

The effect of eight weeks equilibrium exercises on the equilibrium of subnormal children

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Abstract: The aim of present study is to investigate the effect of eight weeks equanimity exercises on the equilibrium of subnormal children. Regarding the study, the research method was semi experimental and selected a population included 7-12 years students in subnormal schools of Andimeshk in the academic years of 2012-2013. In order to conduct the study, 20 participants-10 boy and 10 girl- selected as sample based on IQ between 70 to 80 in two groups: experimental and control group. The instruments to get data included: walking on the star (Johnson et al, 1979), handicap race of walking on the equilibrium rod (Villa Mont et al), the handicap race of Stork (Kirby, 2011). The reliability calculated as 86%, 62% and 87% respectively. The results showed that the eight weeks equilibrium exercises imposed meaningful effect on the static, dynamic and semi-dynamic equilibrium of subnormal children. Also there was significance difference between experimental and control group, while experimental group was better than control group.

Key words: Control equilibrium; Stable equilibrium; Dynamic equilibrium; Retardation mental equilibrium

1. Introduction

Physical health and being in good body condition critically matter to human life and any positive or negative changes can affect other dimensions of life. The outcomes of unhealthy physical condition are so wide that make mental, physical, economic and social dimensions of life conceivable and thinkable (Rahnama et al., 2010). The ability to maintain balance is necessary to correctly carry out our daily activities. Balance control is a process whereby the central nervous system (CNS) generates all models of muscle functions required for regulating the link between the center of mass and the support surface (Maki and McIlroy, 1996). People with mental retardation and slow in processing information in the central nervous system have some problems in keeping their balance in different circumstances. On the other hand, delay in learning fundamental skills including movement skills would affect the ability to keep balance (Goodway and Branta, 2003).

Research studies have shown that 10 to 80 percent of children with mental retardation have developmental delay (Carmeli, 2004). On the other hand, regular training program is a key for people with mental abnormalities to return to their normal lives (Payne and Isaacs, 2002). Physical training, thus, play a radical role in improving motor capabilities among people with mental retardation and decreasing their affinity to others' care.

In today's world, in spite of all advancements, mental retardation is a lifelong discomfort. About 3 percent of the world population suffers from the

intelligence quotient of less than 68 and the performance of 80 to 90 percent of them is placed in the range of slight mental retardation to trainable (Salari et al., 2001).

A part of students studying in any country includes exceptional students that a large number of them are suffering from mental retardation. They consist about 1.5 to 2.5 percent of the society and most of them cannot live normally, unless they get good training (Shahrami and Mottaghian, 1999).

People with mental retardation are those who are less active and have less physical activities relative to their healthy counterparts because of their special mental and psychic conditions and the approach of our society to this disorder. Due to inactivity, they have motor and physical weaknesses (Fadaei et al., 2010).

Results show that they have delay in developing motor skills. This causes them to acquire these skills at a time different from normal people (Schmidt and Lee, 2011).

Keeping balance is a complicated task including muscle activities distributed into whole body. The power of gravity, incidences, external events, and our own activities all can disturb the balance (Balasubramaniam et al., 2002).

Independence in life is of important perspectives of educating disabled people. The educational courses allow people with mental retardation or generally the disabled people to acquired different life and social skills. The society's insight into children with mental retardation is globally changing. Current educational systems are expected to better prepare them for entering adulthood. Developing health system and educational system

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and reducing work force and national costs indicate that these children should acquire the sufficient and necessary education. Such education should be based on new scientific findings and increasing the practical skills (Behrad, 2005).

Regular training courses can help people with mental retardation to return to their normal life (Payne and Isaacs, 2002). Such trainings include balance exercises and are effective for improving their ability to keep balanced. Postural control is very adaptive and can be developed by balance activities. According to DiStefano (2009), all studies in which the training program included three 10-minute balance exercise sessions a week within four weeks gave positive results in improving balance.

