AN INVESTIGATION OF BALANCE LEVELS IN CHILDREN WITH HEARING-IMPAIRED

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Abstract:
The purpose of this study is to investigate of balance skills level of deaf children. Children with hearing impaired from The Kutahya Primary School for Hearing-Impaired, were randomly selected first week of May 2013 during the week days. A total of 45 children (29 boys and 16 girls) with hearing impairments, age from 7 to 16 years, were participated in this study. BOT-2, balance subset with 9 parts was used for evaluation of balance skills. As a statistical method at the level of α=0.05 meaningfulness, t-test were performed in SPSS software package. Results show that age, height, and weight differences between girls and boys were found insignificant. Significance tests were observed between walking forward on a line, standing with feet apart on a line-eyes closed, walking forward heel-to-toe on a line, and standing on one leg on a line-eyes closed (P<0.05). Although there were found differences between girls and boys following balance tests, but all those were not found significance. Children with hearing impairments showed significantly lower balance abilities in girls than boys.
Keywords: *Balance Skill, Hearing Loss, Bruininks-Oseretsky Test-2*

INTRODUCTION

The human nervous system is immature at the time of birth, children are expected to grow and develop continually throughout their childhood years. A number of factors combine to influence each child's rate and quality of motor development (6). Motor development is fundamental for the interface of the child with the external world, for perception, action and for academic skills (1). Hearing loss is usually diagnosed early in life (8). Hearing impairment is often defined in terms of communication deficit. Despite this communication deficit a major impediment, hearing impairment is associated with other physical deficits such as vestibular related impairments. Results of recent investigation have revealed that children with hearing loss may also present with balance and/or motor deficits (7). Children with hearing impairments are likely to show delays in the production of oral language as well as in other important aspects of non-verbal development, such as motor development (1).

Hearing represents the most powerful line of communication among people. Access to speech and linguistic abilities is the fundamental precondition for personality development, and for this reason, the fact that deaf children lack – due to hearing shortage – their speech ability from a very young age plays a determinative role in their school, social and psychological growth. The result is that the personality and social characteristics of deaf persons differs from those of hearing persons. The improvement of key motor abilities is not only training-related but it also depends on the increase of corporal mass, ability to generate strength and changes that take place with age in sensory and perceptual mechanisms (3).

Physical education and sport activities play an important role in acquiring and maintaining pupils' physical and mental health and also in adopting positive attitudes in nutritional and health matters. The importance of deaf and hard of hearing children's participation in sports and recreation activities for their psychophysical development has been underlined by many researchers who proposed physical education programs for the deaf and hard of hearing children similar to those for their hearing counterparts (3).

Most children with vestibular deficits develop walking ability hence their deficits are unnoticed. However, these children avoid outdoor games. Teachers of these children often complain of incoordination, clumsiness and balance deficits which may hinder the child's optimal performance. Moreover, it is reported that the critical period of postural control development is between 4 and 6 years of age and of motor development is 8 years. Hence, intervention to address these deficits should be provided at the primary school age level. Remediation programs to address postural control as well as motor performances should focus on specific component deficiencies. Interventional programs to address motor deficits in children with hearing impairments, must consider vestibular function and motor performance, as well as focus on improving visual and somatosensory effectiveness (7).

Several studies of motor skills in deaf children reported deficits in balance, general dynamic coordination, visual-motor skills, and ball

catching abilities and cite clear differences in reaction times and speed of movements (2). The purpose of this study is to investigate of balance skills level of deaf children in the Kutahya Primary School for Hearing-Impaired.

METHOD

Children with hearing impaired from The Kutahya Primary School for Hearing-Impaired, were randomly selected first week of May 2013 during the week days. Approval of the study was received from the Ministry of Education in Kutahya. A total of 45 children (29 boys and 16 girls) with hearing impairments, age from 7 to 16 years, were participated in this study.

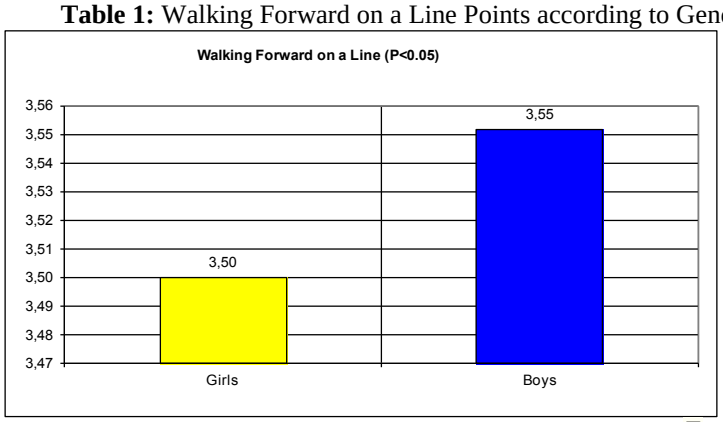
Participants were evaluated in a quiet gymnastic hall in their school during sport lesson hours. The teachers and speech therapists from deaf school helped to communicate with students during measurements. Firstly, children's weight and length measurements were recorded. After that, Bruininks-Oseretsky Test of Motor Proficiency-2, balance subset with 9 parts was used for evaluation of balance skills. Subtests are consisted of standing with feet apart on a line-eyes open, walking forward on a line, standing on one leg on a line-eyes open, standing with feet apart on a line-eyes closed, walking forward heel-to-toe on a line, standing on one leg on a line-eyes closed, standing on one leg on a balance beam-eyes open, standing heel-to-toe on a balance beam, and standing on one leg on a balance beam-eyes closed.

