International Journal of Sport, Exercise and Health Research 2021; 5(1): 6-9

Research Article

IJSEHR 2021; 5(1): 6-9

www.sportscienceresearch.com
Received: 29-12-2020
Accepted: 14-03-2021

The Eeffect of Swiss Ball Training on Core stability and Balance Functions in Students with Congenital deafness

Zahra Norozi [1], Zohre Eskandari [2] and Hadi Miri [3]*

***1** Department of Sport pathology, University of Raja, Qazvin.*
***2** Assistant Professor, Sport pathology, University of Raja, Qazvin.*
***3** Assistant Professor, Department of physical education and sport science, Amirkabir University, Iran, Tehran.*

Abstract

Introduction: Based on past studies, it has been found that congenital deafness is weak in maintaining balance, strength, coordination, and endurance. So, the reinforcement of different aspects of physical fitness of these individuals should be considered in order to improve their quality of life. So, the purpose of present study was to assess the Effect of Swiss Ball Exercises on Trunk Endurance, and Balance Functions in Student with Congenital Deafness. **Methods:** The statistical population of the study consisted of students with congenital hearing loss in Qazvin, 24 of who were selected and were randomly divided into intervention and control groups. Functional tests were used to assess trunk endurance and balance. The intervention group performed the Swiss Ball training but control group continued their routine daily activities. Pre-test and post-test were performed by both groups before and after the training program. Independent t-test and covariance analysis were used to analyze the data. **Result:** According to the results of ANCOVA, there was a significant difference between the control and intervention groups in Trunk Endurance ($p = 0.001$), Static ($p = 0.001$) and Dynamic Balance ($p = 0.001$) tests after six weeks. **Conclusion:** Seems Swiss Ball training can provide a strong base for lower extremity movements by strengthening the core region of the body, thereby improving trunk endurance and balance functions in the deaf.

Keywords: Trunk Endurance, Core Stability, Proprioception, Balance, Congenital Deafness.

INTRODUCTION

Deafness is one of the common neurological defects in person, from every thousand births; a child is born with a profound hearing loss [1]. Hearing is an important feeling that makes part of our communication with the outside world possible. The child learns to speak by hearing data from the auditory system. And any disruption to this system will cause the individual to break away from society and develop personality and other aspects of development [2]. Although communication problems are the major defect in deaf person, but impairment in the semicircular canals and the cochlea of the inner ear, is one of the common problems in people with congenital deafness that has a negative impact on the postural control of these people [3].

Postural control requires a variety of information sent from the somatosensory, vestibular, and visual systems to the central nervous system (CNS). This information contributes to the formation of a reference framework that combines to create a standard that measures successive postural changes, in fact forming the overall body schema, enabling the (CNS) to be aware of the posture at any given moment [4].

Studies of deaf-related studies have shown that deaf people have motor retardation compared to their healthy peers [3]. Rajendran *et al*. (2012), Reported that deaf people had similar physical, motor, and mental needs compared to normal people, but their hearing impairment in many cases affected the activities of this group of people in particular. In childhood (for example in games) it is affected and their motor-physical development is significantly reduced or delayed [5]. Balance is one of the major problems for the deaf. Deaf people have a poorer balance than healthy people because of a defect in their vestibular system. Numerous studies have confirmed this [2, 6]. Research has shown that trunk muscle endurance is also one of the factors that can strengthen and improve balance. Saki and Baghban (2016), in a study assessing the effect of core stability on balance functions in basketball players', found that those with better trunk muscle endurance were also better [7].

***Corresponding author:**
Dr. Zahra Norozi
Department of Sport pathology, University of Raja, Qazvin
Email: zar.norozi[at]yahoo.com
Tel: +98-919-381-7250

In recent years, Swiss Ball has been widely used as a new method of treatment to increase balance, strengthen core region of body muscles, and strengthen muscles that are effective in maintaining posture, coordination, and flexibility. Performing exercises on the Swiss Ball by moving the center of gravity provides the ground for one's instability [8]. Muscle seems to be more active during training on unstable surface than exercises on fixed surface [9]. In the some of studies the effects of core stability training such as balance boards, wavy and sponge mattresses and Physioball or Swiss Ball, on the balance of the deafness have been evaluated and as a result balance functions improved. Taheri *et al*. (2017), Farzaneh Hesari *et al*. (2011) evaluated the effect of core stabilization training on balance of deafness. Results showed that balance functions after a training period significantly increased in this group [1, 10].

