EUROPEAN ACADEMIC RESEARCH
Vol. I, Issue 10/ January 2014

ISSN 2286-4822
www.euacademic.org

Impact Factor: 0.485 (GIF)
DRJI Value: 5.9 (B+)

Relationship between Some of the Lower Extremity Deformities with Static and Dynamic Balance in Female Students of Dorud Islamic Azad University

AKRAM PASHNAMEH*
Department of Physical Education and Sport Science
Islamic Azad University, Borujerd Branch
Borujerd, Iran
RAHIM MIRNASOURI
Department of Physical Education and Sport Science
University of Lorestan
Khoram Abad., Iran
BIJAN GOODARZI
Department of Physical Education and Sport Science
Islamic Azad University, Borujerd Branch
Borujerd, Iran

Abstract:

Introduction: *Balance as one of the concepts of controversial system of sensory - motor , and the complex interaction between sensory inputs and motor responses required to maintain or change posture evaluated . The aim of the present study was to determine Relationship between Some of the lower extremity deformities with static and dynamic balance of female students in Dorud Islamic Azad univercity.*

Materials and Methods : *This study was performed with 42 female students with (mean age , 4 .20 ± 2.2 years , mean weights of 58.5 ± 9.1 kg , mean height of 163 .4 ± 5.04 cm & distribution of feet length of 73.99 ± 1.7 cm were selected . genu varum & genu valgum were measured via a caliper,goniometer was used to evaluate genu recurvatum , drop Navicular (with brody metod) was used for assessment of flat foot , for statistical analysis of data the SPSS software version 22 and Pearson test at a significance level of 0.05 were used . for evaluation of balance of static balance test (BESS) ,and dynamic balance functional testing , turnover on the star (SEBT) were used.*

Results: *A significant relationship between genu varum abnormality and static balance in subjects was found. (r = - 0.47). Significant relationship between genu varum and dynamic balance among*

* Corresponding author: apmpe2012@gmail.com

subjects was found. (r = - 0.36). Significant relationship between static balance and genu valgum was not found among subjects (r = 0.11). Significant relationship between genu valgum and dynamic balance of subjects was not found (r = 0.3). Significant relationship between abnormality of genu recurvatum and static balance was not found. (r = - 0.13). Significant relationship between abnormality of genu recurvatum and dynamic balance was not Found (r = - 0.1) Significant relationship between flat foot and static balance was not found among subjects (r = 0.08). Significant relationship between flat foot and dynamic balance between subjects was not found. (r = - 0.21)

Conclusion: *The results of this study showed except genu varum abnormality , none of the lower extremity abnormalities had no effect on static and dynamic balance, And the possible weakening of balance performance in subjects is not severe. thus, to prevent the emergence and development of these disorders can be effective in improving balance in this group of subjects.*

Key words: static balance, dynamic balance, genu varum, genu valgum, genu recurvatum, flat foot, center of gravity, rang of motion.

Introduction:

Balance is one of the concepts of controversial system of sensory - motor, and the complex interaction between sensory inputs and motor responses requires maintaining or change of posture evaluated (Riman 2002). Balance is one of the basic needs for daily activities and static and dynamic activities and sports skills such as gymnastics play an important role to prevent injuries in sports such as basketball and football (Shumway 2011). Balance is a physiological and mechanical situation and the desire of moving body within the optimal level of support. For the body balance to be maximum, the human leverage skeletal structure must show efficiency and a minimum energy must be consumed. In such a situation, our muscles use less energy and ligaments are less tolerant to stress (Scientist 1383).

Typically, static and dynamic balances in the body are a measure of lower extremity function identification (Karen et al.

2005; Nashner 1982). The straight body is less stable because the center gravity exists on top of the foot and balance has an important role in maintaining body. (Nashner 1982). However, people with lower limb and foot absorb shocks and forces of the moving. The foot without natural arch had less fatigue and we can stand on their feet longer and are later tired. (Bonnie et al. 2000; Razeghi et al. 2004).