BOT-2 is used for assessment of individuals with developmental disorders and different physical characteristics in a wide age range (4.5 – 14.5 years). It is a fairly common tool and it differs allowing us not only to discern the differences between individuals with mild, moderate and severe delays, but also to provide different norms for comparison of different populations (3). As a statistical method at the level of α=0.05 meaningfulness, t-test were performed in SPSS software package.

CONCLUSIONS

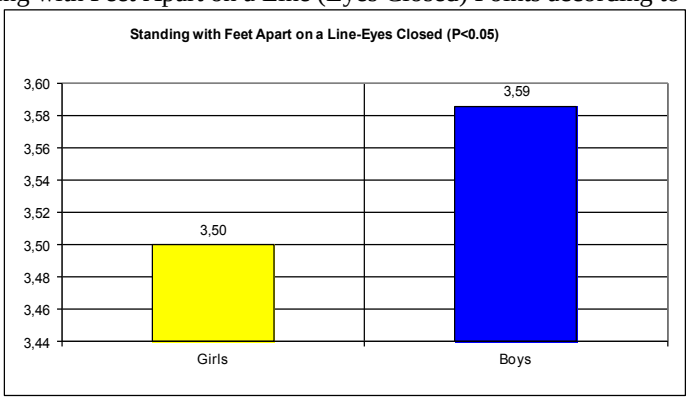
Results show that age differences (P>0.05) between girls (12.1±2.31) and boys (12.0±2.29), height differences (P>0.05) between girls (144.0±12.17 cm) and boys (148.4±16.83 cm), weight differences (P>0.05) between girls (38.6±8.66 kg) and boys (42.3±12.75 kg) were found insignificant.

Table 1: Walking Forward on a Line Points according to Gender



The results of t-test showed that there were significant differences between walking forward on a line levels of the girls and boys ($t_{0.05;43}$= ,179)(p<0.05). According to this, walking forward on a line levels of boys ($\bar{X}$=3,55±0,87) were found higher than walking forward on a line levels of girls ($\bar{X}$=3,50±1,03) (Table 1).

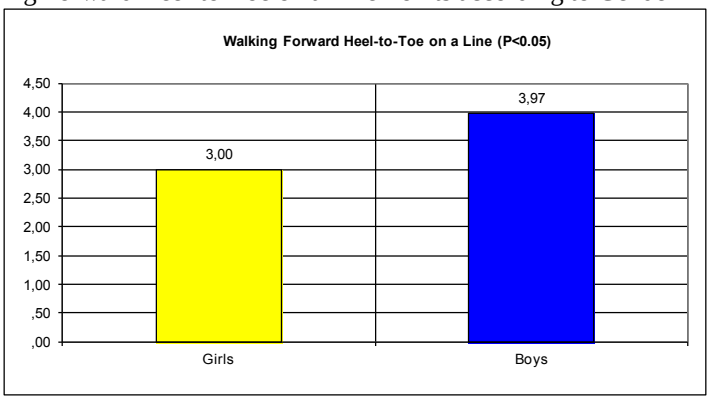
Table 2: Standing with Feet Apart on a Line (Eyes Closed) Points according to Gender



The results of t-test showed that there were significant differences between standing with feet apart on a line-eyes closed levels of the girls and boys ($t_{0.05;43}$= ,291) (p<0.05). According to this,

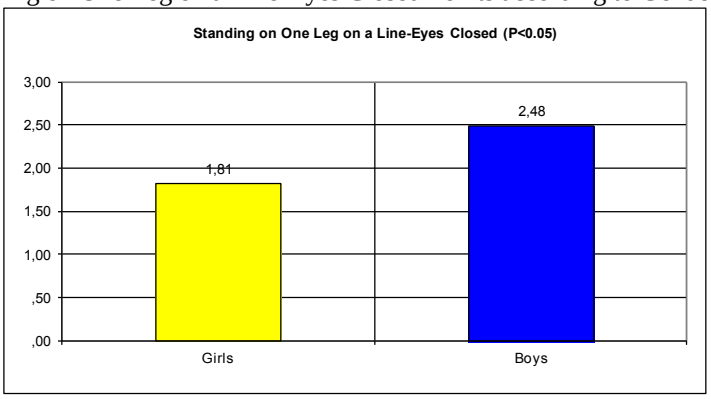
standing with feet apart on a line-eyes closed levels of boys ($\bar{X}$=3,59±0,94) were found higher than standing with feet apart on a line-eyes closed levels of girls ($\bar{X}$=3,50±0,96) (Table 2).

