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Effect of selected balance exercises on the static balance of school age children with visual impairment

Rawat Pooja* Prof. Acharya Jayashree**

*Research Scholar, Department of sports psychology, L.N.I.P.E, Gwalior
**Dean, National Sports University, Manipur

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Abstract

The aim of this research was to determine the effect of selected balance exercises on the static balance of school age children with visual impairment. The participants consisted of (n=20) with no vision girls children, age ranged 10-16 yr with mean & S.D 15.8$\pm$ 1.82 years,from Atma Jyoti Avasiya Drishtiheen Kanya Vidhyalya, Gwalior, Madhya Pradesh, who were randomly assigned to a balance training group (n=10) and control (n=10) groups. Those who voluntarily agreed to participate in the experiment were chosen at random for the purpose and pre-test was conducted. The balance-training group was participated in an eight-week balance training program, while the control group did not participate in any organized. The Flamingo Balance Test was used to measure the static balance of the participants. Both groups performed a pretest prior to the experimental period and performed a posttest immediately after the experimental period. The training programme was carried out thrice in a week on alternate days of the week for each group. Analysis of co-variance (ANCOVA) was applied to analyze the effect of selected balance exercises on the static balance of visually impaired school children; the alpha level was set at 0.05. Statistical analysis of the data revealed there is significant difference in static balance as its p- value (0.00) found significant ($p< 0.05$), hence it may be inferred that 8-weeks balance training is effective for improving static balance of visually impaired school children.

Keywords: balance training, static balance, school children, visual impairment.

Introduction

Balance in the human body, the stability of its characteristic upright postural position, is maintained, controlled, and monitored by a complex system, consisting of the vestibular organs, the visual organs, and the organs of deep perception, touch, and pressure. Nerve signals then reach the effector organs, such as the muscles of the torso, limbs, and eyes, provoking reflex reactions coordinating body posture. Impaired postural stability may be caused by dysfunction in the integration of each of the four sensory systems: visual, proprioceptor, exteroceptor , and vestibular.

Sight, in particular, has been found to play a key role in maintaining postural stability. Visual impairment reduces the ability to maintain balance and may cause frequent injury, including falls, occupational injuries, and traffic-related injuries. A thorough review of the literature established that the risk of injury due to falls is higher for those with visual impairment than for the general population. Studies comparing individuals with/without visual impairment undergoing static and dynamic tests have confirmed that about 80% of our sensory perception is gathered in such situations by the visual system. Our movements are mainly controlled and coordinated by the eyes. Hence not only is the visual system responsible for cognition of objects, it is also used to give information to the brain about the position of our body, which processes and integrates information from other sensory systems to select the strategy for maintaining balance

Various studies have found that children with visual impairments often exhibit delays in motor development, such as poor balance and inefficient gait that are considered by products of predominantly sedentary behaviors during the developmental years. Further, they have fewer opportunities to be physically active due to safety concerns, dependence on sighted exercise partners, and a general lack of accessible activities.

Almost 80-90% of information contained in the mind was observed through visual perception (Barati,Barati, Gaeeni, & Ghanbarzadeh, 2013). One of the disabilities that most people are afraid of are blindness and poor vision because of their being more apparent than other types of disabilities, as well as the role of the eyes in social relations (Barati et al., 2013). Previous studies confirmed that blindness or visual impairment can cause low physical work capacity, postural problems, orientation difficulties, depression and problems with balance (Abolfotouh & Telmesani, 1993; Çolak, Bamaç, Aydin, Meriç & Ozbek, 2005; Portfors-Yeomans & Riach, 1995; Sundberg, 1982) Active participation in regular physical activity during childhood can aid the development of various motor abilities, as well as prevent many chronic and acute conditions (Uzunović, 2015).

Methods

Participants

Selection of Variables

- Independent Variable
  8- Weeks Balance Training

- Dependent variable
  Static balance

Criterion Measures

Flamingo Balance Test

Stand on the beam with shoes removed. Keep balance by holding the instructor's hand. While balancing on the preferred leg, the free leg is flexed at the knee and the foot of this leg held close to the buttocks. Start the watch as the instructor lets go. Stop the stopwatch each time the person loses balance (either by falling off the beam or letting go of the foot being held). Start over, again timing until they lose balance. Count the number of falls in 60 seconds of balancing. If there are more than 15 falls in the first 30 seconds, the test is terminated and a score of zero is given.

