International Journal of Science Culture and Sport
September 2018 : 6(3)
ISSN : 2148-1148
Doi : 10.14486/IntJSCS766

The Effects of Movement Training Applied for 16 Weeks to the Physical Fitness Levels of Children with Intellectual Disability

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Type: *Research Article (**Received:** 05.07.2018 – **Corrected:** 10.08.2018 - **Accepted:** 28.08.2018)*

Abstract

Intellectual disability can be expressed as the defect that occurs in people's mental development and function. Therefore this handicap should be accepted by the society and it should be known that it is a social problem, instead of an individual one. The aim of this research was to determine the effects of movement training applied for 16 weeks to the physical fitness in children with intellectual disability. 30 volunteer, moderate mentally disabled male children have joined to the study. They have been divided into two random groups as group A (15 children) participating in non-play movement training, and group B (15 children) participating in movement training with games. The measurements included the age, height, weight, right and left-hand grip strength, anaerobic power, throwing the stuffed ball, VO_2max, 30 m sprint and long jump parameters. Because mentally disabled children's attention spans are short, and learning abilities are low, movement training programs, do not just improve physical fitness of these children, but also improve their ability to learn and to be more aware of their surroundings.

Keywords: Intellectual Disability, Training, Physical Fitness

Introduction

Mental disability is defined as a condition that emerges as a backwardness and inadequacy of effective and harmonious behavior, as a result of constant slowdown, stagnation or decline of mental development, for various reasons, before or during birth, or in the developmental stage afterward. This handicap should be accepted by the society, and it should be a social problem instead of an individual one. Thus, participation in social activities of handicapped individuals is very important that it is effective in three main areas of their lives, which are physical, emotional and mental (Eichstaedt and Lavay, 1992).

It is a well-known fact that mentally handicapped children who adopted a sedentary lifestyle, because of their loose and weak muscles and bone structure, are inadequate regarding physical and motor fitness components like strength, endurance, agility, balance, running, flexibility, speed, even when they can successfully participate in activities with their peers with normal intelligence. Besides, health-related issues also adversely affect the development of these children (immune system, hormonal disorders, cardio-respiratory diseases, illnesses). Therefore, improvement of physical fitness components like cardiovascular endurance, muscular strength, muscular endurance, flexibility, and body fat index is very important (Winnick and Short, 1985).

Constantly improving global top-level performance also increases competition. With the increasing competition, many physical properties also improve quickly. Especially with movement training, applied at an early age, not just the individual's physical development but also his/her cognitive abilities and emotional development can be benefited. It is shown that the most important factor that provides these developments is playing games. Because education with games, not just gives the children the opportunity to prepare for the sportive activity that they will practice but also ensures that they enjoy it. The aim of this research is to study the effects to some health and skill related physical fitness parameters of the play and non-play movement training applied to mentally handicapped children for the duration of 16 weeks.

Materials and Methods

Study group: The study is done through cooperation with disability organizations, on 30 volunteer mentally handicapped children. The volunteers were randomly divided into two groups of 15, one of them getting movement training without any play for 16 weeks (group A) and the other getting movement training with gameplay (Group B). The mean age of the group A was measured as (10.50 ± 0.76), and the mean age of the group B was measured as (10.90 □ 0.72). The average height of the group A was measured as (145.45 ± 5.60), and the average height of group B was measured as (141.55 ± 6.61). The average weight group A was (37.00 ± 5.48), and the average weight of group B was measured as (34.22 ± 3.78).

Movement training with or without gameplay: Systematic and scientific play and non-play movement programs were designed, in order to ensure the sufficient physical fitness of these people that we accept as a part of our society, even if they are disabled. With the necessary permits obtained, it was also made sure that they have no health problems preventing them to participate. Movement training programs were designed as individualized programs for these students with moderate mental handicaps, and the effects of these programs were measured on physical fitness factors of health and some skill parameters.