Table 3: Walking Forward Heel-to-Toe on a Line Points according to Gender



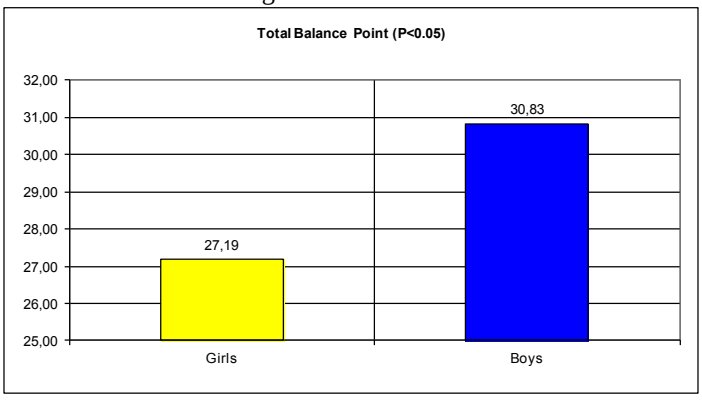
The results of t-test showed that there were significant differences between walking forward heel-to-toe on a line levels of the girls and boys (t0.05;43= -3,915) (p<0.05). According to this, walking forward heel-to-toe on a line levels of boys ($\bar{X}$=3,97±0,18) were found higher than walking forward heel-to-toe on a line levels of girls ($\bar{X}$ =3,00±1,31) (Table 3).

Table 4: Standing on One Leg on a Line-Eyes Closed Points according to Gender



The results of t-test showed that there were significant differences between standing on one leg on a line-eyes closed levels of the girls and boys ($t_{0.05;43}$= -2,088) (p<0.05). According to this, standing on one leg on a line-eyes closed levels of boys ($\bar{X}$=2,48±1,05) were found higher than standing on one leg on a line-eyes closed levels of girls ($\bar{X}$ =1,81±0,98) (Table 4).

Table 5: Total Balance Points according to Gender



The results of t-test showed that there were significant differences between total balance point levels of the girls and boys ($t_{0.05;43}$= -2,367) (p<0.05). According to this, total balance point levels of boys ($\bar{X}$=30,83±3,53) were found higher than total balance point levels of girls ($\bar{X}$ =27,19±6,82) (Table 5).

There were not found significant differences between standing with feet apart on a line-eyes open, standing on one leg on a line-eyes open, standing on one leg on a balance beam-eyes open, standing heel-to-toe on a balance beam, and standing on one leg on a balance beam-eyes closed(P>0.05).

DISCUSSION

In this study, balance skills level of deaf children were investigated. Significance tests were observed between walking forward on a line, standing with feet apart on a line-eyes closed, walking forward heel-to-toe on a line, and standing on one leg on a line-eyes closed according to gender ($P<0.05$). Javari et al. found that hearing-impaired children showed 16.7 to 100% fail results in 7 parts of the balance subset. In normal children fail result was revealed just in 3 parts of the balance subset from 2.5 to 57.5%, and differences between two groups were significant ($p<0.0001$). There was a significant difference between two groups in two static balance skills of standing on one leg on a line and standing on one leg on a balance beam with eyes closed ($p<0.0001$) (4).

There were not found significant differences between standing with feet apart on a line-eyes open, standing on one leg on a line-eyes open, standing on one leg on a balance beam-eyes open, standing heel-to-toe on a balance beam, and standing on one leg on a balance beam-eyes closed according to gender ($P>0.05$). Although there were found differences between girls and boys following balance tests, but all those were not found significance.

Children with hearing impairments showed significantly lower balance abilities in girls than boys in our study. Butterfield and Loovis also examined the impact of age, sex, balance (static and dynamic) and participation in sport on development of ball throwing ability. The sample consisting of 719 pupils (381 boys, 338 girls) aged 4 to 14 years was divided into nine age groups. The subjects' throwing ability was assessed with the OSU-SIGMA test. The static and dynamic balance ability was evaluated with the Short Form BOT Test. Statistically significant differences were found between boys and girls in all age categories, in particular, between the 3rd and the 8th age groups(3). The obtained results from this study can be used for adaptation of physical education programs to meet the needs of deaf pupils.

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