Experimental Design

Pre test post test control group design was adopted for this study. Further the subjects are divided into two groups experimental and control group .The experimental group participated in training program. No treatment was given to control group. The training programme was carried out for a total duration of eight weeks. Duration of training programme was of 15-20 minutes.

Administration of Training Programme

The training schedule prescribed by the researcher was applied to experimental group and training was personally supervised by the researcher. The training was carried out for a period of eight weeks, three days a week excluding the time consumed for conducting per-test and post test. The scholar demonstrated the training for experimental group. Each subject of the experimental group performed their respective training. Sufficient and required recovery was provided between the tests. The scholar demonstrated each exercise with its movement structure. The control group was not allowed to undergo the training program. From the first week to the eighth week, the volume of training load and training increased gradually for the experimental group.

Table 1

Exercise Protocol

Exercises	Week 1&2	Week 3 & 4	Week 5 & 6	Additional progression	Week 7 & 8
Warming up (in min)	3	3	3		3
One leg stand	30 sec	40 sec	45 sec		50 sec
Heel to toe walk (metre)	15 metre	20 metre	25 metre		30 metre
Step ups	10 each leg	15 each leg	20 each leg		25 each leg
Side way walking	20 metre each side	25 metre each side	30 metre each side		35 metre each side
Cooling down	3 min	3 min	3 min		3 min

Administration of Test

Purpose: To assess the ability to balance successfully on a single leg.

Equipment required: stopwatch, metal beam 50cm long, 5cm high and 3cm wide (the beam is stabilized by two supports at each end, and should have a non-slip surface)

Pre-test: Explain the test procedures to the subject. Perform screening of health risks and obtain informed consent. Prepare forms and record basic information such as age, height, body weight, gender, test conditions. Perform an appropriate warm-up.

Procedure: Stand on the beam with shoes removed. Keep balance by holding the instructor's hand. While balancing on the preferred leg, the free leg is flexed at the knee and the foot of this leg held close to the buttocks. Start the watch as the instructor lets go. Stop the stopwatch each time the person loses balance (either by falling off the beam or letting go of the foot being held). Start over, again timing until they lose balance. Count the number of falls in 60 seconds of balancing. If there are more than 15 falls in the first 30 seconds, the test is terminated and a score of zero is given.

Scoring: The total number of falls or loss of balance in 60 seconds is recorded.

Statistical Technique

The differences in the means of experimental group and a control group for balance training was tested for significance by applying Analysis of co-variance (ANCOVA), and the level of significance chosen was 0.05.

Results

Table 2
Descriptive Statistics of Static Balance

	Mean		S.D	
	Pre	Post	Pre	Post
Experimental group	13.3	11.1	0.94	1.19
Control group	13.1	13.2	1.19	0.91

Table indicates mean and standard deviation of static balance of experimental and control group. Mean and S.D of pre test and post test of experimental group is 13.3 ± 0.94 & 11.1 ± 1.19 respectively and mean and S.D of pre test and post test of control group is 13.1 ± 1.19 & 13.2 ± 0.91 respectively.