These applications were made under supervision of expert trainers, with the frequency of two days a week, up to 4 days in total, approximately 60 minutes (10 mins. warm-up, 10 mins. basic tempo, 10 mins. cooldown), and allowing the individuals to rest for a day in between. While studying on strength and endurance parameters in the gym two days a week, in the other two days, quickness, speed and flexibility parameters were tried to be improved in either individual and group exercises. The measurements were carried out using appropriate test parameters for subjects (Tamer, 2000).

Height and weight measurement: The subjects were measured with a precision scale of Angel brand down to 20 grams of error. Height measurements were read with a precision of 1 mm error with floating caliper of Holtain brand.

Strength parameter measurements: Grip force measurements were performed with Hand Grip dynamometer of Takkei brand.

30 m Sprint: On a standard 45 m running track, by establishing a photocell in between 0-30 meters, running time for this distance of the subject was measured, and the best of three trials was recorded.

Vertical jump test and calculation of anaerobic power: For the vertical jump test, the device named Takei Physical Fitness Test Jumping was used. By using Vertical jump test results, and with anaerobic strength formula Kg/sec=vertical jump distance (m) was measured.

VO_2max: For the measurement of this, 20 m crunch run test was used. The result was recorded in ml/kg/min.

Standing Long Jump: Is an anaerobic test for explosive force, done while standing without speed gain. The test is repeated two times and the best result was recorded in cm.

Stuffed ball throwing: The subject took strength by putting his/her arms back, with the stuffed ball in both hands, and feet parallel to each other. And then, with the maximum power he/she a can release, threw the ball forward with both hands. Results were recorded in meters.

Flexibility Measurement: The subject sat on the floor and rested firmly his/her bare feet soles on the test stand. Also, the subject tilted his/her body forward and without bending his/her knees, tried to reach as forward as possible with his/her hands in front of his/her body. In this position, he/she waited for 1 or 2 seconds at the furthest possible point. The test was repeated and the best result was recorded.

Findings

Table 1. Preliminary test "t" values of groups A and B

Parameters	N	Group A AO ± SS	Group B AO ± SS	t	p
Age (years)	30	10,50±,76	10,90±,72	-1,710	,095
Height (cm)	30	145,95±5,06	141,55±6,61	2,363	**,024***
Weight (kg)	30	36,99±5,48	34,23±3,78	1,858	,071
Right Grip Force (kg)	30	17,48±3,142	17,55±3,11	-,066	,948
Left Grip Force (kg)	30	18,35±2,10	19,00±2,09	-,988	,330
Long Jump (cm)	30	147,30±9,22	154,50±7,91	-2,651	**,012***
Anaerobic Power (kg/s)	30	41,82±7,68	38,25±9,24	1,329	,192
Stuffed ball Throw (cm)	30	4,19±,17	4,31±,29	-1,458	,153
VO_2max (mN/kg/min)	30	31,51±5,26	30,73±4,69	,496	,623
30 m Sprint (sec.)	30	5,69±,51	5,87±,30	-1,355	,183
Flexibility (cm)	30	13,70±5,83	18,68±6,64	-2,519	**,016***

P<0,05*

After comparing the preliminary test results of both groups, no significant differences have been observed ($p<0.05$) in age, weight, right hand grip, left hand grip strength, anaerobic power, stuffed ball throwing, VO_2max and 30 m sprint parameters, but significant differences ($p> 0,05$) have been observed in height, standing long jump and flexibility parameters.

Table 2. The last test "t" values of groups A and B

Parameters	N	Group A AO ± SS	Group B AO ± SS	t	p
Weight (kg)	30	34,63±3,18	37,77±5,88	-2,103	**,044***
Right Grip Force (kg)	30	18,17±3,502	18,23±3,139	-,057	,955
Left Grip Force (kg)	30	18,93±2,104	19,90±2,056	-1,482	,147
Long Jump (cm)	30	149,75±10,02	156,55±8,46	-2,319	**,026***
Anaerobic Power (k/s)	30	40,45±9,24	45,25±8,24	-1,733	,091
Stuffed ball Throw (cm)	30	4,26±,22	4,33±,28	-,884	,382
VO_2max (mN/kg/min)	30	31,44±4,69	34,49±4,74	-2,041	**,048***
30 m Sprint (sec.)	30	5,83±,30	5,93±,59	-,708	,483
Flexibility (cm)	30	18,50±7,64	17,05±4,98	,711	,481

