The Effect of Eight-Week Yoga Exercise on Balance and Gait in Girls with Intellectual Disability

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Abstract:

Scientific evidence suggests that the individuals with intellectual disability are less physically active compared with healthy subjects. The former may be at risk of physical and motor disabilities. The present study aimed to evaluate the effect of eight-week yoga exercise on balance and gait of girls with intellectual disability. This was a quasi-experimental study with pre-test and post-test. For this purpose, 30 mentally retarded girls were randomly divided into experimental and control groups. The experimental group experienced yoga exercise with respect to the training program presented in this study. The subjects participated in eight weeks of training, three sessions per week and each session lasted for an hour with ten replications for each exercise. Stork test was used to assess static balance, the test of getting up and walking was used to assess dynamic balance. The number of steps per minute was calculated in order to assess gait. Kolmogorov Smirnov test and analysis of covariance were used to analyze the collected data. The results showed that variables of static balance, dynamic balance and gait significantly increased in the experimental group (P> 0.05). All variables in the control group remained unchanged. Yoga exercise with its special characteristics is a perfect exercise for both body and mind. Thus, yoga engages both body and mind in the exercise in order to increase strength and endurance of all body organs, trigger the deepest part of muscles, and improve balance and gait in the individuals with intellectual disability.

Keywords: Intellectual Disability, Yoga, Static Balance, Dynamic Balance, Walking

Introduction

Most research in relation to the effect of physical activity on physical fitness and motor abilities was conducted on healthy subjects and physically disabled individuals were less considered in this field (Lapier et al., 1997). Therefore, it is necessary to bestow physically healthy bodies to physically disabled individuals for daily activities by applying proper and timely exercise and strengthening physical forces and enhancing dynamic abilities. The individuals with intellectual disability are weak in terms of sensory - motor capacities, physical awareness, static and dynamic balance and coordination between general and delicate movements. The children with intellectual disability react slower to stimuli than normal children (Attix and Welsh Bohmer 2006, Woollacott, 2000).

Decreased muscular tonicity and hyper-mobility of the joints are common in people with intellectual disability. This may cause various disabilities such as motor fractures and disabilities, social and psychological disorders such as uncertainty, decreased self-confidence, restricted mobility, and fear of falling, depression, and loss of independence in activities (Cremers*et al.,* 1993). Due to low mobility of people with intellectual disability and imbalance and walking, yoga has lasting benefits for the individual by strengthening and making flexible the interior muscles. This exercise can help prevent injuries and postural problems.

Yoga as a teamwork exercise is accessible, relaxing and healing with no side effects. Yoga was approved as a physical and mental exercise. Yoga as an exercise has a significant effect on the health of various groups and segments of society, including men and women in different age groups (Leininger, 2006). Yoga is implemented with minimal cost and accurately in multiple cases. The people with intellectual disability can benefit from this exercise without any concern. Thus, due to importance of balance and musculoskeletal structure in daily activities and participating in sports programs and improving balance skills to control and acquire motor skills, the present study investigated the effect of eight-week yoga exercise on balance and gait of girls with intellectual disability.

The effect of physical and motor fitness exercises on dynamic balances was significant while the above selected exercises had no significant influence on static balance of the students with intellectual disability (Benjuya etal., 2004).Looper*et al.* (2008) investigated the effects of treadmill exercise intensity and its consequences on gait in children with Down syndrome. The result suggested that the number of steps was higher in children with intensive training and they attained most of the motor milestones at an earlier mean age.

Materials and Methods

This was a quasi-experimental study. The subjects consisted of mentally retarded female students in school for exceptional students in the first district in Karaj in Alborz province in 2014-2015. Among 200 students in this school, 30 students were randomly selected into deviation of height was equal to 145.4 ± 8.8 cm, mean and standard deviation of weight was equal to 50.9 ±16.1 kg; mean and standard deviation of age was equal to 15.3 ± 2.9 years old) and experimental group (n =15, mean and standard deviation of height was equal to150.06 ± 9.8; mean and standard deviation of weight was equal to 50.4 ± 13.3; mean and standard deviation of age was equal to 15.6 ± 2.4). The students with a history of lower extremity injury and disability were excluded from the statistical population.

