



The effect of eight-weeks corrective games on kyphosis angle and postural control in mentally retarded children having kyphosis

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Abstract

Mental retardation is one of the most common mental disabilities that are allocated about 3% of the world's population. The purpose of this study was to examine the effect of eight-weeks corrective games on kyphosis angle and postural control in mentally retarded children having kyphosis. Thirty mentally retarded female children with Hyper kyphosis (increase in thoracic curve greater than 40 angle) were selected and randomly divided into two groups; experimental group (N=15) and control group (N=15). The angle of kyphosis was measured by using a flexible ruler. However the BIODEX Balance System (BBS) was used to evaluate the static and dynamic postural control of performance. The Experimental group played the corrective games for eight weeks (three sessions per week) while during this period control group did not experience any exercises. To analyze the data independent and dependent T test were used. The results of the research showed that corrective games had a significantly positive effect on kyphosis angle and all directions of postural control in the static and dynamic states among mentally retarded children. So it can be concluded that performing corrective exercise may be effective in the improvement of kyphosis angle among mentally retarded children

Keywords: Children, Control, Retardation, Kyphosis, Postural

Introduction

Health and disease of children affects the health and disease of the society and future generation. Therefore mental health and studying the manner of children adaptability helps their fertility and growth in adulthood while lack of attention to the developmental condition of childhood brings irreversible damage to community mental health. Nowadays this undeniable fact is proven that young children

not only need health care, but also require making attention to all aspect of their existence, including social growth, emotional personality and intelligence [1]. There are a large group of children and adults in our community who are differ from other peers in so certain aspects of their intellectual, physical, emotional or behavioral characteristics. One of these groups is children with mental disabilities. Since the ability to learn and

adaptability to the environment changes is limited in this people, many problems occurs in their ability to do the activities of daily living and functions within society. Postural control is one of the basic requirements for doing the activities of daily living. In order to identify the deficiencies of postural control, researchers have investigated its various aspects. Some studies with the focus on the effect of changes in body position and structural balance showed the negative effects of poor posture on balance control. One of the most common deformities in upper extremity is kyphosis which is seen mostly among female students, and also is more likely to be seen in mentally retarded children. A variety of Complications arise from physical deformities, such as kyphosis which leads to difficulty in breathing, pain in the upper regions of the spine and premature fatigue. Game is an essential aspect of children's lives, because mostly when playing, they are in a natural and comfortable position. Since the treatment methods of the corrective exercises are carried out over a relatively long process, sometimes they are boring. So according to the conditions of this children such as their age or mental, the type and design of the corrective exercises are so important [2]. In regard of play in children's lives and due to the importance of corrective exercises to eliminate functional abnormalities, further researches to investigate the usefulness of such exercise seems essential.

Method

This research was a semi-experimental study. Our subjects included 30 mentally retarded female children with increased thoracic kyphosis with the degree of 40 or more who were divided to two groups (control group: 15 mentally retarded female children . Mean age 12.26±2.8 years old, height 144±9.8cm, weighting: 43.66±1.31kg) and (15 experimental group, mean age 12.06±2.8 years old, height 145±9.8 cm, weight 42.33±1.38kg) were randomly selected. The IQ level for two groups were 50-70.

At first the angle of kyphosis was measured by using a flexible ruler as a reliable non-invasive

method. The subjects were stood up in their usual relaxed posture. A flexible ruler was placed over the spinous process of T2 to T12 and to get the form of back spinal curve. Then the ruler was carefully replaced with a piece of white paper. A vertical line was drawn to connect the T2 and T12 landmarks. The total length of curvature line (L) and the deepest part of curvature line (H) were measured using the ruler and the degree of kyphosis were calculated through the following equation in centimeters: ($\Theta=4\text{ARC tan } [2H/L]$ where Θ represents the magnitude of kyphosis degrees) [12]. Then the postural sway of individuals was measured using the Balance Stability System (Biodex): Model SD, 115 VAC, 50 / 50HZ 950-300 made in America. The static balance was obtained from the BBS at a resistant level of 12 to a dynamic balanced level of 3. The BBS uses a circular plat form which freely moves in anterior-posterior and medial-lateral axes simultaneously through which three measures can be obtained: an overall stability index, an anterior- posterior stability index, and a medial-lateral stability index. Assessments were performed during 20-sec trails in which participations were asked to maintain an upright standing position on their dominant limb on the unstable surface of the BBS, then the trials were repeated was for three times [13].

