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The effect of core stabilization exercises on factors physical fitness to mental retardation

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Abstract. The purpose of this study was to determine the effects of core stability exercises program on physical fitness of children with mental retardation. Subjects were divided randomly into two groups, training (TRN: n=17) and control (CTL: n=14). Training group performed a core stabilization program for 6 weeks and three times per week. Pre- and post-tests measurements were taken for cardiovascular endurance, muscle endurance, speed, static balance and agility was done for two groups afterward. Results showed that training group improved in significantly ($p<0.05$) in five dependent variables. Core stability exercises appear to be a viable and effective way to improve physical fitness capacity of the children with mental retardation.
Key words: *mental retardation, physical fitness, core stability exercises.*

Introduction

Mental retardation (MR) causes important effects on children's physical fitness, as well as cognitive activities during life span. Most research in the literature states that children with MR have poor level of physical fitness compared with their nondisabled peers. These studies found that children with MR have a low level of cardiovascular endurance, muscular strength, muscular endurance, running speed, balance and agility (1). It is well known that children with MR have isolation problems in society what leads to their physical inactivity (2). Some research reports indicate that children with MR achieve very low scores in cardiovascular fitness tests (1). In addition, several studies reported a significantly positive correlation between inactive lifestyles and cardiovascular disease. Therefore, physical activities should be established for children with MR, to develop their cardiovascular fitness (3). The core encompasses the lumbopelvic-hip complex (with 29 muscles of Insertion) in which the center of gravity is located and where all movements begin [4]. Core stability is the motor control and muscular capacity of the lumbopelvic-hip complex. Normal function of the stabilizing system is to provide sufficient stability to the spine to match the instantaneously varying stability demands due to changes in spinal posture and static and dynamic loads [4].

Although, there was research about the effects of core stability exercises on children without disabilities (5), there has been no research on children with MR. Therefore, the purpose of this study was to evaluate the effects of a 6 weeks core stability exercise program on physical fitness of children with MR.

Material and Method

Our subjects included 31 students boys mentally retarded in the two groups (control, 14 patients with a mean age of 11.07±3.02year, height 152±7.86cm, weight 44.07±8.08kg) and (17experimental group with a mean age 11.23 ± 1.95year, height 147±7.07cm, weighing 38.11±4.85kg) of the random pare selected. The two groups were with 50-70 IQ level. Subjects signed an informed consent form and answered a demographic.

Injury history questionnaire, which was used to obtain background information from each subject. Any they were free of lower and upper extremity pathology, neurological and visual disorders, and none of them used medication and all participants were selected from children without prior physical activity experience.

Core stability exercises program within the past six months and they were matched in age and physical activity level.

In this study, data were collected on six dependent variables as pre- and post-test measurements to determine the effects of a 6 weeks core stability exercises program.

1. *25-yard (22.86m) dash*. This test measures short distance running speed. Subjects ran 25 yards as quickly as possible, with ready and go commands. At the end of the run, time was measured in seconds with a chronometer (1).

2. *Bent arm hang*. A horizontal bar was used for this test. Subjects hold the bar with both hands, using a reverse grip. The hands are shoulders width apart. The subjects bring their head to bar, pressing the bridge of their nose to the bar. He holds this position as long as possible. The number of seconds held in this position is recorded. The purpose of this test is to measure upper extremity strength and endurance (1).

3. *Leg lift*. This test measures lower extremity strength and endurance. The subjects lie flat on their backs with their hands clasped behind the neck. The subjects raise their legs, keeping the knees straight till a 90-degree angle is achieved. Subjects do as many leg lifts as possible. The number of leg lifts is recorded during 20 seconds (1).

4. *Thrusts*. This test measures agility. The subject takes a squat position with the feet and hands on the mat. At the command, the subjects take their weight upon their hands; then thrusts their legs straight back and then return to the starting position. The number of thrusts is recorded during 20 seconds (1).

5. *Static balance test*. This test measures ability to maintain balance in a stationary position. The subjects place their hands on their hips. One leg is then lifted and the foot is placed on the inside of the knee of other leg. Subjects then close their eyes and maintain balance in this position as long as possible. The time is recorded in seconds (1).

