International Journal of Physical Education, Sports and Health 2016; 3(6): 385-388

P-ISSN: 2394-1685
E-ISSN: 2394-1693
Impact Factor (ISRA): 5.38
IJPESH 2016; 3(6): 385-388

www.kheljournal.com
Received: 06-09-2016
Accepted: 07-10-2016

Biswajit Dhali
Master Degree Scholar, Department of Physical Education, Jadavpur University, Kolkata, West Bengal, India

Gopal Chandra Saha
(H.O.D.), Department of Physical Education, Jadavpur University, Kolkata, West Bengal, India

Correspondence
Biswajit Dhali
Master Degree Scholar, Department of Physical Education, Jadavpur University, Kolkata, West Bengal, India

Comparison of dynamic balance between two legs of three growth stages of children

Biswajit Dhali and Gopal Chandra Saha

Abstract
Dynamic balance is considered as an ability to maintain stable position while performing a task that occurs at difference growth stages of children. The purpose of the study was to compare the Dynamic Balance between Two Legs of three growth stages of children. A total ninety male children was selected out of which pre-adolescent (n=30) age level 11-13 years, adolescent (n=30) age level 14-16 years and adult (n= 30) age level 18-20 participated in the study. The variable under taken for the study was dynamic balance which was measured by Star Excursion Balance Test. The significance of statistical difference between two legs of three growth stages of children on Star excursion balance test (SBET) was measured by applying 't'-test at 0.05 level of significance. From the study it has concluded that there was no significant difference of Dynamic Balance between Left Leg and right leg of three different growth stages children.

Keywords: Dynamic balance, star excursion balance test (SEBT), pre-adolescent, adolescent, adult

1. Introduction
Dynamic balance is the branch of mechanics that is concerned with the effects of forces on the motion of a body or system of bodies, especially of forces that do not originate within the system itself, which is also called kinetics. (Kwon *et al*., 2013) [7].
Dynamic balance is considered as an ability to maintain stable position while performing a task. (Winter *et al*., 1990) [19] Dynamic balance is desirable in sports that require stability while athlete is moving and quickly reacting to changing circumstances. Balance is maintained by the vestibular, visual and somatosensory system along with Centre of gravity and Centre of mass. A player may face perturbations against his dynamically balanced position either by the opponent or by the player themselves while changing directions to avoid an opposing player or while passing or kicking a ball. These perturbations are large and need strong stabilization. (Lloyd *et al*., 2003) [8].
The Star Excursion Balance Test (SEBT) is a dynamic test that requires strength, flexibility, and proprioception. It is a measure of dynamic balance that provides a significant challenge to athletes and people who are physically active. The test can be used to assess physical performance but can also be used to screen deficits in dynamic postural control due to musculoskeletal injuries like chronic ankle instability. It could be used to identify athletes at greater risk for lower extremity injury. It is also possible to use the test during the rehabilitation of orthopedic injuries in healthy, physically active adults (Plisky *et al*., 2009) [13].
Preadolescence is a stage of human development following early childhood and preceding adolescence. (NOA Dictionary, 2005) [12] It generally ends with the beginning of puberty, but may also be defined as ending with the start of the teenage years (Erikson, 2009) [4]. For example, dictionary definitions generally designate it as 10–14 years (RH Dictionary, 2009) [3].
Adolescence is a transitional stage of physical and psychological human development that generally occurs during the period from puberty to legal adulthood. (Merriam-Webster, 2012.) [11]. The period of adolescence is most closely associated with the teenage years, (Medline Plus, 2014) [10] though its physical, psychological and cultural expressions may begin earlier and end later. The age level of adolescent is 13–19 years. (Kail & Robert, 2011) [6].
Adulthood has been determined primarily by the start of puberty (the appearance of secondary sex characteristics such as menstruation in women, ejaculation in men, and pubic hair in both

Sexes). In the past, a person usually moved from the status of child directly to the status of adult, often with this shift being marked by some type of coming-of-age test or ceremony. (Maranz & Robin, 2010) [9].

Young children walk with a wide base of support. As they mature, they are better able to control their body weight over the supporting limb, due to greater coordination and improved balance (Sutherland, 1997) [18]. Age and more practice improve balance control, leading to better postural control and decreased postural sway (Rival *et al*, 2005) [15].

For the moment, the role of Dynamic balance has not been clear so in this study the comparison the Dynamic Balance between Two Legs of three growth stages of children has been taken into consideration.