Studies have shown that congenital deafness has problems in maintaining balance and gait due to defects in the vestibular system. Despite the evidence, there is little published information on the balance between deaf students compared to hearing children. According to research, we know that absolute and deep congenital deaf people, due to a defect in their vestibular system, are less able to maintain balance and postural control than healthy controls; It has been done while the deaf have a poorer balance than the hearing impaired, and research in this sample may be more prominent; So, the purpose of this study was to evaluated the effect of Swiss Ball training on trunk stability and balance functions in deaf students.

METHODS

The present study was an applied one with pre-test and post-test design. The statistical population of this study consisted of students with deaf hearing in Qazvin who had obtained the necessary permits from the General Education Department and the Department of Exceptional Education of Qazvin province and were coordinated with the Qazvin Baghcheban Deaf School in accordance with the admission criteria. Twenty-four eligible subjects were selected and randomly divided into intervention and control groups.. Inclusion criteria included willingness to participate in research, non-use of drugs or affecting performance and balance, non-cochlear implantation, a hearing range exceeding 75 dB, avoidance of exercise training or excessive activity during research, no history of injury. Lower extremity during the past six months or neuromuscular problems, lack of visual impairment, absence of affective status abnormalities, no history of lower extremity injury, surgery, fracture prior to research or affecting neuromuscular diseases during research and Filling in and signing parental consent for research Students. Before the beginning of the training program, information was provided on the stages of the research and participants' anthropometric indices were measured and then a pretest consisting of dynamic balance functional tests by Y balance test and balance error test (BESS) and trunk endurance test were used to measure central stability. Afterwards, two to three sessions were held to familiarize the participants of both groups with the desired movement and duration and how the exercise program was implemented. The training program consisted of six weeks of training using Swiss balls [1, 10].

Test star excursion balance

This test is a valid tool for dynamic balance assessment [6]. In this test, drawn as Y on the ground, the test directions are aligned at a 45-degree angle. The participant will be placed in the center of directions on one foot (the upper leg) and perform the accession with the other foot then return to the first position [11]. The participant tries to touch the farthest point possible with each toe and each individual record is recorded [12-14] (Figure 1).

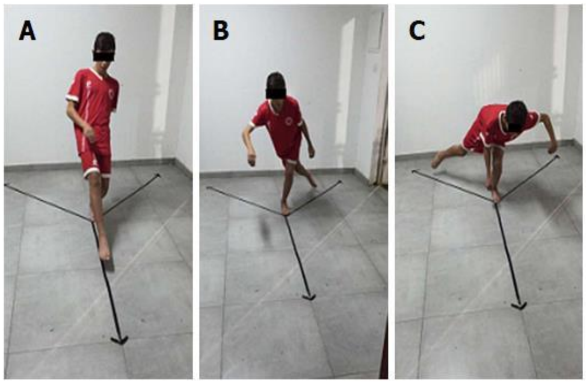

Figure 1: Y test

Balance Error Scoring System

This test is a valid tool for measuring static balance. The subject is evaluated in six different situations including three situations on hard surfaces and three situations on soft surfaces. Each situation will take about 2 seconds, during which time the number of subjects' errors will be counted and recorded. Errors include heel or toe lifting from the ground, adhesion or abduction of more than 30 degrees of thigh support, eye opening, lifting the hands off the waist, hitting the ground with the foot suspended, or disturbing the balance for any reason. The reliability coefficient of this test was obtained by Shah Heydari *et al*. R = 0.87 [15] (Figure 2).

Figure 2: Balance error test (BESS)

Training Procedures

intervention group performing the training protocol for six weeks and three sessions for sixty minute, included eight exercise to improve endurance of the core body region muscles [16]. But the control group avoided any core strengthening exercises. The intervention group performed the planned training program that presented in table 1.

Table 1: Training protocol

Warm-up	Running-stretching 10minute	
Exercise	Squat, Pike, Crunch, mountain climber, Hamstring Cruel, Oblique Crunch, Lunge, Plank	
Exercise Method	1 Week	2sets, 9reps, 2sets, 9sec 30sec rest, 2-3min rest
	2 Weeks	2sets, 9reps, 2sets, 9sec 30sec rest, 2-3min rest
	3 Weeks	2sets, 12reps, 2sets, 12sec 30sec rest (exercise), 2-3min rest
	4 Weeks	2sets, 15reps, 2sets, 15sec 30sec rest, 2-3min rest
	5 Weeks	3sets, 15reps, 3sets, 15sec 30sec rest, 2-3min rest
	6 Weeks	2sets, 9reps, 2sets, 9sec 30sec rest, 2-3min rest
Cool-down		Stretching 10minute

Statistical Analysis

The data were analyzed using SPSS software version 20 and descriptive and inferential statistical tests. For this purpose, covariance analysis at the significant level P≥0.05 was used for data analysis.

