Effect of 4 Weeks Balance Training Program in Healthy Young Adults: A Randomized Clinical Trial Study

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Abstract

Background: The balance is a complex motor task, which requires the interaction of the nervous system, musculoskeletal system and contextual factors. It is important to maintain balance during daily activities like walking, stair climbing, running, jumping and other recreational activities in healthy young individual. Available literature suggests use of many strategies for improving balance. Out of which balance board and BOSU ball trainings are most commonly used strategies which are yet to be discussed for the intensity of training and its effectiveness.

Purpose: To check the significant effectiveness and difference in the two balance training techniques after a 4 weeks Intervention using BOSU Ball and Balance Board for improving balance in healthy young adults.

Procedure: The purpose and the procedure of the research was explained to the subjects and On the basis of inclusion and exclusion criteria, they were requested and those who were willing to participate in the research were selected. The subjects were randomly divided into two groups for BOSU Ball and Balance Board training, the intervention was given for 4 weeks. The pre and post-test measurement was taken using SEBT to check effectiveness of the training devices.

Results: Both groups showed statistical significant improvement ($p = 0.001$) pre and post training within the groups but there was no statistical significant difference between the groups ($p > 0.05$).

Conclusion: 4 weeks Of Continuous Balance Training using BOSU Ball and Balance Board is effective in improving balance.

Keywords: *Balance Training, Star Excursion Balance-Test (SEBT), BOSU Ball.*

Introduction

Postural control is defined as act of maintaining, achieving or restoring state of balance during any posture or activity which can be achieved with support and coordinated action of muscle groups. Postural stability is modulated by postural adjustment and is measured by small postural oscillation known as postural sway.[1-3]

During self-initiated and externally triggered disturbances center of mass of body is maintained by coordination of Sensory-motor strategies in environment. The human posture is maintained by antigravity function, equilibrium of COG within BOS and perception of body segments in relation to external environment. This complex task of controlling body in environment through musculoskeletal system is termed as balance.[4-9]

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Different sensory systems work together to sense information for relation of body in environment and Information from all these systems are integrated and processed in higher centers of brain. The cerebellum has role in planning, learning and coordination of movement task while basal ganglia have role in planning, controlling and initiation of motor programs.[10-16]

For the examination and evaluation of impaired balance,various types of tests are available which are Romberg's test, Single leg balance test, Functional Reach Test, Star Excursion Test, Push and release test, Pull test, Four square step test, Time up and go test, Berg balance scale, etc.[17,18]

The Star excursion test is low cost and reliable tool for measurement of postural control, which is used to check dynamic balance in healthy adults and athletes. It has eight direction measurement including anterior, anterior-medial, medial, posterior-medial, posterior, posterior-lateral, lateral and anterior-lateral direction. It has high intra-rater (ICC value 0.88 to 0.96) and inter-rater reliability (ICC value 0.83 to 0.93).[19-24]

The BOSU Ball is a good tool for implementing proprioception, balance and strengthening activities in rehabilitation protocol. It provides training using its both surfaces, the dome and platform. Launder et al. conducted a study on ankle muscle activation by using both sides of BOSU balance trainer on healthy collegiate male subjects which concluded that both sides of BOSU Ball is equally effective in improvement of Balance.[25-28]

The Balance Board has curved surface underneath which allows single plane motion. It helps in improving coordination, proprioceptive awareness, core stability, leg strength, flexibility and agility. A study oneffect of wobble board exercise training & static balance performance in healthy male subjects revealed significant increase in balance performance and strength of muscle of lower extremity after 6 week of training on wobble board.[29-31]

Another study on role of BOSU Ball, Wobble Board, Airex and Floor found that BOSU ball and Wobble Board are most challenging compared to the Airex and the Floor. A comparative study done on collegiate football players using BOSU Ball and Balance Board which shows significantly increase in balance.[32-33]

Hence, purpose of study was to check significant difference in two balance training techniques to find the effectiveness of BOSU Ball and Balance Board in improving balance.

Aims and Objectives: To determine efficacy and to compare effectiveness of two different Balance training Devices in improving balance among healthy young individuals using SEBT.

Sampling Method: Random Sampling

Sample Size: n = 63 (Kelsey et al.)

Inclusion/Exclusion Criteria: Healthy young asymptomatic men and female between age 17-22 Years were included in study and Subjects with 1)previous balance training 2) trauma requiring medical attention within the past 2 years 3)history of any dizziness, visual, vestibular problems were excluded.

Materials:

A Measure tape for SEBT measurement

Stop watch

Balance Board

BOSU Ball

Record sheet

Restameter

Weight scale

Outcome Measure:

Pre-Post SEBT Score.

Procedure: The purpose and procedure of research were explained to subjects. On the basis ofcriterias, signing of consent and based on willingness to participate they were randomly allocated in one among both study groups.

Test Procedure:

Formation & procedure of Star Excursion Balance Test: The layout consisted of four lines, made up on floor with measure tape: two forming vertical and horizontal lines and two positioned perpendicular to each other and at 45 degree with respect to vertical and horizontal lines. The foot is placed at centre point were all measure tape merged.

