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The effect of participating into sport on the fitness level of youths with hearing impairment

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Abstract

The aim of the present study was to compare the physical fitness levels of physically active and sedentary individuals with hearing impairment. The study included physical active (G1) n=30 and sedentary (G2) n=15 students with upper level hearing impairment, ranging in age from 16 to 20 years and communicating through lip- reading and sign language. In order to determine the physical fitness level of the subjects, their anthropometric characteristics, and other characteristics such as aerobic capacity, anaerobic power, vertical jump, right and left hand grip and velocity were measured. Analysis of the data obtained from the subjects was made using the "Independent - Samples T" test. A significant difference was observed between G1 and G2 in terms of aerobic power ($MaxVO_2$) respectively 54,3 and 45 ml/kg/dk, vertical jump 53,6 and 45 cm, anaerobic power 110.2 kg/m/sec, 100.4 kg/m/sec, and velocity- 30 m run 4.31 and 4.59 sec ($p<0.05$).

In conclusion, it can be said that there was a favorable result in favor of the physical fitness level of the students with hearing impairment who had participated in a soccer training workout at least twice a week and, by means of that, their physical fitness level resembled that of the ones with no hearing impairment.

Keywords: physical fitness, hearing impairment, performance

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Introduction

World Health Organization (WHO) defines the handicapped as "the person who is in some degree able to or totally unable to fulfill the expected roles, changing regarding age, gender, social and cultural factors, due to a kind of disorder or a handicap". Sport teaches individuals to cope with their handicap and lessen it, gives pleasure, enhances communication and sharing, increases their desire to live, and also enables them to acquire some useful characteristics such as honesty, tolerance and cooperation.

Not only the non-handicapped but also the handicapped can benefit from physical activities. The studies conducted have revealed that physical activity has positive effects on the physical and motor fitness components, motor skills and self-concepts of the individuals with handicaps (Oliver, 1960, Rarick, Chasey & Wyrick, 1971, Beasley, 1982, Rarick, Widdop & Broadhead 1970).

The individuals ranging in age from 0 to 21 years particularly need physical activity for muscle growth, ossification and better performance of the inner organs such as heart and liver. The fact that many individuals with handicaps experience an interruption in their growth can relate to their not joining physical activities sufficiently (Bruininks, 1974).

Like all other individuals, those with handicaps also have some rights. These include providing children and adults with handicaps with the opportunity to take part in sports activities as well. Some sports activities have been organized for those with handicaps at all national and international levels. In sports competitions, the individuals with handicaps are divided into four groups according to the level of their handicap. The handicapped in the first group can compete with the non-handicapped in the same competitions. For example, the individuals with hearing impairment can compete in some branches of sports with the non-handicapped at the highest-level competitions. The physical fitness levels of the handicapped in this group do not differ from those of the non-handicapped (Stein & Paciorek, 1994).

The aim of the present study was to compare the physical fitness levels of physical active and sedentary individuals with hearing impairment.

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Method

Participants

The participants of the study were the physical active (n=30) and sedentary (n=15) students with upper level hearing impairment, communicating through lip- reading and sign language, and ranging in age from 16 to 20 years. The students in the active group (G1) participated in two-hour-a-day and twice-a-week soccer and basketball work-outs for six months. However, the students in the sedentary group (G2) did not participate in any kind of physical activity regularly. For all the students who volunteered to participate in our study, the required permissions were taken from the school administration and their parents. Before going on with the measurements, the tests were introduced to the subjects. In order to determine the physical fitness levels of the subjects, their anthropometric characteristics (weight, height, fat %), aerobic capacity, anaerobic power, right and left hand grip and velocity were measured.

Anthropometric Measurements

1- The height and weight of the subjects in shorts and no shoes were measured. Height was measured using the Holtain Stadiometer having 0.1 cm sensitivity, and weight was measured using the Nan-bascule (a Turkish-made weight measuring tool) having 0.01 kg sensitivity.

2- Body Mass Index (BMI) was determined using the formula: weight (kg) / height (m) ^{2}.

3- Ideal body weight was calculated using the Martine Index formula.

Ideal Body Weight = (Chest circumference * Height) / 240.

4- Body fat % was determined using Skinfold Method. Measurements were taken by a specialized person using Skinfold Calliper (Holtain Ltd, England) having 0,2 mm sensitivity. To determine the fat percentage of the subjects, Yuhaz formula was applied.