On the other hand, the presence of abnormalities in the foot structure may affect the function of the position of static, dynamic, movement and especially affected the displacement of the body. Flat foot deformities may disrupt the motion sensing receptors. (Bonnie et al. 2000, Dwyer et al. 1975). So balance requires motion sensing receptor information processing to evaluate the body's position in space and the ability to control power generation system and it can involve posture in a complex interaction and also involves joint in entire range of motion for maximum balance. Nervous systems with biomechanical and musculoskeletal flexibility and with cooperation between the spine and joints control the posture. Neuromuscular components controls are:

1- Motor processes, including neuromuscular response synergy

2- Sensory processing in the visual and vestibular system and motion sensing receptors

3- Higher processing and integration of sensory information to convert feelings into action

4- Motor mechanisms of balance control

Getting the right posture minimizes the effect of gravity. Anti-gravity muscles during standing have a great role in right posture. (Lord 1996). Researchers have found that many muscles are active in the standing position:

1. Soleus and gastrocnemius because the center of gravity passes slightly from anterior knee and ankle.
2. Tibialis anterior when the body is deflected.
3. Gluteus medius and Tensor fascia latae (but not

Gluteus maximus)

4. Iliopsoas that prevented hip from hyperextension but is not involved in hamstrings and quadriceps.

5. Semispinalis of the dorsal spinal cord along with activation of the abdominal muscles.

It seems that postural control can be organized at the level of the spinal cord, but is under the control of higher centers such as the brain stem (including the vestibular nuclei) and cerebellum. (Robertson 1994). Towards achieving the proper balance and postural control, body forces alone are not enough. Visual sensory systems and vestibular proprioceptives with cooperate of central nervous system can control the body's position in space. (Winter 1990)

According to many researchers the balance control is very important. Vestibular system and the motor system control the body posture as a static equilibrium and dynamic equilibrium. (Woolacott 1993).

Proprioceptive system collects data movement and body position in space by the central nervous system transmission. The system consists of sensory receptors of deep muscles, joints and skin receptors, muscle spindles, Golgi receptors, muscle receptors. (Aubin 1998)

Postural control and balance are an active process (Gautier 2008). Implementing and maintaining a state of static equilibrium or during activity to generate enough force applied to the muscles and body levers (bones) require a complex interaction involving the musculoskeletal system and the nervous system (Gautier et al. 2009)

Materials and Methods:

This is a descriptive - correlation study. All subjects were students of Islamic Azad University of Dorud. After test 42 female students were invited to participate in the study with abnormalities in lower limb. Then, there was used existing tools assessment and there have been identified genu varum, genu valgum, genu recurvatum and flat foot and then there have been examined the static and dynamic balance tests. Subjects were aged between 18 and 24 years. We tried to explain the sufficient skills, learn the proper movements, and participants must not have been familiar with such exercises in order to minimize the effects of the variables. Organizing training and test conditions in terms of time, space and measurement instruments were identical. In this study, the relationship between static and dynamic balance and lower limb abnormalities was assessed.

Methods:

Before the start of the exercise protocol, all pre-test were performed. Measurement included genu varum, genu valgum, genu recurvatum and flat foot the static and dynamic balance tests.

The SEBT dynamic test procedure

SEBT test was used to assess dynamic balance. In this test, eight ways of stars are plotted on the ground. Then with right leg and or left leg the test was performed.

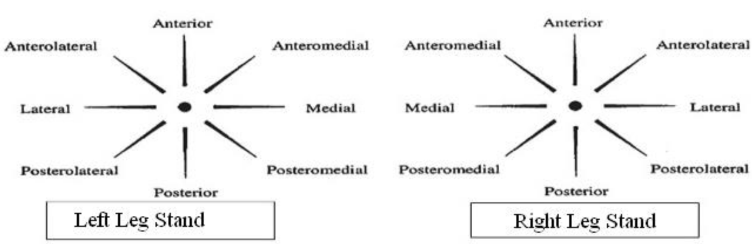

Figure 1: SEBT Overview

Method of measuring static balance

BESS test was used to measure static balance. The test consists of three stands. The three situations are: standing on both feet, stand on the one foot while opposite leg is flexed at 14 degrees and again stand on another leg while opposite leg is flexed at 14 degrees. In all three situations, eyes were closed and hands were on the waist. Each position was maintained for 20 seconds and the score was determined by registration errors (Bressel et al. 2007; McGuine et al. 2006).

Results:

Table 1 shows age, weight, height and feet length of subjects. According to the standard deviation of the data, the subjects' conditions are almost similar.

