spontaneously circulating in anterior-posterior as well as medial-lateral direction. Biodex fall risk higher score denoted higher fall risk irregular balance and vice versa. Assessor was unfamiliar of group distribution and enrolled members were briefed that not to communicate study protocols with assessor. SPSS was utilized for fact analysis. Demographic facts just like BMI (body mass index) weight, height and age were recorded in SD format moreover gender division was recorded in form of repetition and percentage. Shapiro-Walk Test of commonness was utilized at baseline with the objective of assessing distribution. Non-expressive findings ( $p>0.05$ ) justified parametric tests utilization. Independent samples t-test was used for groups.  $P<0.05$  was define as substantial level.

### RESULTS:

The researcher made two groups comprising of nine (50%) individuals in each group. In general, the average age, weight and height were  $62.89\pm 7.91$  years,  $74.48\pm 10.68$  kg and  $1.59\pm 0.09$  meters respectively. The number of males and females was seven (38.9%) & eleven (61.1%) respectively. No expressive variations were noticed between the categories after eight weeks of intervention ( $p=0.07$ ). Evaluation of the groups presented substantial betterment in intervention category with P-value  $< 0.001$  whereas no substantial improvement was noticed in control group with P-value  $> 0.05$ . Post-intervention, the findings remain constant while comparison of both the categories (P-value  $< 0.05$ ).

Table – I: Gender Distribution

Gender	CTRL Group		BDEX Group	
	Number	Percentage	Number	Percentage
Male	3	33.3	4	44.4
Female	6	66.7	5	55.6

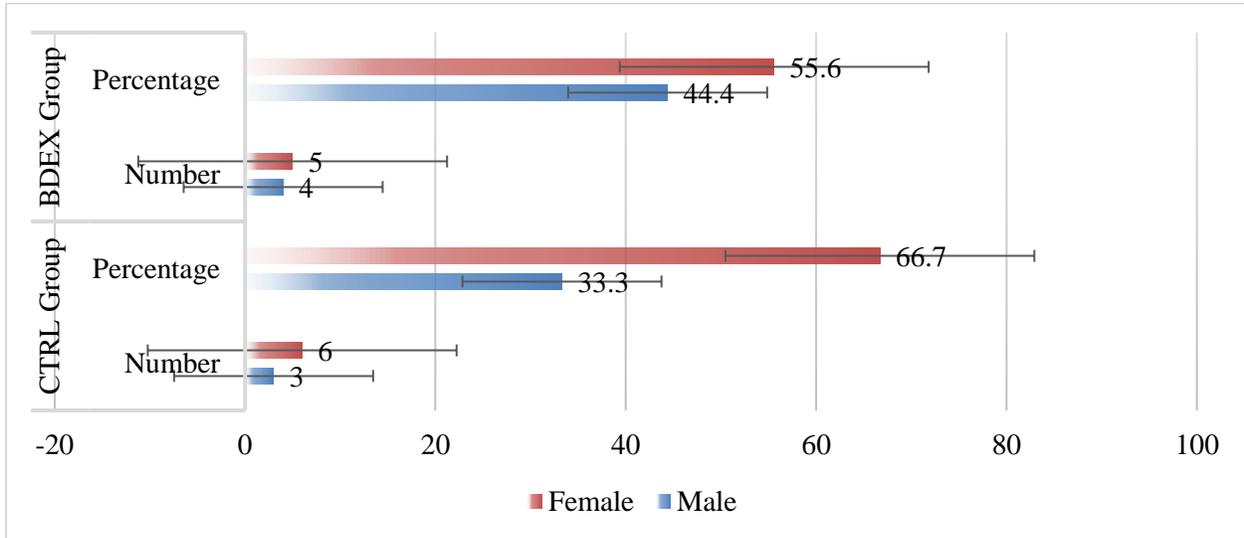
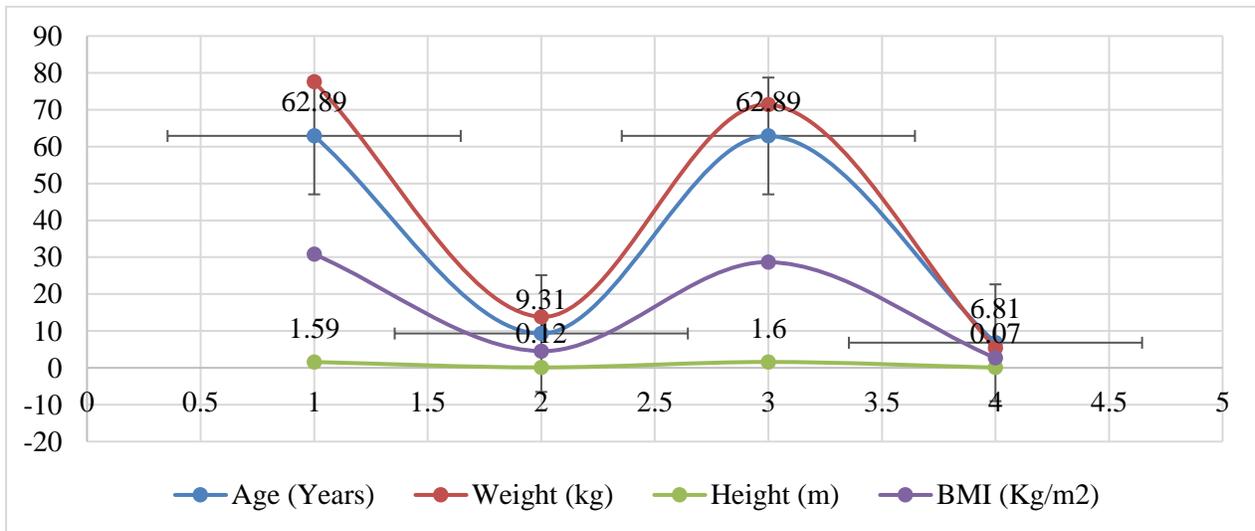