Many studies have proved the effectiveness of balance exercises on improvement of the ability to keep balance. What has not been widely considered, however, is the effectiveness of balance exercises and the new ways of trainings on improvement of the ability to keep balance among those with mental retardation. These people have characteristics and restrictions which are different from healthy people.

The level of learning to keep balance by balance exercises and the extent of effect of exercises on mentally retarded people differ from healthy people. As the subject of keeping balance among people with mental retardation has not been widely studied, it is not clear that how the selected balance training can affect mentally restarted people during a specified period. No researchers have yet to study the impact of such trainings on static, dynamic and semi-dynamic balance of these people. This research is, thus, considered as a new method in terms of type and the combination of balance training and on the way of assessing balance. Regarding the weakness of some children in keeping balanced and the importance of daily activities and performing sport skills, it is necessary for schools to develop and fulfill some programs aiming to improve the balance level among these children.

Given the importance of balance in daily activities, participating in physical training programs and improving the balance capacities to control and acquire motor skills, this research studies the effect of eight weeks balance exercises on the improvement of keeping balance among people with mental retardation. Regarding the importance of balance in daily activities, participating in physical training programs and improving the balance capacities to control and acquire motor skills, the present research aims to answer this question that can the combined balance exercises and using new training improve the ability to keep balance among those with mental retardation?

2. Research methodology

This is an empirical research study with semi-empirical research design. Here, the exercising condition was sufficiently intimate and friendly. And subjects were spurred to see these balance trainings as a play. Exercises were done over balance

platforms, balance board and shaking board. Jumping from one platform to the other was taught to subjects as a play to make it more interesting and improve the dynamic balance. Similarly, the exercises over balance board and shaking board were selected. This allowed people to impose some forces to any four directions (forward, backward, left and right) at different standing positions and overcome what disturbed their balance. This method causes some instability in the support surface, increases efforts to keep balance and generate more muscle activities, especially in lower body and legs. In their research studies, Behem and Anderson (2006) found out that increased pressure because of instability could further improve muscle nerve adaptation, reduce contraction and enhance coordination and certainty in performing activities. When exercising over balance board and platform, subjects had to bear more pressure against external forces and neutralize the effect of external forces disturbing balance by increasing the muscle activities of back and legs. According to Behem and Anderson, in such condition, the coordination and muscle nerve adaptation was improved and the muscular contraction was reduced. These factors highly affect people's balance.

3. Statistical society and sample

The statistical population included 7 to 12 year old students from exceptional schools in Andimeshk during the academic year of 2012 to 2013. The statistical sample included 20 (10 girls and 10 boys) 7 to 12 year old mentally retarded students with intelligence quotient between 70 and 80. They were purposefully selected and put into two groups of experimental and control. Subjects with intelligence quotient between 70 and 80, with no regular exercise background, not being a member of a team and not participated in any sport events and with no physical problems were selected after being invited to this research.

3. Data collection tool

1. Stork Balance Test
2. Balanced Walking Test over Stable Wood

4. Measuring static balance

Revised stork balance test was used to evaluate static balance. According to Johnson, the validity of this test is 0.87. At first, subjects had to warm up their body for 10 minutes. After that, in standing position, they put their hand over their back, stand over their preferred leg, and put the sole of their non-preferred leg over the preferred leg. At the time calling "Ready", they stand over the heel of their preferred leg and as standing over the toe of their preferred leg; they try to keep their balance. As long as they could stand at this position was recorded. When hands are separated from the back, the non-

preferred leg set apart of the other leg, and subjects lose their control, the test is stopped.

Before doing the main test, subjects perform the test four times as an exercise. The main test is done three times with time interval of 30 second to rest. The best record is registered as the main record (Johnson et al., 1979).



Fig. 1: Measuring static balance

To assess dynamic balance, modified star excursion balance test was used. The reliability of this test with open eyes was reported by Wilamont et al. at 0.62. Subjects should try to pass the route without falling. They can also open their hand to the sides to better keep their balance. Accordingly,

subjects stand on one side of the balanced wood. Taking the first step over wood, the time starts. They should keep their balance on the wood by the time they reach the other end. Each subject can do the test three times. Results are then compared with the following results.