Maximum	Minimum	mean and standard deviation	Statistics / Group
24	18	2/2 ± 20/4	Age (years)
85	45	9/1 ± 58/5	Weight (kg)
183	156/5	5/04 ± 163/4	Height (cm)
82/2	71/4	1/7 ± 73/99	Leg length (cm)

Table 1: Mean and standard deviation of age, height and weight of subjects

flat foot	Go back knee	Genu varum	Genu valgus	static and dynamic balance	
13/3±1/6	12/4±1/9	13/1±1/5	13±1/8	open eyes	BESS(Number of errors)
14/5±1/7	14/5±2/2	14/6±1/3	14/8±1/5	closed eyes	
13/9±1/2	13/5±1	13/7±1/2	13/9±1/1	static balance	
644±11/6	638/9±11/4	638/8±9/3	640/42±10/3	total leg length to touch point	SEBT
108/6±4/5	107/8±2/6	107/6±3/8	108/5±2/1	dynamic balance	

Table 2: Mean and standard deviation of static and dynamic balance to separate the subjects with abnormalities in their status

Existing data in the Table 2 indicate that subjects with go back knee abnormalities in terms of the number of errors in the BESS test than the other groups had the lowest error rate in the test SEBT.

Discussion:

All people need health and fitness to live better but there is a number of people who suffer from abnormality in the skeletal structure of the lower limb and particularly in the foot growing.

As equilibrium determines the growth and development of children and adolescents' motion, the effect of structural deformities of the feet always interested researchers.

The result of this study shows that in Genu varum student dynamic and static balance decrease because leg adductor isweaker than normal. This result is similar to Perez 2007; Choy et al. 2008; Engebretsen et al. 2008 because when performing dynamic balance test, and standing on one leg, the hamstrings and quadriceps muscle contraction is necessary (Bahr 2003 ; Gribble 2003 ; Hrysomallis et al. 2007; Junge and Dvorak 2004).

Results of the present study are the same with the results of Arnold et al. (1980), this study concluding that: Genu varum and rotation (eversion) of the tibia is affecting the balance and performance of soccer players.

This study suggests that there was no significant difference between the knee valgus deformity and static and dynamic balance in subjects.

This study was inconsistent with the research of Samaei et al. (2012) who pointed out that the knee deformities such as genu valgus and varum may disrupt the center line of the lower limb joints and interfere with the static and dynamic balance.

Another result of this study indicates that there was no significant relationship between static and dynamic balance and the back knee.

The back knee is one of the deformations which the knee is further back than normal. In other words, knee opened more than the range of normal. This deformity may cause weakness of quadriceps muscle, paralysis of the quadriceps, weakness of the hip muscles, weakness muscles behind the thigh. (Daneshmandi 2003)

Other results of the study indicate that there was no significant relationship between the dynamic balance and flat foot deformity. This study was inconsistent with the research of Preston 1974; Akbari 2007; Waller 1978. They agree that the balance is the complex process that involves the ankle, the knee and hip joints. In people with flat feet, ankle joint move the talus to a non- equilibrium state that will affect the structure of ankle bones (Preston 1974; Akbari 2007; Waller 1978). Significant correlation has been seen between the severity of their flat feet and balance while they were standing. The reason for this difference may be related to the balance calculation method that we used.

Conclusion:

The results of this study showed that except abnormalities for knee Genu varum, none of the abnormalities in lower limb affect static and dynamic balance in female students. Thus preventing the formation of these disorders can be effective in improving balance in this group of subjects.

BIBLIOGRAPHY:

Akbari, M., Mohammadi, M., and Saeedi, H. 2007. "Effects of rigid and soft foot orthoses on dynamic alance in females with flatfoot." *Med J I R Iran* 21(2): 91-7.

Arnold, J.A., Brown, B., Micheli, R.P., and Coker, T.P. 1980. "Anatomical and physiologic characteristics to predict football ability. Report of study methods and correlations, University of Arkansas, 1976." *Am J Sports Med* 8(2): 119-22.

Bonnie, Y., San, T., Ming, Z., Yu, B.F., and Boone, D.A. 2000. "Quantitative comparison of plantar foot shape under different weight bearing condition." *Journal rehabilitation research & develop.* 40: 628-526.