All parents filled out informed consent and form of personal characteristics of the students. At beginning of the study, the research variables of stork test get up and walking and the number of steps per minute were measured as pre-test in both experimental and control groups. Then, the control group were excluded any training program. The experimental group received yoga exercise program for 8 weeks, 3 sessions per week, each session lasted for 60 minutes. At the beginning, the training program lasted for 15 minutes. By the end of the second month, the training lasted for60 minutes. At the beginning, each movement was repeated three times. At the end, each movement was repeated ten times. Each session began with a warm up and ended with cooling exercises in a team work manner. The day after the last day of exercise, the post-test was performed.

The period and procedures of pre-test and post-test were identical to each other. In other words, pre-tests and post-tests were performed at a certain time. Soehnle Scale made by Germany was used to weight the subjects. A meter tape was used to measure heights of the subjects. A flat surface and a Q & Q stopwatch made by Germany were used to measure the stork test. A chair, one cone and one Q&Q stop watch were used to measure the test of getting up and walking. Four cones and one Q&Q stopwatch were used to measure the number of steps per minute. Statistical analysis: The descriptive statistics of mean and standard deviation, inferential statistics, assumptions testing (Kolmogorov Smirnoff) and hypotheses testing (analysis of covariance) were used. All operations were performed using SPSS

version 20.EXCEL was used for drawing the charts.

Results

The descriptive statistics of mean and standard deviation, inferential statistics, assumptions testing (Kolmogorov Smirnoff) and hypotheses testing(analysis of covariance) were used. Tables show the subject's physical characteristics. The results showed that variables of static balance, dynamic balance and the number of steps per minute were normally distributed in terms of independent variable. Data of Kolmogorov Smirnoff test results relevant to variables of static balance, dynamic balance and number of steps per minute, which were normally distributed in terms of independent variable (P>0.05). Data of results of analysis of covariance, which showed significant difference in static balance between girls with intellectual disability in experimental group (25.37) and control group (10.67) (p = 0.006, F (1, 27) = 8.888. The results of analysis of covariance showed a significant difference in dynamic balance between girls with intellectual disability in experimental group (10.39) and control group (13.42) (p = 0.000, F (1, 27) = 8.83. The results of analysis of covariance showed a significant difference in number of steps per minute between girls with intellectual disability in experimental group (130.7) and control group (109.03) (p = 0.000, F (1, 27)= 89.3. (See Fig. 1 and 2).

Table 01
Mean and SD of individual's properties of studied groups

Group	**Height** (cm)	**Weight** (kg)	**Age** (year)
Exercise	150 ± 9.8	50.4 ± 13.3	15.6 ± 2.4
Control	145 ± 8.8	50.9 ± 16.1	15.3 ± 2.9

Table 02
Description of independent variables in studied groups

Variable	**Exercise group**		**Control**	
	Pre test	**Post test**	**Pre test**	**Post test**
Static balance	17.9 ± 16.2	23.6 ± 16.7	11.6 ± 9.3	9.71 ± 9.1
Dynamic balance	11.07 ± 1.03	9.81 ± 0.83	13.35 ± 2.2	14.10 ± 1.4
walking per minute	119 ± 10	133 ± 5.6	111 ± 7	107 ± 6.5

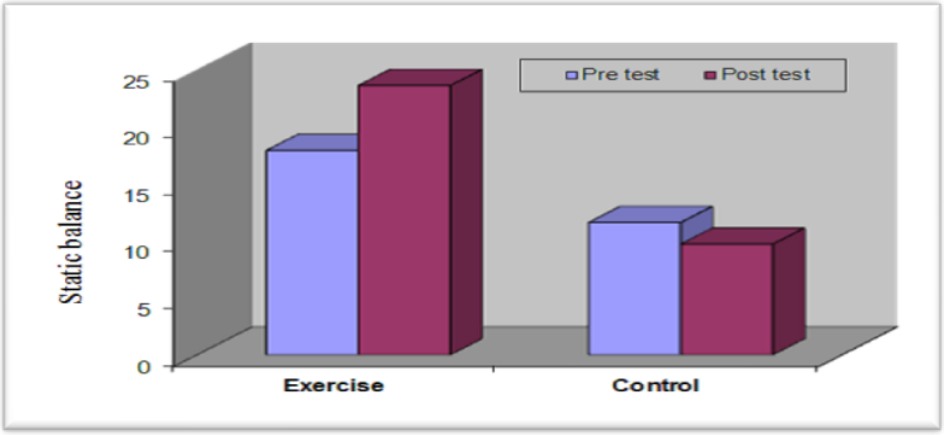

Fig. 01 - Pre and post training of static balance of two groups.