Rehearsing program: According to the proposed BRAKPVRT fitness exercise program rehearsing three days a week can be best repeated for moderate to severe activities [4]. So the TRN group received the corrective exercise training in model of game. It consisted of 9 corrective game exercises three times per week for 8 weeks [2]. According to the rules of physiological adaptation, participations started with warming up the body, activities such as walking, jumping, running and then specific exercises to stretch Pectoralis muscles. At the end of each session participants exercised to cool down and get back to their primary status. To increase the intensity of exercise depending on the type of game we were used an increase in distance,

in time, and dumbbells with different sinker s. All statistical analyses were performed

Table 1 TRN program performed by experime ntal group

Game	The number of participants	Hardening of the game	purpose	Required Equipments
airplane	Single	Increase in the duration of the game, Use of sinkers and stretch Traband	Stretching the shortened muscles	Cone Barrier
Cat and mouse	16	Increase in the duration of the game	Stretching the shortened muscles	-*
Wooden house	8	Increase in the drawn houses, Increase in the distance	Stretching the shortened muscles	Cable, Half- meter woods
Good balance	2	Increase in the number of getting ups	Stretching the shortened muscles	-
Broken knee	Single	Increase in the duration of the game, Use of sinker	Stretching the shortened muscles	-
Haul- Haul	2	Setting a time to win	Strengthen the weak muscles	Wood
conveyance tennis ball	2	Increase in the duration of the game	Strengthen the weak muscles	Tennis ball
Trying to get up	Single	Putting a tennis ball behind the participants	Strengthen the weak muscles	-
Throw the ball from the above of the head to the back	Single	Increased the number of balls and the play duration	Strengthen the weak muscles	Balls with different sizes

*It does not require any equipment.

using SPSS statistical software version16. Kolmogorov-Smirnov test was applied to evaluate the normality of the data. Independent T test used to analyze the data with the

Table 2 General characteristics of participants

group	Age (years) M±SD	height (cm) M±SD	Weight (kg) M±SD
TRN	12.06±2.98	145.83±13.33	42.33±13.08
CTL	12.26±3.03	144.83±9.83	43.66±13.14

Table 3 Descriptive statistics of the pre and post test data for the kyphosis degree and postural control index

Variables	Pretest Group(TRN)	Posttest Group(TRN)	Pretest Group(CTL)	Posttest Group(CTL)	MD±SD	T	P
Kyphosis	47/17±8/62	42/36±7/96	46/74±8/61	47/1±9/49	5/16±0/17	-4/4	0/001*
Overall Stability Index (static)	2/08±0/81	1/4±0/94	2/05±0/83	2/38±0/75	1±0/31	2/81	0/003*
Anterior/Posterior Index (static)	1/2±0/72	0/93±0/58	1/28±0/46	1/53±0/58	0/53±0/3	2/93	0/007*
Medial Lateral Index (static)	1/1±0/68	0/76±0/49	1/14±0/45	1/28±0/44	0/46±0/2	2/09	0/04*
Overall Stability Index (dynamic)	3/47±0/51	2/18±0/59	3/4±0.75	3/97±0/71	1/86±0/33	6/21	0/001*
Anterior/Posterior Index (dynamic)	2/37±1/02	1/25±0/63	2/33±0/66	2/71±0/82	1/49±0/27	5/27	0/001*
Medial Lateral Index (dynamic)	2/43±0/97	1/5±0/68	2/4±0/46	2/76±0/76	1/28±0/4	4/15	0/001*

significance level of 0/05.

Table 1 shows the mean and standard deviation of the general characteristics of the subjects for both the experiment and control groups.