6. *300 yard (274.32m) run-walk*. The purpose of this test is to measure cardio-respiratory endurance. The subjects start in a semi-crouch position with the start command. The time is measured in seconds. Procedure and description of the treatment program (1). All subjects (n=17) participated in a 6 weeks core stability exercise program, for three times a week. Pre and post treatment tests were conducted in both groups at the end of 6 weeks. Training sessions were organized under directions of specialists sport medicine.

Core Strength Training Protocol. The control group did not receive the CST protocol; they were instructed to maintain their training routines and to report any alterations to the investigator. The CST group received the CST program that consists of 5 core-related exercises performed 4 times per week for 6 weeks. The following 5 exercises were visually demonstrated and verbally instructed by the investigator after the pre training test: a) abdominal crunch on a stability ball to target abdominal muscles, b) back extension on a stability ball to target back extensor muscles, c) supine opposite 1-arm.1-leg raise to target back. Hip extensor muscles, d) hip raise on a stability ball to target back. Hip extensor muscles, and e) Russian twist on a stability ball to target abdominal muscles. These exercises have been used in previous studies to determine the effects of CST (6-8). The exercises are relatively well balanced, targeting core muscles (abdominal, hip flexor & extensor and back extensor muscles). Even though those exercises are relatively novice level according to Stanton et al. (17), some of them are considered a challenge for those who have no experience in CST. All exercises were fully instructed and demonstrated by a certified strength and conditioning specialist to ensure the understanding of the proper mechanics after the pre training laboratory test. In addition, the CST group received a hard copy of exercise instructions including pictures and training logs. Stability balls were provided to the experimental group because the treatment is intended for home training. They were instructed to fill out the training log after each session, and they also were contacted by the investigator at the end of each week to ensure adherence or to answer any concerns. Table II lists the volume of the training for the 6 weeks. According to Casio Lima et al, the total session volume should increase to challenge strength improvement rather than performing the same volume throughout the treatment. Therefore, this study was designed to increase the volume of exercise sessions every 2 weeks (4).

Table I. Training Volume for the 6 Weeks

	Sets	Repetitions
First 2 weeks	2	10
Second 2 weeks	2	15
Third 2 weeks	3	12

Table II. General Characteristics of Subjects

Group	Age(years) Mean ± SD	Height(cm) Mean ± SD	Weight(kg) Mean ± SD
TRN	11.23±1.95	147±7.07	38.11±4.58
CTL	3.02±11.07	7.87±152	44.07±8.08

Statistical Analysis. Data were analyzed using the SPSS statistical software package. Paired Samples Statistics test was used to compare groups and Independent Samples Test was used for within group analysis.

Results

Using Paired Samples Statistics test, significant differences were found between Table III the groups. In general, results showed that (TRN Group) children with MR significantly improved physical fitness levels ($p<0.05$) in five dependent variables examined (25 yard dash, agility, bent arm hang,balance and cardiovascular endurance).

Table III. Between group differences in all dependent variables of physical fitness

Group	Before Training	**After Training**	**t**	**p-value**
25 Yard Running Test				
CTL TRN	5/41±0/82 5/27±0/53	5/12±0/44 4/10±0/52	1/85	0/054*
Bent Arm Hang Test				
CTL TRN	28/64±18/26 20/47±10/18	36/85±20/22 20/52±9/44	2/78	0/012*
Leg Lift Test				
CTL TRN	12/07±3/29 13/17±3/94	10/85±1/70 11±3/39	0/143	0/88
Thrust Test				
CTL TRN	7/5±3/32 7/29±3/36	9/71±9/09 9/58±2/95	0/116	0/041*
Static Balance Test				
CTL TRN	7±3/16 7/82±4/59	8/35±3/41 10/58±4/59	1/50	0/014*
300 Hundred Yard Run-Walk Test				
CTL TRN	94/92±12/80 93/72±10/29	94/64±16/63 86/05±10/05	1/7	0/04*