The trial initiated when the subject began to reach in one of the eight diagonal directions. Subjects were not allowed to touch ground with preceding leg at any time

during reach. The maximal reach distance was furthest point along directional line is marked and noted. The trial was completed after subject returned to starting point by performing in all direction and placing preceding leg in the starting box with the supporting leg. The three trials were performed and average value was taken as final value. Same was performed post intervention to see for change in score.

BOSU Ball Protocol[32] (Group 1):

Exercise	Repetitions
Double Limb Stance	1 Min
Anterior/Posterior Tilts	10
Medial/Lateral Tilts	10
Knee Flexion	10
Lunges	10
Single Limb Stance	1 Min

Balance Board Protocol[32](Group 2):

Exercise	Repetitions
Double Limb Stance	1 Min
Anterior/Posterior Tilts	10
Medial/Lateral Tilts	10
Knee Flexion	10
Rotations	10
Single Limb Stance	1 Min

Both groups performed 3 sets of each exercises**.**

Results

Demographic characteristics of study participants:

Characteristic	Group:1 Mean±SD/N (%)	Group:2 Mean±SD/N (%)
BMI	20.57±4.14	20.55±4.21
Male	6 (18.2%)	3 (10%)
Female	27 (81.8%)	27 (90%)

On paired t test, BOSU ball & Balance board training groups showed change in mean score values on all components of SEBT post 4 weeks. There was strong positive correlation for pre- post score of SEBT. Correlations for all components were found to be highly significant (p=0.001).

An independent t- test was applied to analyze the SEBT score among two training groups. The pre and post F value and p- value with df = 61 for all components of SEBT on right and left side. Indicated that there was no statistical significant difference between the groups

Discussion

BOSU is defined as Both Sides Up. BOSU Ball training is been proved to be used for improving lower extremity and core strength. A Study suggested that performing unilateral stance on BOSU can stimulate and improve neuromuscular system in maintaining body balance. Together these can be possible reasons that after 4 weeks of BOSU Ball training in present study there was significant improvement in mean score in all the components of SEBT (p=0.001).[33]

Dootchaichaiwanichsiri et. al suggested that Balance board training exercises focus on concentric & eccentric muscle contractions, proprioception as well as coordination which may have helped in improving the score on SEBT components post 4 weeks of balance board training with significant results in all the components with p=0.001 values.[34]

In present study, both training groups when compared, results were found to be non-significant (p> 0.005). The possible reason for that could be duration of training. As suggested by L Melanie et. al. for healthy young adults, a training period of at least 11-12 weeks with overall 36-40 training sessions with each session of 30-45 minutes is more effective to improve balance. Total balance training of 91-120 minutes per week seems to be effective to improve overall balance performances which was not been followed because of time limitation.[35]

A study on young female athelets using BOSU Ball training found improvement in antero-posterior and medial-lateral direction score on SEBT following 3 sessions of 90 minutes per week training. P Neeraj et al. had studied effects of balance board training in male collegiate athletes. The training was given for eight weeks; five times a week for first four weeks and three times a week for next four weeks. They had significant improvement with balance board training.[36,37]

In this study continuous training was given for 4 weeks and each session was of 20 minutes of duration which can be the reason for not having significant result (p>0.005) among both training groups and superiority of one training program over the other training could not be concluded.

Due to its unique design both sides of the BOSU provides a different type of instability challenge. As in standing on the firm side,while the soft side is on the ground; the BOSU is least stable which can generate maximum changes in body's COG which can be used to train balance in healthy young individuals likewise exercises performed on the other surface of BOSU provides strength training. Considering both effects together we had improvement in BOSU Ball group but when compared we could not get the significant results.[38]

Balance training using BOSU has certain limitations. 1) Pressure inside BOSU can produce undesirable outcome with usage over time. 2) Subject's body weight can influence its stability. 3) Height of firm side of BOSU from ground has to be maintained same for comparison of all subject's score. These parameters were not considered for every participant. Balance Board used in current study was not a multi-axial balance board so all the exercises given were not been trained in multi- axis. Other component of sensory system which can affect balance was not been focused in the present study which could have influenced our study results.[39,40]

Force plateform is found to provide better insight for balance by measurement of COG displacement.[41] Here, SEBT was used for post training balance measurements. It has been found that modified SEBT is practice based test and improvement of score can be due to repeated practice of test.[42] Hence, that can be taken as one of the future direction of study for getting the significant results in comparison of both training groups.

Future Recommendation: A cohort study with different age group and with ideal duration of training can be carried out to find out the difference in BOSU Ball and Balance Board training in healthy young adults.

Conclusion

Young healthy individuals of 17- 22 years of age had better improvement on SEBT Score post 4 weeks of continuous training using BOSU Ball and Balance Board.

Ethical Clearance: Taken from institutional advisory board.

Source of Funding: Self

Conflicts of Interest: Nil

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