EFFECTIVENESS OF BOSUBALL EXERCISES ON DYNAMIC BALANCE USING STAR EXCURSION BALANCE TEST IN PRIMARY SCHOOL GOING CHILDREN: AN EXPARIMENTAL STUDY

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ABSTRACT

INTRODUCTION: Neuromuscular development starts in embryonic stage and continues after birth. Balance is an ability to maintain the line of gravity of body within the base of support with minimal postural sway. Children may inherit sensitivity to the effects of limited physical activity (i.e., sedentary environments) that can trigger reduced motor development during youth.

AIM: To study the effect of 4weeks bosuball exercise on dynamic balance on primary school going children.

METHOD: Total of 38 participants with age group between5-15 were recruited in this study. Participants were test for SEBT on first day and after 4 weeks of balance training.

STASTICAL ANALYSIS: t test

RESULT: The SEBT scores pre and post training with $p<0.001$

CONCLUSION: 4 weeks balance training using BOSU BALL is effective in improving dynamic balance in primary school going children and also can be used as a component of multifaceted training to improve dynamic balance and game skills.

KEY WORDS: Balance training, bosuball, SEBT.

INTRODUCTION

Motor development is the gradual process by which child gains balance and coordination of the large muscle of legs trunk and small muscle of the hand. It includes age related changes in posture, movement and balance. Motor skill is an acquired series of movement that combine to produce a smooth, efficient action. Neuromuscular development starts in embryonic stage and goes on after birth.

Balance is an ability to maintain body's line of gravity with minimal postural sway within the base of support. An increase in sway is not necessarily an indicator of dysfunctional balance so much as it is an indicator of decreased sensorimotor control. Maintaining balance requires coordination of input from multiple sensory systems including the vestibular, somatosensory, and visual systems.[1]

Children and adolescents who regularly engage in physical activity have good musculoskeletal strength, enhanced cardiorespiratory function, and reduced risk of sports- and other physical activity-related injuries. Additionally, regular enjoyment and engagement in activities which improve physical fitness and health enhancing behaviors during childhood and adolescence may be benificial in prompting regular physical activity as an ongoing lifestyle choice into adulthood.[2]

Balance is an integral component of almost every activity of daily living (ADL).Balance training can be given by various devices such as tilt boards, wobble board, BOSU (Both Side Utilised) ball, T- bow, dyna-discs etc. Bosu ball is established by david weck in 1999, which has inflated rubber hemisphere attached to a rigid platform measuring 24. 6 x 24.6 x 6 inches.[3]

You can group the Postural-control and balance into static and dynamic categories. Static postural control tasks require that the individual establish a stable base and maintain that position while minimizing body movements while evaluation. Dynamic postural-control requires some degree of anticipated movement around a stable base. It could include things like jumping or hopping to a new location and immediately attempting to remain as motionless as possible or attempting to create purposeful segment movements (reaching) without compromising the established base of support. Star Excursion Balance Test (SEBT) becomes of that kind of task which has gained prominence in the research and clinical setting. Initially described by Gray as a rehabilitative technique, the SEBT is a sequence of single-limb squats using the nonstance limb to achieve a point at maximum on ground along to 1 of 8 designated lines on the ground. The lines are arranged in a grid that extending from a center point and are 45^0 from one another. The path to reach offers Nemours challenges and involves combination of sagittal, frontal, and transverse movements. The directions to follow are labeled as anterior, anteromedial, anterolateral, medial, lateral, posterior, posteromedial, and posterolateral in relation to limb ob the body. The objective of the task is to have the individual create a stable base of support on the stance limb in the middle of the testing grid and maintain it through a maximal reach excursion in 1 of the prescribed directions.[4]

1. **MATERIAL AND METHODS**

MATERIAL

Bosuball,

Medical tape,

Measure tape

METHODOLOGY

38 children were selected government primary school, Gujarat, who are meeting the inclusion criteria. A written consent form was signed by their parents. Inclusion criteria were Children between 5-15 years of age, Parent of participants gave written informed consent and Participants of both boys and girls are included. Serious or unstable medical conditions, History of any chronic diseases, previous history for any injury, pathologies and history of recent fractures of lower limb, and Subjects not willing to participate in study were excluded.[1]

INTERVENTION: Participants received BOSU ball training three times a week for a period of 4 weeks. The patients were asked to maintain a record of the exercises done and the number of sessions completed. At the end of 4 weeks of training post- measurements of the same outcomes were obtained. The exercises performed are as given in Table 1. Progression of exercises was done by eyes open to eyes closed.

Outcome measure: Star excursion balance test (SEBT) [figure 1&2] - The SEBT a functional test that incorporates a single-leg stance on one leg (e. g. right leg) whilst trying to reach as far as possible with the opposite leg (e. g. left leg). The participants stood in a square at the centre of the grid with 8 lines extending from the centre at 45°. Each of the 8 lines extending represent the individual directions which each subject is required to reach out with the most distal part of their reach foot. The eight directions are antero-lateral (AL), anterior (A), antero-medial (AM), medial (M), postero-medial (PM), posterior (P), postero-lateral (PL) and lateral (L). A standard tape measure (cm) was used to quantify the distance the participant had reached from the centre of grid to the point that the participant managed to reach along each diagonal. line.

2. STASTICAL ANALYSIS

Statistical analysis for the present study was using the statistical software SPSS 25.0, as to verify the results obtained. Comparison of the pre training and post training outcome measures within the groups was done by using student paired 't' test and between the groups was done using unpaired 't' test . Probability values less than 0.05 were considered statistically significant and probability values less than 0.001 were considered highly significant.