RESULTS

In Table 2, the anthropometric characteristics of the study participants are determined.

Table 2: Anthropometrical Characteristics of Subjects

Variables	Groups	Numbers	Mean ± SD	t	sig
Age(year)	control	12	16.15±1.00	0.192	0.850
	intervention	12	1.04±16.56		
Height (cm)	control	12	154.50±7.89	1.80	0.85
	intervention	12	153.66±7.16		
Weight (kg)	control	12	50.33±4.67	0.631	0.535
	intervention	12	48.91±5.48		

* Significance level is P≤0.05

As can be seen in Table 3, between the intervention and control groups the dependent variables (dynamic balance including anterior direction, internal posterior direction, external posterior direction, static balance and trunk endurance test were controlled by pretest effect level (P 0.000) there is a significant difference.

Table 3. Results of ANCOVA analysis for comparing between two groups

Variables	Source	Sum of Squares	df	Mean square	F	Sig
Anterior	Pretest	221.097	1	221.097	17.924	*0.00
	Group	226.943	1	226.943	21.640	*0.00
	Error	259.043	21	12.335	-	-
Posteromedial	Pretest	189.986	1	189.986	4.923	*0.038
	Group	1549.980	1	1549.980	40.161	*0.00
	Error	38.594	21	810.475	-	-
	Pretest	822.788	1	822.788	57.962	*0.00
Posterolateral	Group	1471.504	1	1471.504	103.662	*0.00
	Error	298.100	21	14.195	-	-
BESS	Pretest	5.625	1	5.625	4.671	*0.042
	Group	57.042	1	57.042	47.362	*0.00
	Error	25.292	21	1.204	-	-
Trunk Endurance	Pretest	752.380	1	752.380	52.948	*0.00
	Group	1280.210	1	1280.210	90.210	*0.00
	Error	298.203	21	14.200	-	-

* Significance level is P≤0.05

As shown in Table 3, observed a significant difference between two groups in the anterior excursion [(p = 0.00) and (F = 17.924)]. There is a significant difference between two groups in the Posteromedial excursion [(p = 0.038) and (F = 4.923)], and observed a significant difference between two groups in the Posterolateral excursion [(p = 0.00) and (F = 57.962)]; There is a significant difference between two groups in the static balance after the elimination of the pre-test effect [(p = 0.042) and (F = 4.671)] ; ultimately there is a significant difference between two groups in the Trunk endurance [(p = 0.00) and (F = 52.948)] ; So, as observed, the intervention group in all tests achieved better results than the control group.

DISCUSSION

The aim of this study was to assess the effect of Swiss ball training on trunk endurance and balance in students with congenital hearing loss that were evaluated by functional tests. The results showed that performing Swiss ball training for six weeks can improves trunk endurance and balance in students with congenital hearing loss.

Here, before examining the effect of core stabilization training on trunk endurance and balance in the intervention group, it was necessary to first examine the relationship between deafness and balance.

Rajendran *et al*. Have argued that deaf people have similar physical, mental, and motor needs compared to deaf people, but the fact that the deaf are naturally deprived of the hearing system has in many cases affected their activities, especially in childhood (e.g. games) [5]. Restricts them to a degree that substantially slows them down and delays them. Fear of injury due to poor understanding of the environment in deaf children as perceived by parents in childhood can reduce the natural interest of deaf children in heavy muscle activity such as running, climbing and jumping, and so on. It affects muscle growth and muscle coordination. But continued participation in physical activity can hasten the offset of motor developmental delay in the deaf. Findings of this study were in line with the results of Taheri *et al*. (2017), Ramazani *et al*. (2016), Baluchi *et al*. (2017), Hesari *et al*. (2011) and Khodashenak *et al*. But it was inconsistent with the results of Sato *et al* (2009), Loracik *et al* (2003), Aswani and Hess (2003). Although the nature of the exercise program is similar in the research conducted, the differences in the results may be due to factors such as readiness of subjects, level of physical activity, motivation, sex, dominant leg, age, height, weight, and leg length. The differences observed in the research can also be attributed to the two research methods and other variables.