Fig. 1: Measuring dynamic balance

To analyze findings, correlation tests with correlational t were employed using SPSS v. 21 at the significant level of 0.05.

5. Research results and findings

Table 1: mean and the standard deviation of subjects' height and weight

Statistical indices	Height		Weight	
	Exercise	Control	Exercise	Control
Frequency	10	10	10	10
Mean	76.5	73	42.8	39.4
Standard Deviation	5.2	3.51	4.51	5.3
Minimum Value	67	66	36	33
Maximum Value	88	87	55	44

Results achieved by table 1 reveal that the frequency of all groups is 10. The subjects' mean height in the group exercising with equipment is 76.5 with standard deviation of 5.2. The subjects' mean height in the control group is 73 with standard

deviation of 5.2. The subjects' minimum weight in the exercise group is 42.8 kg with deviation of 39.4 and standard deviation of 5.3. The minimum and maximum values for all groups are from 33 to 55 kg.

Table 2: Subjects' score in stork balance test and modified star excursion balance test

Statistical indices	stork balance test				modified star excursion balance test			
	Exercise		Control		Exercise		Control	
	Pretest	Posttest	Pretest	Posttest	Pretest	Posttest	Pretest	Posttest
Frequency	1.4	2.5	1.5	1.4	2.7	4.9	2.8	2.9
Mean	0.51	0.52	0.51	0.51	0.94	0.73	0.87	0.88
Standard Deviation	1	2	1	1	1	4	1	1
Minimum Value	1	2	1	1	1	4	1	1
Maximum Value	2	3	2	2	4	6	4	4

According to table 2, the mean scores of modified star excursion balance test for exercise group in pretest and posttest stages were 1.4 and 2.5 respectively. The mean scores for control group in pretest and posttest stages were 1.5 and 1.4 respectively. As mean values show, no increase is

observed between pre and posttest for the exercise group. The mean scores of stork balance test for exercise group in pretest and posttest stages were 2.7 and 4.9 respectively. The mean scores for control group in pretest and posttest stages were 2.8 and 2.9 respectively. As it is observed, no significant increase

is observed between pre and posttest for the exercise group.

6. Testing the research hypothesis

Hypothesis: balance exercises have a significant effect on improving the ability to keep static and dynamic balance among people with mental retardation.

Table 3: Dependent t-test to compare scores of dynamic and static scores in exercise group

Test	Phases	Mean	Standard Deviation	Mean Differences	t-value	Level of Significance
Static Balance	Pretest	2.7	0.94	2.2	-16.5	0.001
	Posttest	4.9	0.73			
Dynamic Balance	Pretest	1.4	0.51	1.1	-11	0.001
	Posttest	2.5	0.52			

Given table 4, the mean score of static balance for exercise group in pretest and posttest phases were 2.7 and 4.9 respectively, showing a significant increase during posttest. The mean difference of two phases is 2.2. And as $t = -16.5$ which is significant at the significant level of less than 0.05 ($p < 0.05$), it can be stated that there is a significant difference between subjects' mean score in pretest and posttest. The balance exercises are effective for improving the static balance of people with mental retardation and can significantly increase their static balance. In other words, selected balance exercises helped mentally retarded people to increase their static balance. Also, the mean scores of dynamic balance for exercise group in pretest and posttest phases were 1.4 and 2.5 respectively, showing a significant increase during posttest. The mean difference of two phases is 1.1. And as $t = -11$ which is significant at the significant level of less than 0.05 ($p < 0.05$), it can be stated that there is a significant difference between subjects' mean scores in pretest and posttest. The balance exercises are effective for improving the dynamic balance of people with mental retardation and can significantly increase their dynamic balance.