Fat %= 5.783+0.153 (Triceps+Subscapula+Abdominal+Supraliac)

5- The amount of body fat of the subjects and their lean body weight fat was determined using the formula below:

Fat Amount = Body Weight* Body Fat %

Lean Body Weight = Body Weight - Fat Amount

Vertical Jump

Vertical Jump was measured using the Laser Optoelectronic Vertical Jump Device. The system can be used in both open and closed areas. The device can work at the environmental temperatures ranging from -5°C to 50°C. In addition, it can be fed from the 220 V / 50 Hz network voltage and a 12V accumulator. The power the device gets from the network is 5 W. It displays at every 0.5 cm grade. The measurement altitude is between 10 and 99 cm. Compared to available devices, Laser Jump Device has advantages. The most important ones are that it has no mechanical connections and contacts affecting the systems. Faults resulting from the sportsman's movement(s) were eliminated. Athlete's movements are not restricted. The duration of the drop do not affect the result. There is no certain standing position for the sportsman. The device is easy to use and a special training is not required (Musayev, 2006). Figure 1

Figure 1: Laser Optoelectronic Vertical Jump Device

Anaerobic Power

Anaerobic power was tested using the Sargent vertical jump test and calculated using the Lewis formula (Fox. & Matthews, 1974).

Anaerobic Power=√4.9 * (Body Weight) * √ D
D=Vertical Jump Height (m)

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Aerobic Capacity (Max VO_2)

Max VO_2 measurement was made using the Multistage Fitness Test. This test involves continuous running between two lines 20 m apart in time to recorded beeps. For this reason the test if also often called the 'beep' or 'bleep' test. The time between recorded beeps decrease each minute (level). There are several versions of the test, but one commonly used version has an initial running velocity of 8.5 km/hr, which increases by 0.5 km/hr each minute (Brewer, Ramsbottom & Williams, 1988, Ramsbottom, Brewer & Williams, 1988). This test has excellent reliability (r=0.97) and validity (r=0.84), and can be used to test a large number of athletes simultaneously (Leger & Lambert, 1982).

Hand Grip

Right and left hand grip was measured using a Japanese hand grip dynamometer in (0-100 kg.w, Takei kiki kaygo). Subjects were required to do total two tests with their right and left hands. They were granted a time period of at least 30 seconds during the tests. Their best scores were recorded (Winnick & Short, 1985).

Velocity

The velocity of the subjects were determined using the 30m run test. Measurements were made using a photocell chronometer.

Statistical Analysis

Analysis of the data obtained from the subjects was made using the "Independent - Samples T" test, employing the SPSS statistical package programme. The test significance level was taken as $p<0.05$.

Results

Descriptive Values and inter-group differences regarding the data obtained are presented in Table 1 and 2.

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Table 1: Descriptive Values of the Anthropometric Parameters of Students with Hearing Impairment

VARIABLE	*Group*	*N*	*Mean*	*SD*	*« t » values*	*P values*
AGE (year)	G1	30	17,6	0,9	1,282	P>0.05
	G2	15	17,1	1,2		
HEIGHT (cm.)	G1	30	173,4	7,3	1,614	P>0.05
	G2	15	170,7	4		
BODY WEIGHT (kg.)	G1	30	66,8	6,8	-0,629	P>0.05
	G2	15	67,9	4,8		
BMI (kg/m²)	G1	30	22,2	1,6	-2,101*	**P<0.05**
	G2	15	23,3	1,7		
BODY FAT % (BF%)	G1	30	11,4	1,9	-1,815	P>0.05
	G2	15	13,4	3,9		
FAT AMOUNT (FA)	G1	30	7,7	1,8	-1,734	P>0.05
	G2	15	9,1	2,8		
LEAN BODY WEIGHT (LBW)	G1	30	59,1	5,5	0,272	P>0.05
	G2	15	58,7	4,5		
IDEAL BODY WEIGHT (kg) (IBW)	G1	30	63,9	4,9	4,274*	**P<0.05**
	G2	15	59,4	2		

p<0.05: there is a statistically significant difference between groups
p>0.05: there is no statistically significant difference between groups
G1: Physical Active Group
G2: Sedentary Group

As shown in Table 1, no statistically significant difference was found between G1 and G2 regarding height, body weight, body fat %, fat amount, and lean body weight and the values obtained were as follows respectively in G1 and G2: 73,4 cm and 170,7 cm; 66,8 kg and 67,9 kg; 11,4 % and 13,4 %; 7,7 kg and 9,1 kg; 59,1 kg and 8,7 kg ($p>0.05$). However, a statistically significant difference regarding BMI (Body Mass Index) and ideal body weight was found between G1 and G2 and the values found were 22,2 kg/m² and 23,3 kg/m² for G1 and G2 respectively regarding MBI and 63,9 kg and 59,4 kg for G1 and G2 respectively regarding ideal body weight ($p<0.05$).