**P<0,01 *P<0,05

After comparing the results of the last test values for both groups, while no significant difference has been observed ($p>0.05$) in right hand grip, left hand grip strength, anaerobic power, stuffed ball throwing, 30 m sprint and flexibility parameters, rather significant differences ($p<0.05$) have been observed in weight, long jump, and VO_2max parameters.

Table 3. Preliminary test results of group A

Parameters	**N**	**First test AO ± SS**	**Last test AO ± SS**	**t**	**p**
Weight	30	34,23±3,78	34,63±3,18	-,559	,583
Right Grip Force (kg)	30	17,48±3,14	18,17±3,50	-,893	,383
Left Grip Force (kg)	30	18,35±2,10	18,93±2,11	-5,617	,000**
Long Jump (cm)	30	147,30±9,22	149,75±10,02	-3,788	,001**
Stuffed ball Throw (cm)	30	4,20±0,17	4,26±0,22	-1,294	,211
VO_2max (mN/kg/min)	30	30,73±4,70	31,44±4,70	-52,852	,000**
Anaerobic Power (kg/s)	30	38,25±9,24	40,45±9,25	-2900,649	,000**
30 m Sprint (sec.)	30	5,87±0,30	5,82±0,28	44,831	,000**
Flexibility (cm)	30	18,68±6.64	18.50±7.62	,259	,798

**P<0,01 *P<0,05

After comparing the results of the pre- and post-test values of group A, while no significant differences ($p>0.05$) have been found in weight, right-hand grip and stuffed ball throw parameters, rather significant difference have been observed ($p<0.01$) in left hand grip, long jump, VO_2max, anaerobic power, 30 m sprint and flexibility parameters.

Table 4. Preliminary test results of group B

Parameters	**N**	**First test AO ± SS**	**Last test AO ± SS**	**t**	**p**
Weight	30	36.99 ± 5.48	36.55 ± 5.04	1,192	,248
Right Grip Force (kg)	30	17.55 ± 3.11	18.23 ± 3.14	-4,236	,000**
Left Grip Force (kg)	30	19.00 ± 2.10	19.90 ± 2.06	-6,728	,000**
Long Jump (cm)	30	154.50 ± 7.91	156.55 ± 8.46	-4,959	,000**
Vertical jump (cm)	30	18.35 ± 4.08	19.60 ± 4.04	-6,140	,000**
Anaerobic Power (kg/s)	30	41.82 ± 7.68	44.82 ± 7.68	-6646,027	,000**
Stuffed ball Throwing	30	4.31 ± 0.30	4.33 ± 0.28	-,483	,635
VO_2max (mN/kg/min)	30	31.51 ± 5.26	35.75 ± 5.31	-223,847	,000**
30 m Sprint (sec.)	30	5.69 ± 0.51	5.77 ± 0.51	-161,000	,000**
Flexibility (cm)	30	13.80 ± 5.68	16.21 ± 5.82	-34,013	,000**

**P<0,01 *P<0,05

After comparing the results of the pre- and post-test values of group B, while no significant differences ($p>0.05$) have been observed in stuffed ball throwing and weight parameters, rather significant differences could be observed ($p<0.01$) in right-hand grip, left-hand grip strength, long jump, anaerobic power, VO_2max, 30 m sprint and flexibility parameters.

Discussion and Conclusions

In this study, the effects to some health and skill related physical fitness parameters of play and non-play movement training applied to 10-year-old mentally handicapped male children for duration of 16 weeks were studied, by comparing pre and post-test result values. Games are activities done for a specific purpose within a specific time and place, using physical and mental abilities, with their own specific set of rules, which improve social harmony, intelligence and skills and which also are entertaining (Kale and Erşen, 2003). Today, in modern education, games play a huge role in the movement training that will benefit children's physical, spiritual and mental developments (Aslan, 1982).