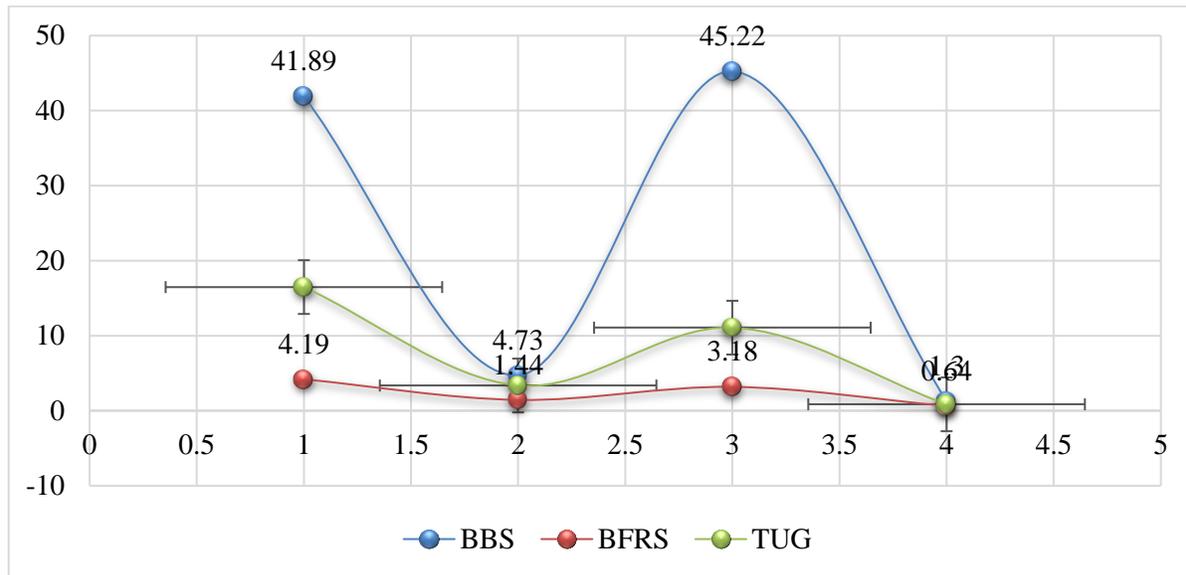
Table – II: Comparison of Variables among Groups

Variable	CTRL Group		BDEX Group	
	Mean	±SD	Mean	±SD
Age (Years)	62.89	9.31	62.89	6.81
Weight (kg)	77.57	13.84	71.39	5.39
Height (m)	1.59	0.12	1.6	0.07
BMI (Kg/m <sup>2</sup> )	30.8	4.54	28.67	2.67