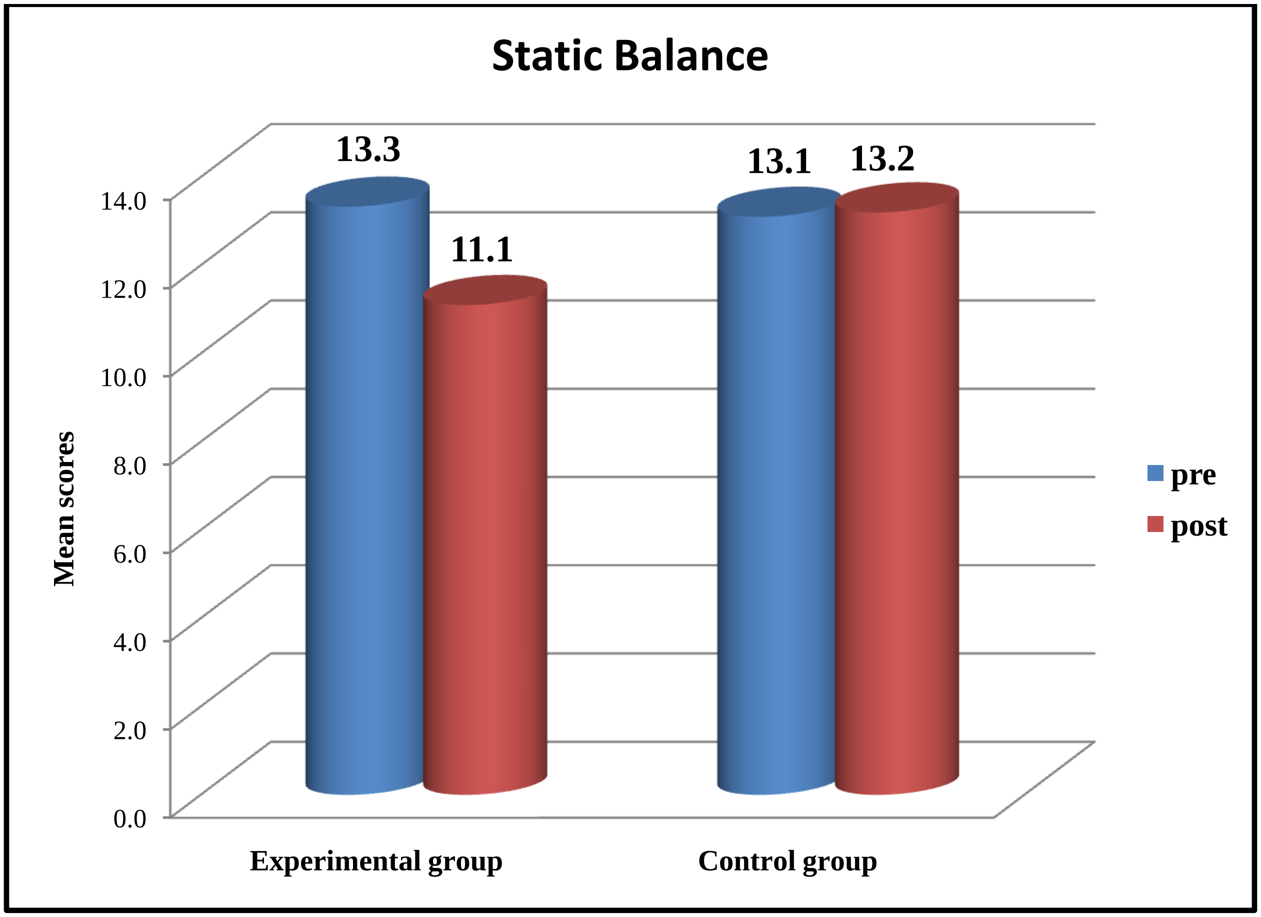

Fig.1 Graphical representation of pre test scores and post test score of Balance Training

Table 3
Levene's Test of Equality of Error Variances

F	df1	df2	p-value
.036	1	18	.851

To test the equality of variances balance training, Levene's test was used. The F-value was insignificant as the p-value (.851) was more than 0.05. Thus the null hypothesis of equality of variances might be accepted, and it was concluded that the variances of the two groups were equal. The results were presented in Table

Table 4

ANCOVA Table for the Data on Static Balance

Source	Type III Sum of Squares	df	Mean Square	F	p-value
Pre_test	1.188	1	1.19	1.05	.32
Groups	22.610	1	22.61	19.90	**.00***
Error	19.312	17	1.14		
Total	2995.000	20			
Corrected Total	42.550	19			

Table shows the F- value for Pre balance training was found insignificant as p-value (0.32) is greater than 0.05. It shows that the initial conditions of both the groups are same.

The f- value for comparing the adjusted means of the two groups (experimental and control group) during post testing. Since p-value of statistics is 0.00 which is less than 0.05, it is significant. Thus the null hypothesis of no difference among the post means of the data on balance training of both groups may be rejected at 5% level

Discussion

From the above results it may be concluded that balance training of 8 week is effective to improve static balance. It is inferred that if we provide selected balance exercises to the visual impaired children could help to improve their static balance because balance is an indispensable factor for the blind and it helps to encourage the visually impaired person's integration in space that the training program may have effective on motor skills. The forces generated while rapidly changing direction, or balancing exercises training may confer excellent balancing properties. (Colak, 2004). In Slavoljub's 2015 study also inferred that more training intervention are necessary to investigate the effect of exercise on single leg balance of visually impaired children.

Conclusion

Finding concludes that the balance training of 8 week is effective to improve their static balance. So we can say that balance exercises help to improve the static exercises among female visually impaired children.

Further conclude that exercises stimulating the vestibular system with head and body movements should be recommended for individuals with visual impairments to achieve better balance retention.

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