After comparing the results of the pre- and post-test values of group A, while no significant differences ($p>0.05$) have been found in weight, right-hand grip and stuffed ball throw parameters, rather significant difference have been observed ($p<0.01$) in left hand grip, long jump, VO_2max, anaerobic power, 30 m sprint and flexibility parameters. After comparing the results of the pre- and post-test values of group B, while no significant differences ($p>0.05$) have been observed in stuffed ball throwing and weight parameters, rather significant differences could be observed ($p<0.01$) in right-hand grip, left-hand grip strength, long jump, anaerobic power, VO_2max, 30 m sprint and flexibility parameters.

As the physical and motor requirements of children with a low degree of intellectual levels are similar to other children, their physical education and playing activities are usually in the same pattern with other children. For these children, what usually recommended are individual activities rather than group activities, like individual sports, musical activities, strategy, rules, or memory development-oriented activities, also large muscle activities rather than small muscle activity, and activities that require them to move constantly, rather than keeping them static (Eichstaedt, 1992).

In today's technology age, there is an observable decline in both society's and children's exercising habits. Especially disabled children, with their weak muscles and non-constant joint structures, experience delays in reaching the necessary levels of motor development starting from a very early age. When poor eating habits and lack of exercise also accompany this, significant changes in the body components do occur with an increased fat accumulation. While the significant height and weight increase in children is mostly related to the development of adolescence and childhood, we also see that regular exercises also cause significant effects to the height and weight of children of the same age (Koç and Gökdemir, 1997; Mengütay, 1999). Especially in children with mental handicap, low physical fitness capacity and cardiorespiratory fitness do stand out (Fernhall et al., 2001). Of course; we have lots of opportunities to develop the health capacities of children with intellectual disability. In a research, these children engaged in the recommended 60 min of moderate to vigorous physical activity and measured their activity levels. Results are shown positively (Shields et al, 2009). It is critical that health professionals increase Health Promotion efforts, including physical activity for children and youth with intellectual disabilities (Lloyd, 2012).

The strength level of mentally handicapped individuals is lower than the ones without intellectual disabilities. Muscle strength and endurance is all about improved performance in daily activities gained by carrying and lifting weights, climbing stairs up and down, keeping a good posture and carrying out work-related activities (Feliz et al., 1998). Isokinetic muscle strength and knee flexion and extension of the mentally handicapped were found lower than the normal mental functioning individuals. Lower extremity (leg) muscle strength is associated closely with the VO_2max and running performance and is found to be low. Therefore, for this population, it was described that the factor limiting VO_2max is weak muscle strength (Horvat et al., 2000). Mero et al. (1990), in their study they have done with athletes of 10-11 age groups, have concluded that regular activities increase the capacity of aerobic capacity (Mero et al., 1990).

There is a need to maximize the positive effect of physical activity on people with intellectual disability. First, we need to initiate appropriate techniques used for motivation to participate in physical activity for this population (Jin-Ding Lin, 2010). And then we have to apply any appropriate tests and techniques to them. In literature, there was agreement among studies that children with intellectual disability were significantly less active compared to children without disabilities (Hinckson, 2013; Whitt-Glover, 2006).

After all, boys are more active than girls and this difference is mostly the result of the difference in outside school activities of these children of young age. Even when they have some kind of disability, they are still required to take regular and programmed movement training. Because mentally handicapped children's attention spans are short, and learning abilities are low, movement training programs, do not just improve physical fitness of these children, but also improve their ability to learn and to be more aware of their surroundings.

As a result, activities and exercise programs don't cause much of a change in the mental level of intellectually disabled children, but they do contribute to the development of adaptive behavior, which holds an important place in the social integration of these children.

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Conflict of Interest

The authors have not declared any conflicts of interest.

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