**Table – III:** Group-Wise Comparison of BBS, BFRS and TUG

Variable	CTRL Group		BDEX Group		P-Value
	Mean	±SD	Mean	±SD	
BBS	41.89	4.73	45.22	1.3	0.07
BFRS	4.19	1.44	3.18	0.64	0.08
TUG	16.48	3.36	11.07	0.85	< 0.001

**Table – IV:** Baseline and 8<sup>th</sup> Week Assessment

Variable	Group	Baseline Assessment	8 Week Assessment	P-Value
BBS	BDEX Group	40.89 ± 1.76	45.22 ± 1.30	< 0.001
	CTRL Group	42.78 ± 5.87	41.89 ± 4.73	0.67
BFRS	BDEX Group	5.29 ± 0.75	3.18 ± 0.64	< 0.001
	CTRL Group	4.03 ± 1.39	4.19 ± 1.44	0.82
TUG	BDEX Group	15.45 ± 1.50	11.07 ± 0.85	< 0.001
	CTRL Group	16.12 ± 3.37	16.48 ± 3.36	0.42

## DISCUSSION

There is a concede requirement for intention calculation in indices for fall hazards, however, confined proofs of such calculations are available. Additionally, no productively accessible instruments have materialized as a gold standard of balance evaluation [21]. For analysis as well as balance training, the huge variety of clinical application for biodex balance training group is available. It has established its valuation as a compatible and objective instrument [22]. Number of earlier researches has noticed about this instrument to develop balance of body and prevent falls among the aged personals via neuromuscular training [23]. The current research is first of its type in Pakistan to evaluate and trained the aged public by utilizing moderate balance training and evaluation system acquiring extensive as well as

targeted balance measures. The finding of the research was encouraging and presented that over eight weeks duration, there was substantial betterment in individual motility as well as in balance of biodex balance training group. With respect to control group, displaying prominent diminution in fall chances, however, there was statistically no expressive variations between the Berg balance scale and biodex fall risk score groups, evaluation within groups in BFRS and BBS presented that these was striking contrast between post-intervention values as well as base line in biodex balance training group, displaying mark able diminution in fall chances as demonstrated by betterment in Berge balance scale and biodex fall risk score. With comparison to control group, accordingly accepting betterment of balance was more additional in biodex balance training group with

respect to control group. Uniformly, substantial betterment appeared in mobility of biodex balance training group with comparison to control group as displayed by diminution timed up and go test score. The outcomes of the present researches are uniform to one additional research on balance recovery by utilizing biodex system, which presented a substantial development in BFR index after release from rehabilitation ( $P < 0.001$ ). In contrariety, a research had few drawbacks as no control group was enrolled and insufficient trainer was accessible for utilization of BDEX [24]. In one additional research on balance development in diabetic patients utilizing BDEX, timed up and go test, FRI fall risk index ( $P= 0.002$ ) and Berg balance scale ( $P=0.04$ ) presented expressive development in the treatment category after training, however, had no absolute variation in control group [15]. These results are similar with the results of our research where expressive development our time was recorded in BFRS, TUG, and DBS of biodex balance training group. The results of our research assist the findings of one additional research in which balance training utilizing the biodex balance training. SD was performed by the BDE category. The Romberg test timed up and go test FRI, BBS, and postural stability test were examined in both the categories at base line as well as after twelve weeks. There was expressive development in the finding measures of timed up and go test, FRI and OSI (overall stability index) in the treatment category after twenty-four spells [17].

An RCT on institutionalized aged population for balance training involves twelve weeks training comprising two spells per week of balance and rebalance training with biodex balance training. There was expressive diminution in fall hazards in intervention category at twelve weeks with respect to control group [23]. These findings are also assisted by our research which presented expressive development in static and dynamic balance, the mobility and minimizing fall changes as identified by scores of biodex fall risk (BFR), BBS and TUG.

The mode of the current research was pilot study carried out in one centre. The specimens were insufficient and also not pre-calculated. Therefore the findings of the research could not summarized to common public, additionally several centre researches required to be performed with huge sample volume to make the finding more generalized.

### CONCLUSION:

Dynamic postural training through inert as well as dynamic biodex balance system had categorical consequences on mobility as well as equilibrium in aged individuals and could be utilized as the training

instrument to minimize fall hazard and develop balance and mobility.

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