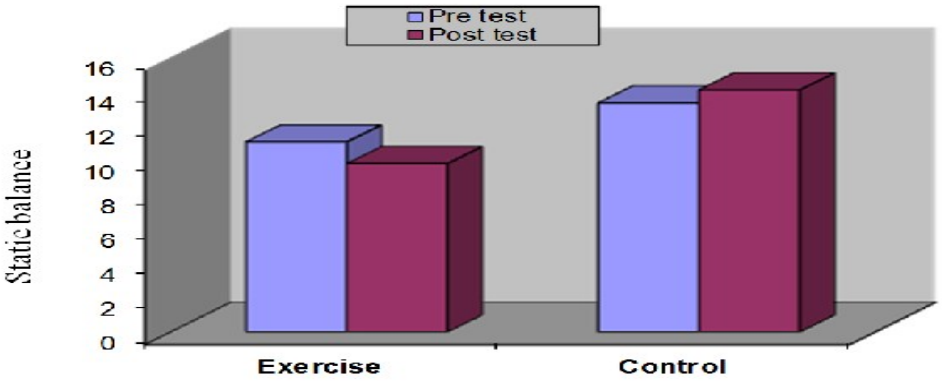

Fig. 02 - Pre and post training of dynamic balance of two groups.

DISCUSSION AND CONCLUSION

Deficiency or excess of flexibility affect stiffness and instability of moving organs and maintaining proper posture (Schieppati *et al.,* 1994, Woollacott *et al.,* 1986, Melzer*et al.,* 2000, Wipple *et al.,* 1987). Weak or poor posture, poor relative arrangement of different body parts in relation to each other increase stress on the body support structures and reduce function of balance on support (Kendall *et al.,* 2005). Finally, these changes will affect the ability of people to undertake their tasks and affect physical efficiency (Houglum,2000).

Yoga coordinates various human body systems and engage body and mind in the exercises in order to increase strength and endurance of all organs and target the deepest part of the body Thereby, yoga can improve balance. The findings revealed that yoga exercises affect static balance in girls with intellectual disability. These findings are not consistent with those obtained by this difference is due to type of exercise and age of the subjects. Balance operates as a feedback circuit between the brain and musculoskeletal system. Dynamic balance can be observed in normal individual movements in daily activities, which play an important role in human life. The importance of dynamic balance is more considered in lives of mentally retarded individuals since they are less physically active than healthy people. Imbalance increases the likelihood of falls, which can cause various injuries (Ulrich *et al.,* 2011,Ordonez *et al.,* 2010).

The findings showed that yoga exercises affect dynamic balance of mentally retarded girls. Muscular tonicity and hyper-mobility of the joints are common in people with intellectual disability. Weakness in lower limbs and poor balance in standing posture increase the possibility of falling. Improved strength and balance after walking program positively increase self-confidence and reduce or decelerate age-related diseases, reduce the risk of falling and encourage people with intellectual disability to participate in social and recreational activities (Wipple*et al.,* 1987). The findings revealed that yoga affect the number of steps per minute in mentally retarded girls. Walking requires coordination, balance, heal thyproprioceptive and mobility sense as well as healthy joints and muscles.

The study compared the number of steps per minute between the experimental group and the control group in mentally retarded girls. The results showed that the number of steps per minute increased after a period of yoga exercise in mentally retarded girls. They suggested that the number of steps per minute increased after a period of yoga exercise in mentally retarded-individuals. Thus, Yoga is a

traditional sport exercise, which meets individual physiological needs for muscular stretch and increasing mobility of joints and muscular tonicity for harmony between body and soul.

The stretching helps to reduce cerebral excitements and muscular contraction, which improves physical and mental alertness, social adaptability, reduces depression and anxiety, improves concentration, and improves the balance. Thus, necessary measures should be adopted to remedy difficulty in balance in these subjects due to importance of balance in daily activities and acquiringother skills and positive impact of various physical exercises in improving the balance (Tsimaras and Fotiadou 2004).In summary, people with intellectual disability are less physically active than normal subjects. Improvement in the present study may be attributed to the exercise protocol. Thus, yoga exercise can be used as a method to improve balance and gait in people with intellectual disability. On the other hand, it seems that changes in training methods effectively improve balance and gait according to the findings of other studies. Additional studies are needed in this area.

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