2. Methodology

For the present study total ninety male children was selected randomly from three different growth stages of Medinipur district in West Bengal. Out of ninety male subjects of three different growth stages of children, 30 subject from Pre-adolescent age level 11-13 years, 30 subject from Adolescent age level is 14-16 years and 30 subject from Adult age level is 18-20 participated in the study. Personal data of the children for Age, Body weight, Standing height, Height of both leg length were undertaken. The variable under taken for the study was dynamic balance which was measured by Star Excursion Balance Test.

The protocol described by Gribble and Hertel (2003) [5] was followed to measure dynamic balance using star excursion balance test (Fig. 1 & 2). The subjects were instructed to maintain a stable single leg stance with the test leg while shoes were off and to reach for maximal distance with the other leg in each of the 8 directions. A verbal and visual demonstration of the testing procedure was given to each participant. Then subjects were made to place the foot of their stance leg in the middle of the SEBT and were instructed to make a light touch on the tapes aligned in different directions with the most distal part of the reaching leg while looking over the point of contact of the reaching leg with tape without using the reach leg for support. If it is determined that the reach leg has been used for support or stable base of support has been compromised, the trial was repeated. For the trial to be successful hands had to remain on the hips and the foot of stance leg should not move from its original position and the heel of stance leg should be in contact with ground. The leg tested and order of reach direction was randomly selected before testing and a 5 sec. rest with a 2 feet stance was given between reach attempts. Subjects were allowed to practice reaching 4 times in each of the 8 directions (Robinson and Gribble, 2008) [17]. After a 5 minute rest period; subjects performed three trials in each of 8 directions. These three trials were performed for each limb. Subjects were instructed to reach behind the stance leg when performing trials in the posterior directions. Visual cues were removed from the testing area to help reduce visual and auditory influences. Marks at regular intervals (1cm) were set on the tape (Chaiwanichsiri *et al*., 2005) [2]; a pencil was used to point and read the distance to which each subject's foot reached. To measure leg length, the participant was made to lie on a plinth; a mark was placed using a marker on the participant's most inferior aspect of each anterior superior iliac spine and on the most distal portion of medial malleolus. The subject was asked to lift hips off the plinth and return them to starting position. The examiner passively straightens the legs to equalize the pelvis. The subject's limb length was measured in centimeters from the anterior superior iliac spine to the most distal portion of the medial malleolus with a cloth tape measure. The average of three distance (cm) scores was taken for each direction over the three trials and was normalized to leg length. [Reach distance/ leg length X 100 = percentage of leg length]. The normalized distances in each direction were summed for both limbs and the total sum of the mean of summed normalized distances of both limbs were calculated.

2.1 Statistical analysis

The obtain data in the form of scores was treated statistically to get results and to draw conclusions. The significance of statistical difference between two legs of three growth stages of children on Star excursion balance test (SBET) was measured by applying't'-test at 0.05 level of significance.

3. Results

Table 1: Mean, S.D. &'t' values of Dynamic Balance of Pre-Adolescent children between Left Leg and right leg.

Variables	status	Mean	S.D.	't'-Ratio
Pre-Adolescent children	Dynamic Balance of Left Leg	65.96	8.32	2.005*
	Dynamic Balance of Right Leg	64.01	8.72	

* Table value of't' for at 0.05 level of confidence = 2.045

From table 1 it was found that the mean and SD of Left Leg Dynamic Balance of Pre-Adolescent children's (65.96/8.32) are more than the mean and SD of Right Leg Dynamic Balance of Pre-Adolescent children's (64.01/8.72). And obtained't' value 2.005 is less than the table value 2.045 at .05 level of confidence. From the findings it has been observed that there was no significant difference of Dynamic Balance of Pre-Adolescent children between Left Leg and right leg.

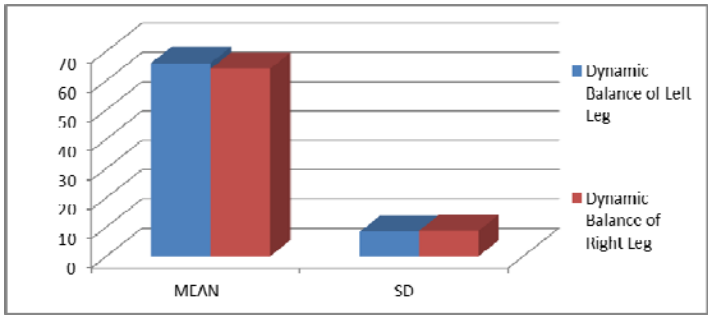

Fig 1: Graphical representation of mean and S.D. of Dynamic Balance of Pre-Adolescent children between Left Leg and right leg.