Balance assignments are increasingly challenging people's balance and forcing them to use self-control systems to maintain their status [17]. One of the most effective training programs to improve balance and increase the strength and endurance of trunk athletes is the Swiss Ball exercises. It is essential to maintain a balance in the activities of daily living and the proper performance of sports. Concerning the mechanism of the effect of core stability exercises on balance, it should be explained that central contraction of the core region of body muscles precedes postural reaction by the central nervous system (CNS), preventing postural disturbances and organizing postural balance. Therefore, it is likely that performing a central stabilization exercise program will improve the anticipation of activity prior to movement formation, thereby reducing the disruption of the center of gravity movement. It also improves the core stability of the musculoskeletal system, which optimizes lumbar-pelvic-hip joint movement along the functional motor chain and proper muscle balance.

CONCLUSION

According to the results of the present study, it can be said that performing core stabilization exercises in unstable environments such as Swiss Ball, leads to increased core region of body endurance as well as improved deaf balance. Research has shown that continuous participation in athletic activities may be able to effectively enhance the core sensory-motor system without being dependent on vestibular data and strengthening the core stability. These exercises, by strengthening the core muscles of the body and neuromuscular strengthening, put the line of gravity in its natural line, thus improving the balance.

Acknowledgement

The present study is based on the thesis of MS Zahra Norozi on the direction of Dr. Zohreh Eskandari. At the end, we would like to thank all the participants and the respected management of the Qazvin Special School for helping us with this research, as well as the Raja University and the Qazvin Special Education Department for providing the necessary background for this research.

REFERENCES

1. Taheri M, Irandoust K, Norasteh A, Shaviklo J. The Effect of Combined Core Stability and Neuromuscular Training on Postural Control in Students with Congenital Hearing Loss. J Res Rehabilitation Sci. 2017; 13(2):80-6.
2. Shavikloo J, Irandoust K, Norasteh A, Daneshmandi H. Comparison of the Efficiency of Sensory Systems Involved in Postural Control of the congenital Deaf and Blind. Journal of Exceptional Children. 2019; 19(1):39-48.
3. Sorkheh E, Majlesi M, Jafarnezhadgero AA. Frequency domain analysis of gait ground reaction forces in deaf and hearing children. Journal of Sport Biomechanics. 2018; 4(2):17-27.
4. Shavikloo J, Norasteh A. The Effect of Six Weeks Neuromuscular Training Program on Balance of Congenital Deafness Students. 2018.
5. Rajendran V, Roy FG, Jeevanantham D. Postural control, motor skills, and health-related quality of life in children with hearing impairment: a systematic review. European Archives of Oto-Rhino-Laryngology. 2012; 269(4):1063-71.
6. Shavikloo J, Norasteh A. The Effect of Aerobic and Core Stability Training Combination on Respiratory Volume and Balance of Children with Congenital Deafness. International Journal of Sport Culture and Science. 2018; 6(3):298-309.
7. Saki F, Baghban m. Relationship between Core Stability Muscle Endurance and Static and Dynamic Balance in Basketball Players. Journal of Sport Biomechanics. 2016; 1(3):33-41.
8. Marshall PW, Murphy BA. Core stability exercises on and off a Swiss ball. Archives of physical medicine and rehabilitation. 2005; 86(2):242-9.
9. Escamilla RF, Lewis C, Bell D, Bramblet G, Daffron J, Lambert S, *et al*. Core muscle activation during Swiss ball and traditional abdominal exercises. journal of orthopaedic & sports physical therapy. 2010; 40(5):265-76.
10. Hessari FF, Norasteh AA, Daneshmandi H, Ortakand SM. The effect of 8 weeks core stabilization training program on balance in deaf students. Medicina Sportiva. 2011; 15(2):56-61.
11. Coughlan GF, Fullam K, Delahunt E, Gissane C, Caulfield BM. A comparison between performance on selected directions of the star excursion balance test and the Y balance test. Journal of athletic training. 2012; 47(4):366-71.
12. Bell DR, Guskiewicz KM, Clark MA, Padua DA. Systematic review of the balance error scoring system. Sports health. 2011; 3(3):287-95.
13. Carpes FP, Reinehr FB, Mota CB. Effects of a program for trunk strength and stability on pain, low back and pelvis kinematics, and body balance: a pilot study. Journal of bodywork and movement therapies. 2008; 12(1):22-30.
14. Pollock KM. The star excursion balance test as a predictor of lower extremity injury in high school football players: University of Toledo; 2010.
15. Finnoff JT, Peterson VJ, Hollman JH, Smith J. Intrarater and interrater reliability of the Balance Error Scoring System (BESS). Pm&r. 2009; 1(1):50-4.
16. Bompa TO, Haff GG. Periodization: Theory and methodology of training: Human Kinetics Publishers; 2009.
17. Akuthota V, Ferreiro A, Moore T, Fredericson M. Core stability exercise principles. Current sports medicine reports. 2008; 7(1):39-44.