Discussion

The results of this study show that (TRN group) children with MR improved in five dependent variables (25 yard dash, agility, balance and cardiovascular endurance of physical fitness). It is well known that children with MR have low physical fitness levels compared to children without disabilities (9, 10). Shepherd (1980) stated that this was highly related to low physical activity participation instead of physical disabilities. In addition, Pitetti and Champell (1991) concluded that low physical fitness of MR children was related to the combination of low motivation and insufficient physical activity (11). Furthermore, research showed that mentally retarded populations have lower motor performance standards compared to populations without disabilities (1). Barton (1982) proposed that maintaining optimal health for mentally retarded populations should emphasize conditioning for better physical fitness levels (12). Besides, the majority of the literature reviews emphasized the importance of exercise and recreational activities for optimizing the well-being of MR populations, by nurturing physical fitness, motor development (Sherrill, 2006) and self-esteem (13-15). The 25 yard dash test results showed that children with MR improved significantly after 6 weeks of core stability exercises. This can be explained as positive effects of these physical activities on running speed. In other studies, Yılmaz et al. (1994) reported significant improvement of results in the 25 yard dash test of 21 educable children with MR (age 9-12). Similar results were also reported by Özbeser and Ergun (1).

Bent arm hang test was used to determine the strength and endurance of upper extremities for children with MR. Test results showed improved significantly for after 6 weeks core stability exercises. Studies by Yılmaz et al. (1994) and Özbeser and Ergun (1994) also reported significant results in bent arm hang test times in TRN MR children. Engelman and Morrow (1981) emphasized the importance of strength and endurance of upper extremities on daily life activities of children. Therefore, they suggested that this parameter should be included in the measurement of physical fitness for children. However, the “pull up” test was emphasized to determine upper extremity strength and endurance for children without disabilities in the literature. (Erbaugh, 1990). Leg lift test was used to measure lower extremity strength and endurance for children with MR. Results show that children with MR in both groups don’t improved after 6 weeks core stability exercise. Moreover, in other studies, Yılmaz et al. (1994) and Özbeser and Ergun (1994) found similar leg lift test results on educable MR children.

In this study, the thrust test was used to measure lower extremity strength. Results showed that children with MR improved significantly after 6 weeks core stability exercise intervention. Yılmaz

et al. (1994) reported thrust test results on educable MR children is affect and Özbeser and Ergun (1994) found similarity results.

Static balance test results show that children with MR in TRN groups improved significantly in the static balance test after intervention. In the literature, it was reported that mentally retarded populations have balance problems (1). With the widely accepted concept that dynamic and static balance abilities are important components of daily life activities for all children (16), improving balance in MR children is of great value. However, Sherrill (2006) stated that children with MR do not learn how to stand on a single leg until around 6-9 years old. Therefore, Boswell (1991) and Sherrill (2006) highly recommended dance and rhythmic activities to develop balance ability for children with MR (17).

Cardiovascular fitness is an essential component of physical fitness. Research shows that children with MR have lower cardiovascular fitness than their peers without MR (1). In this study, 300 yard run-walk test result showed that children with MR in TRN groups improved significantly after 6 weeks treatment. Özbeser and Ergun (1994) reported this similarity results. Baltaci et al (1996) reported that swimming exercises had positive effects on cardiovascular fitness of children. Therefore, core stability exercises can be an integral part of cardiovascular fitness development of all children in various fitness levels. Consequently, the present study found that 6 weeks core stability exercises have viable effects on physical fitness of children with MR(1). Results show that children with MR improved significantly in five dependent variables after 6 weeks treatment. Considering the limitations and sedentary life styles of all children with MR, core stability exercises can be a good way of developing physical fitness and motor skill development for children with MR. At this point, Horvat and Franklin (2001) suggest that children with MR should be provided with more opportunities for different physical activities (10). Moreover, they emphasize that sedentary life styles, such as inactivity and reduced participation in games and physical activity, should not be tolerated for children with MR. Instead, physical activity should be encouraged to develop healthier life style habits. Present study was aimed in developing physical fitness of children with MR, via core stability exercises. Results show that these exercises have viable effects on subjects' physical fitness. Therefore, children with MR should be encouraged to participate in exercises, as well as other sport activities. This study was limited to characteristics of the participants, intervention, tests and measurements that were applied. Further work should address the effects of different settings and physical activities on physical fitness of children with MR.

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