Bahr, R. and Holme, I. 2003. "Risk factors for sports injuries-a methodological approach." *Br J Sports Med* 37(5): 384-92.

Bressel, E., Yonker, J.C., Kras, J, and Health, E.M. 2007. "Comparison of static and dynamic balance in female collegiate soccer, basketball and gymnastics athletes." *J Athl train* 42(1): 42-46.

Choy, N.L., Brauer, S., and Nitz, J. 2008. "Linking stability to demographics, strength and sensory system function in women over 40 to support pre-emptive preventive intervention." *Climacteric* 11(2): 144-54.

Daneshmandi, H., Alizadeh, M.H., and Gharakhanlou, R. 2003. "Corrective actions." Institute of Physical Education and Sports Science.

Dwyer, F.C. 1975. "The present status of the problem of pes cavus." *Clinical orthopaed*. 6: 254-75.

Engebretsen, A.H., Myklebust, G., Holme, I., Engebretsen, L., and Bahr, R. 2008. "Prevention of injuries among male soccer players: a prospective, randomized intervention study targeting players with previous injuries or reduced function." *Am J Sports Med* 36(6): 1052-60.

Gautier, G., Thouvarecq, R., and Larue, J. 2008. "Influence of experience on postural control: effect of expertise in gymnastics." *J of Motor Behavior* 40(5): 400-408.

Gribble, P.A., Robinson, R.H. Hertel, J. and Dengar, C.R. 2009. "The effects of gender of gender and fatigue on dynamic postural control." *J sport rehabil.* 18(2): 240-57.

Gribble, P. 2003. "The star excursion balance test as a measurement tool." *Athl Today* 8(2):46-7.

Hrysomallis, C., McLaughlin, P., and Goodman, C. 2007. "Balance and injury in elite Australian footballers." *Int J Sports Med* 28(10): 844-7.

Junge, A. and Dvorak, J. 2004. "Soccer injuries: a review on incidence and prevention." *Sports Med* 34(13): 929-38.

Karen, P.C., Michael, E.B., Bruce, M., Gansneder and Sandra, J.S. 2005. "Effect of pronated and supinated foot posture on static and dynamic postural stability." *Journal athlete train.* 40: 41-46.

Lord, S.R., Lloyd, D.G., and Li, S.K. 1996. "Sensori-motor function, gait patterns and falls in community-dwelling women." *Age and Ageing* 25(4):292–299.

McGuine, T.A. and Kneene, J.S. 2006. "The effect of a balance training program on the risk of ankle sprins in high school athletes." *Am J Sports Med.* 34: 1103-1111.

Nashner, L.M., Black, F.O., and Wall, C.III. 1982. "Adaptation to altered support and visual condition during stance: Patients with vestibular deficits." *J Neurosci.* 12: 536-544.

Perez, B.M. 2007. *The Development of a Clinical Preventative Screening Tool for the Lower Quarter*. Thesis submitted to the School of Physical Education at West Virginia University in partial fulfillment of the requirements for the degree of Master of Science in Athletic Training, 2007.

Preston, E.T. 1974. "Flat foot deformity." *Am Fam Physician* 9(2): 143-7.

Robertson, S., Collins, I., Eliot, D., and Starkets, J. 1994. "The influence of skill and intermittent vision on dynamic balance". *I. Mot. Behave.* 26: 333-336.

Razeghi, M. and Batt, M.E. 2004. "Foot type classification: a critical review of current methods." *Gait and Posture* 15: 282-291.

Samaei, A., Bakhtiary, A.H., Elham, F., and Rezasoltani. A.

2012. "Effects of genu varum deformity on postural stability." *Int J Sports Med.* 33(6): 469-73. doi: 10.1055/s-0031-1301331. Epub 2012 Feb 29.

Shumway-cook, A. and Woollacott, M.H. 2011. *Motor control: Translating research into clinical practice*. 3ed. NewYork: Lippincott William & Wilkins.

Waller, J.F. 1978. "Physiology of the foot and the biomechanics of the flexible flat foot." *ONA J* 5(4): 101-3.

Winter, D.A., Patla, A.E., and Frank, J.S. 1990. "Assessment of balance control in humans." *Medical progress through technology* 16(1): 31-51.

Woolacott, M.H. 1993. "Important in balance in the elderly through training in sensong organization abilities." Moves and Hum.