Discussion

Playing is one of the methods which is currently used to correct postural abnormalities in advanced societies. Game Not only affects normal children, but also has a positive impact on mentally retarded children and their education. Playing of mentally retarded children of elementary schools is effective in the improvement of public health and control of large muscles of the body, including the hands and feet. Thus mentally retarded children live passively life, and because of this inactivity they are suffered from physical and postural abnormalities. Lack of physical activity suppresses the coordination of muscle activity which leads to Postural sway. Due to the positive effects of playing and health problems among mentally retarded children, we studied the effect of game exercise on kyphosis angle and postural control. The result of the research showed that the corrective games had a significantly positive effect on kyphosis angle and all of the directions of postural control among mentally retarded children in the static and dynamic status. The findings of this study were consistent with results of Mashhadi who examined the effect of combined physical exercise on kyphosis and lordosis angle among mentally retarded adolescent. He concluded that the applied exercises lead to a significant reduction in kyphosis and lumbar lordosis angles [4].

Micah and Synaky have shown a negative relationship between the strength of the back extensors and the degree of kyphosis in their investigation. It means that the intensity of anomalies may be due to the strength reduction of back extensor muscles which is consistent with the findings of the present study [5, 6]. Obayshi and coworkers performed a study on the strength improvement of the spinal cord muscle and the body posture. They observed that the practice reinforces the spine extensor which

leads to decrease in the angle of kyphosis after 12 weeks [7]. Adhami, Rahnema, Azizi and coworkers; pawlosky, Shoedi and coworkers reported similar results about the effect of exercise on the degree reduction of kyphosis angle [8, 9, 10, 11]. The reason of consistency between this study and the others may be due to the same mechanism for all of the corrective exercises. The main purpose of the correcting kyphosis deformities is reinforcing the weak muscles (Trapezius, Rhomboid) and extend the shorted muscles (Pectoralis muscles). During strength training the muscle tendons are affected which leads to the ligaments became of the stability and perseverance .After exercising the resistance trainings on the skeletal muscle the following changes were revealed: a total increase in contractile protein, particularly in Myosin fibers, increase in the amount of strength connective tissue and tendon and ligament, increase in the capillary density of muscle fibers, increase in the number of fibers in the longitudinal split muscle fibers which generally increases the strength and endurance of the muscles [11]. Also strength training affects the length of the muscle tendon and moves different parts of the skeleton and leads to ligaments stability. On the other hand stretch training acts as coordinator for agonist and antagonist muscles; so this training increases the length of muscle in concavity side and the force and strength of the muscles in convexity side and consequently the deformities will be corrected [8]. Other hypotheses on determining the effectiveness of corrective games on postural control among mentally retarded children has two levels: stable (level 12) and unstable (level 3). Data analysis showed significant differences between experimental and control groups in all of three indicators: overall, medial-lateral and anterior-posterior. To our knowledge, no research has been conducted in this area in both mentally retarded children and normal ones. Prior studies have focused on the effect of changes of body position and balance which indicated a negative effect on the poor postural control of the body.

The results of the present study were consistent with those of Anbryan et al (1388) who compared the postural control between healthy subjects and kyphosis. They reported that dynamical balance is impaired by changes in the spine [12]. Also the results of the current study are consistent with those of Domoros et al (2010) and Tetsikoo et al (2007). They concluded that there is a positive relationship with the increase of kyphosis angle and decrease of the postural balance [13, 14]. Studies on people with other spinal deformities such as scoliotic demonstrated that the postural abnormalities are effective factors on postural control. Sufficient power of muscles in lower extremities is one of the effective mechanisms in maintaining the postural balance. According to Efgen theory, the thoracic muscles in kyphosis people is low powered, which can reduce the balance of them [15]. On the other hand, mentally retarded children have not enough focus on their bodies and probably this causes deformity increase in their spinal such as kyphosis. In kyphotic people because of spine deformity, the center of mass (COM) of body is moved forward and down of base support which leads to stability of the postural balance. Finally individuals have to adopt a compensatory mechanism with hip extension, knee flexion and plantar flexion in ankle to return the gravity center of their body to the normal status this action is less done among mentally retarded children which causes a decrease in the postural control [12].

Conclusions

Mentally retarded children have flaccidity and weak muscles, and can't focus on their bodies so they have a passive inactivity life. All of these factors lead to postural abnormality such as kyphosis and less postural balance. So we can correct these deformities in the form of a game based on the understanding and knowledge of deformities, with the least side effects and cost by doing corrective exercises among mentally retarded children.

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Contributions

Study design: LA, AE, NK, YS

Data collection and analysis: LA

Manuscript preparation: LA, AE, NK

Conflict of interest

"The author declare that they have no competing interests."

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