Table 2: Mean, S.D. &'t' values of Dynamic Balance of Adolescent children between Left Leg and right leg.

Variables	status	Mean	S.D.	't'-Ratio
Adolescent children	Dynamic Balance of Left Leg	79.88	6.120	0.176*
	Dynamic Balance of Right Leg	79.63	7.295	

* Table value of't' for at 0.05 level of confidence = 2.045

From table 2 it was found that the obtained't' value 0.176 is less than the table value 2.045 at 0.05 level of confidence. From the findings it has been observed that there was no significant difference of Dynamic Balance of Adolescent children between Left Leg and right leg.

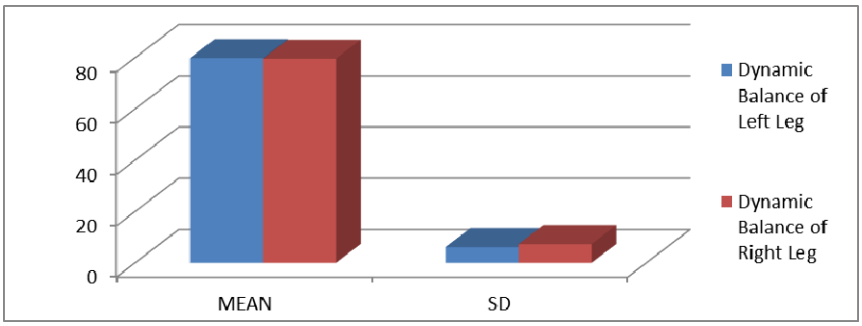

Fig 2: Graphical representation of mean and S.D. of Dynamic Balance of Adolescent children between Left Leg and right leg.

Table 3: Mean, S.D. &'t' values of Dynamic Balance of Adult children between Left Leg and right leg.

Variables	status	Mean	S.D.	't'-Ratio
Adult children	Dynamic Balance of Left Leg	81.544	9.867	0.997
	Dynamic Balance of Right Leg	80.552	10.193	

* Table value of 't' for at 0.05 level of confidence = 2.045

From table 3 it was found that the obtained 't' value 0.997 is less than the table value 2.045 at 0.05 level of confidence. From the findings it has been observed that there was no significant difference of Dynamic Balance of Adult children between Left Leg and right leg.

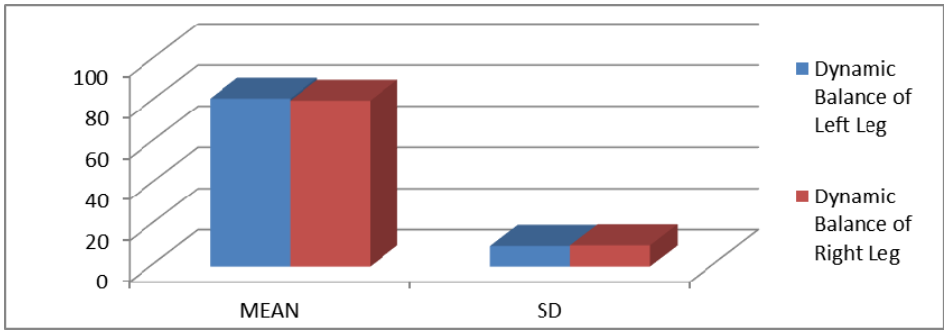

Fig 3: Graphical representation of mean and S.D. of Dynamic Balance of Adult children between Left Leg and right leg.

4. Discussion of findings

This study compared dynamic balance between two legs of three growth stages of male children on Star excursion balance test (SBET). The result demonstrated that adolescent children had better dynamic balance than pre-adolescent children and low dynamic balance than the adult children with respect of their age and leg length. And the dynamic balance of left leg is better than the right leg of three growth stages of children. But this difference of Dynamic Balance between Left Leg and right leg was not significant.