7. Discussion and conclusion

Research results revealed that dynamic exercises affect the improvement of dynamic balance among people with mental retardation. This means that the selected dynamic exercises for the exercise group improve the dynamic balance. On static balance, the effectiveness of selected balance exercises on the ability to keep balance agreed with results of a research study titled "the effect of a particular motor program on perception-motor capability among mentally retarded trainable 10 to 13 year old boy student in Tehran" carried out by Rahbanfard (1998). Such agreement was not, however, observed in terms of dynamic balance. He concluded that the particular exercise training which he had been selected for these children did not have any effect on their dynamic balance, ability and precision, but affected their static balance, coordination and speed. The research results also agree with results found by Akhavast (2009). In a research study titled "educational plays and their effect on mentally retarded children's training-learning process", the explored the effect of these plays on these children's

ability and power of learning. Akhavast stated that plays had a strong impact on transferring concepts within learning environments. Participatory learning elements including competition, excitement, curiosity, and creativity to create a different learning environment should be embedded into an empirical play. Our research disclosed that implementing exercises as a play and in an entertaining and exciting space would result in learning and improving balance among mentally retarded children.

Results also agree with what Marshal et al. (1998) found. Studying the effect of motor training on people with mental disorders, they concluded that this program had a strong impact on returning to normal life. They argued that a regular program would help mentally retarded people to improve their mental and physical health; as we proved the effectiveness of exercise training on the improvement of balance and reduction of motor problems.

Violerm et al. (2001) concluded that motor development abnormalities referred to the varying degrees of intelligence disability. Studies have shown that low intelligence quotient would delay development and control (Violerm et al., 2001). On the other hand, Guidetti (2010) found out that IQ level was in direct relationship with motor coordination and balance. He suggested that athletes with lower IQ got higher score in motor coordination tests. In fact, the shorter time in these tests was an indicator of better performance (Guidetti et al., 2010). People with mental retardation are weak at controlling gross motor skills. This affects the performance in physical preparation tests and ends in weak results for factors of physical preparation such as balance (Guidetti et al., 2010).

According to Gapna and Nayer (2008), contrary to a widespread view, the standing position is sustainable and it remains as long as an external factor may disrupt it. Winterz (1995) believed that most fallings happened when an external out of control factor disrupted the balance. Thus, according to the principle of using special training, the closer the motor characteristics and the exercise environment are to the skill and the target setting, the more learning would happen (Edwards, 2011). The balance exercise conditions should be in a way for learners to exercise strategies and methods of overcoming factors disturbing balance and prepare

themselves for overcoming external factors may disturb their balance. On the other hand, according to Behem and Anderson (2006), at the time of keeping balance in different states, factors such as muscle weakness in lower body and legs, muscle contractions, weakness at nerve and muscle coordination or lack of coordination between agonist and antagonist muscles can affect people's ability to keep balance. Given what said before, exercises should be selected as to be similar to tasks and target setting, strengthen the lower body muscles, increase the coordination between nerve and muscles, reduce muscle contractions and enhance the ability to keep balance.

As our research subjects are children with mental retardation, they should be excessively attended, because mentally retarded children and teenagers mostly show a specific affinity to play due to various reasons such as escaping from classes and serious activities. They display a large part of their power and energy during play (Afruz, 2000). Therefore, exercises were selected as to be entertaining and exciting and subjects showed interest to them.

Anatomically, the central body is the center of gravity and all movements arise from this point (Roso, 2003). Therefore, strengthening these muscles would reduce uncontrolled swings, keep the center of gravity in support surface and facilitate keeping balance (Kasio et al., 2003).

Although balance and physical training to improve balance among children with mental retardation have not been widely explored, all types of exercises affecting balance were studied here to develop a good exercise program for this group. Research results show that implementing this program within 8 weeks can strengthen static and dynamic balance. As these children may resist against doing these balance training, it was designed as an entertainment which can be employed by exceptional schools as balance training. Improving balance skills by designing and implementing balance exercise programs should be considered by teachers and physical training instructors at lower ages during which the motor models are forming. More research studies are needed on designing and implementing the protocols of improving balance regarding mentally retarded children's intelligence level, capabilities and limitations, and on its effect on improving motor activities and physical training.

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