3. RESULT

Age of the participants in this study was between 5 to 15 years. The mean age of the participants in was 10.92. The differences in all eight directions of SEBT compared by paired t test were presented in table 2.There is a highly significant change in pre and post treatment in both right and left leg.(p<0.001)

4. DISCUSSION

The results of the present study showed improvement in SEBT scores in all eight directions by using BOSU ball exercise. Results of this study were focused on dynamic balance in school going children. There was a significant difference in all 8 direction after the training. Alyson Filipa who compared neuromuscular training with strength training in improving SEBT scores in athletes. This study showed that muscle activation and proprioception, may have a stronger relative relationship to the SEBT performance than non–weight-bearing strength testing. Mark paterno had given 6 weeks of neuromuscular training in female athletes using bosuball. There was increase in single limb stability in anterior-posterior, and medial-lateral direction after 6 weeks of training. The results of this study for the 4 weeks of training were similar to the present study for both right and left leg. Usually the position on unstable surface exhibite a posture that include a slight angle of dorsiflexion in the ankle. With the joint in   closed-packed orientation and loaded in a single-legged position, the proprioceptive influence of the joint may have been

agitated to satisfy the demand of stressed joints, resulting in a more controlled position. Eisen TC, Danoff JV suggests that mutiaxial balance training promotes neuromuscular mechanisms responsible for the co-contraction of agonist and antagonist muscles which improve active joint stability.

5. CONCLUSION

The present study concludes that 4 weeks balance training using BOSU BALL is effective in improving dynamic balance in primary school going children and can be used to improve dynamic balance and game skills.

LIMITATION: The Subjects were not blinded to the training sessions which could have created some amount of bias.

RECOMANDATION: In future the prospective study can be done on large sample size to generalize the results.

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6. REFRENCES

1. Pooja Narendra Yengde*, Sanjivani Dhote, "Assessment of balance using bot-2 in age group 5-15 year school going children" journal of Asian Pac. J. Health Sci., 2017; 4(1)

2. Gregorgy D. Myer, Avery D. Faigenbaum, "when to initiate integrative neuromuscular training to reduce sports related injuries in youth?" Curr Sports Med Rep.2011; 10(3):155-166

3. Nisha Joshi, Arati Mahishale, Basavraj Motimath. "Comparative Study of 4 Weeks of Dynamic Balance Training Program in Collegiate Football Players: Randomized Clinical Trial". Journal of Evidence based Medicine and Healthcare; Volume 2, Issue 10, March 09, 2015

4. Phillip A. Gribble, jay hertel, "Using the star excursion balance test to assess dynamic postural-control deficits and outcomes in lower extremity injury: A literature and systemic review", journal of athletic training, 2012; 4(3):339-35

Table 1: BOSUBALL EXERCISE

Exercise	Repetitions	Sets
Double limb stance	1 minute	3
Anterior/posterior tilts	10 repetitions	3
Medial/lateral tilts	10 repetitions	3
Knee flexion	10 repetitions	3
Lunges	10 repetitions	3
Single limb stance	1 minute	3

Table 2: Difference between pre - post data of SEBT

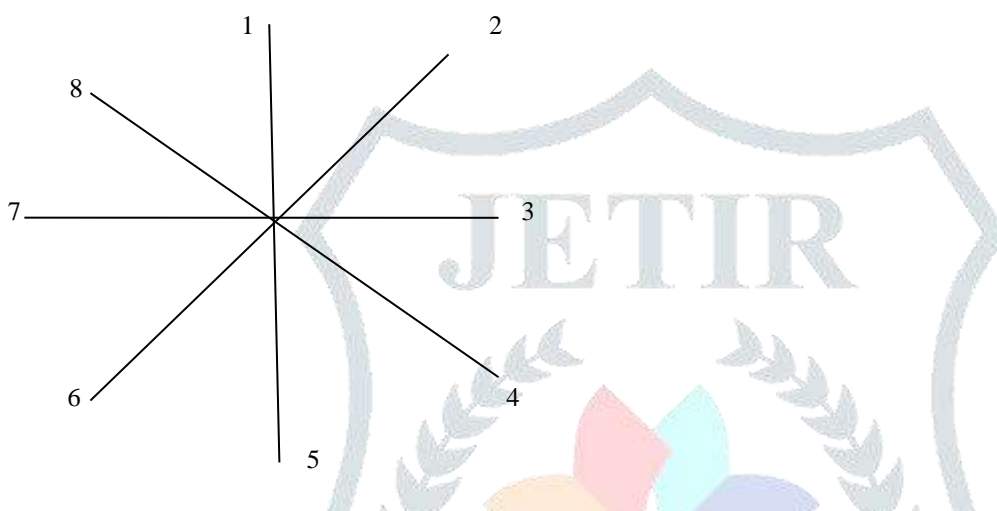| SEBT DIRECTIONS	Pre		Post		P-VALUE
	Right (MEAN±SD)	Left (MEAN±SD)	Right (MEAN±SD)	left (MEAN±SD)	
Anterior	31.28±6.92	30.89±7.21	37.47±7.02	37.39±6.98	0.000
Antero-medial	31.44±7.10	30.94±7.17	37.52±7.09	37.55±7.11	0.000
Antero-lateral	24.26±7.08	23.81±7.75	30.47±7.45	30.44±7.86	0.000
Posterior	30.55±6.82	30.15±7.08	36.86±7.07	37.18±8.04	0.000
Postero-medial	31.10±7.57	30.47±7.24	37.39±7.67	37.31±7.70	0.000
Postero-lateral	29.76±7.00	29.47±7.51	36.23±6.98	36.39±7.48	0.000
Medial	31.15±7.06	30.65±6.94	37.52±7.48	37.31±6.90	0.000
Lateral	27.26±6.69	26.57±7.01	33.63±6.86	33.84±7.55	0.000

Figure 1: SEBT standing on left leg

Figure 2: SEBT Standing on Right leg