Dynamic balance is an important factor associated with injury and performance in athletes (Bizzini *et al*., 2012) [1]. Performance on dynamic balance has previously been determined to depend on an individual's age, competition level, gender, and sport. (Plisky *et al*., 2006) [14] The results of this study suggest that normative values for dynamic balance may be influenced by country of origin in addition to the previously established covariates of gender, sport, and competition level (Robert, 2013) [16]. Researcher is of strong opinion according to the obtained results that the dynamic balance has greater impact on the different growth stages of male children in respect of age. Dynamic balance is strongly dependent on core muscle strength and it is observable by the results that better development of Dynamic balance is established by the male children in continuation with the increase of age level. Male children have better strength, range of motion, proprioception, neuromuscular control as well as sensorimotor function for better balance ability as well as athletic performance. Sufficient endurance of core muscles has an essential role in balance, coordination and sports specific tasks of the male children.

5. Conclusion

From the study it has concluded that there was no significant difference of Dynamic Balance between Left Leg and right leg of three growth stages of children.

6. References

1. Bizzini M, Hancock D, Impellizzeri F. Suggestions from the field for return to sports participation following anterior cruciate ligament reconstruction: soccer. J Orthop Sports Phys Ther. 2012; 42(4):304-312. [PubMed]
2. Chaiwanichsiri D, Lorprayoon E, Noomanoch L. Star excursion balance training: effects on ankle functional stability after ankle sprain. J Med Assoc Thai. 2005; 88:S90-4.
3. Random House Dictionary, Dictionary.com Definition of preadolescence (Based on the Random House Dictionary, 2009) Retrieved on July 5, 2009.
4. Erik Erikson-Ego Psychologists "PSY 345 Lecture Notes", (PDF). Retrieved, 2009.
5. Gribble PA, Hertel J. Consideration for normalizing measures of the star excursion balance test. Measure Phys Educ Exerc Sci. 2003; 7:89-100.
6. Kail Robert V. Children and Their Development (6th Edition) (Mydevelopmentlab Series). Englewood Cliffs, N.J: Prentice Hall, 2011. ISBN 0-205-03494-2. OCLC 727047867.
7. Kwon Yoo J, Park SJ, Jefferson J, Kim K. The Effect of Open and Closed Kinetic Chain Exercises on Dynamic Balance Ability of Normal Healthy Adults. Journal of Physical Therapy Science. 2013; 25:671-674. doi:10.1589/jpts.25.671. Retrieved 18 October 2013.
8. Lloyd D, Ackland TR, Cochrane J. Balance and Agility In: Timothy R. Ackland, Bruce C. Elliot, John Bloomfield editors. Applied Anatomy and Biomechanics in Sport. Blackwell Scientific Publications. 2nd edition, 2003.
9. Maranz Henig Robin. What Is It About 20-Somethings? New York Times. Retrieved 2010-09-24. The Discovery of adolescence is generally dated to 1904, with the publication of the massive study Adolescence, by G. Stanley Hall, a prominent psychologist and first president of the American Psychological Association, 2010, 10.
10. Medline Plus. Puberty and adolescence Archived from the original on April 3, 2013. Retrieved July 22, 2014.
11. Merriam-Webster Adolescence. Retrieved May 9, 2012.
12. New Oxford American Dictionary. 2nd Edition. Oxford University Press, 2005.
13. Plisky P *et al*. Am J. The Reliability of an Instrumented Device for Measuring Components of the Star Excursion Balance Test. Sports Phys Ther. May. 2009; 4(2):92-99. (2B)
14. Plisky PJ, Rauh MJ, Kaminski TW *et al*. Star excursion balance test as a predictor of lower extremity injury in high school basketball players. J Orthop Sports Phys Ther. 2006; 36(12):911-919. [PubMed]
15. Rival C, Ceyte H, Olivier I. Developmental changes of static standing balance in children. Neurosci Lett. 2005; 376:133-136.
16. Robert Butler J, Robin Queen M *et al*. Comparison of Dynamic Balance In Adolescent Male Soccer Players From Rwanda And The United States. Int J Sports Phys Ther. Dec. 2013; 8(6):749-755. PMCID: PMC3867068
17. Robinson RH, Gribble PA. Support for a reduction in number of trials needed for the star excursion balance test. Arch Phys Med Rehabil. 2008; 89:364-70.
18. Sutherland D. The development of mature gait. Gait Posture. 1997; 6:163-170.
19. Winter DA, Patla AE, Frank JS. Assessment of balance control in humans. Med Prog Technol. 1990; 16:31-51.