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Table 2: Descriptive Values of Physiological Parameters of Students with Hearing Impairment

VARIABLE	*Group*	*n*	*Mean*	*SD*	*« t » values*	*p values*
AEROBIC CAPACITY (ml/kg/min)	G1 G2	30 15	54,3 50,4	1,1 2,3	2,215*	**P<0.05**
VERTICAL JUMP (cm)	G1 G2	30 15	53,6 45	7,8 6,6	2,635*	**P<0.05**
ANAEROBIC POWER (kg/m/sec)	G1 G2	30 15	110,2 100,4	14,2 10,8	2,679*	**P<0.05**
RIGHT HAND GRIP (kg.W)	G1 G2	30 15	42,1 40,7	4 6,8	0,835	P>0.05
LEFT HAND GRIP (kg.W)	G1 G2	30 15	40,2 40,1	5,7 4,1	-0,051	P>0.05
VELOCITY - 30 M sprint (sec)	G1 G2	30 15	4,31 4,59	0,3 0,3	-3,355*	**P<0.05**

p<0.05: there is a statistically significant difference between groups
p>0.05: there is no statistically significant difference between groups
G1: Physical Active Group
G2: Sedentary Group

As shown in Table 2, there was no statistically significant difference between G1 and G2 in terms of right hand grip and left hand grip considering the means obtained for both groups which were 42,1 kg W and 40,7 kg w respectively regarding the right hand grip and 40,2 kg.W and 40,1 kgW respectively regarding the left hand grip (p>0.05). However, a statistically significant difference was observed between G1 and G2 in terms of the following variables, considering the means obtained for both groups (G1 and G2), which were 54,3 ml/kg/min and 50,4 ml/kg/min respectively regarding aerobic power; 53,6 cm and 45 cm respectively regarding vertical jump; 110,2 kg/m/sec and 100,4 kg/m/sec regarding anaerobic power; and 4,31 sec and 4,59 sec regarding velocity-30 meter run (p<0.05).

Discussion

The aim of the present study was to compare the physical fitness levels of physical active and sedentary individuals with hearing impairment.

In the present study we have observed in active (G1) and sedentary (G2) groups that the height averages were 173,4 cm and 170,7 cm; the body weight averages were 66,8 kg and 67,9 kg; the body fat percents were 11,4 % and 13,4 %, the Max $V0_2$ averages were 54,3 ml/kg/min and 50,4 ml/kg/min respectively. It was seen that the active group's Max $V0_2$ values were statistically different from those of the sedentary group. Franks et al. (1999), in a study of theirs carried out on 66 elite English soccer players, aged 16, have determined that the

average height was 176,5±0.02 cm, the average body weight was 71,2±1,4 kg, the fat % was 11,7 % ±0.8 % and the Max $V0_2$ was 57.7±6.8 ml/kg/min. Leat et al. (1987), in a study conducted on 9 Canadian soccer players with an age average of 16.7±0.5, have determined that the average height was 176±0.4 cm , the average body weight was 69.1±3.4 kg and the Max V02 was 57.7±6.8 ml/kg/min. Hugg (1997), in the study conducted on the soccer players, aged 17, of the Australian national team, who joined the 1993 World Championship, has found out that the average height was 174,5 ±0.07 cm, the average body weight was 66.2±5,6 kg and the Max $V0_2$ was 59,9±6.3 ml/kg/min. Jankovic et al. (1993), determined that the average height, body weight, and Max VO_2 of the players of the Crotian national soccer team, having an average age of 16.0±0.5, were 176±0.05 cm, 66.2±5.6 kg and 59.9±6.3 ml/kg/min. respectively. We may say that in the present study height, weight and fat % values of the active and sedentary groups were similar to the above mentioned results. It was seen that the active group's Max $V0_2$ values were similar to those mentioned above. Shvartz & Reibold (1990) evaluated Max $V0_2$ 45,2-50,9 as "good" and 51,0-55,9 as "very good" for youngs aged 13-19. According to this, in our study, we may declare that the average Max $V0_2$ of the active group (G1) was "very good", but that of the sedentary group (G2) was "good".

No significant difference in terms of left and right hand grips was observed between the active (G1) and sedentary (G2) groups. That is to say, the right hand grip was 42,1 kgW in the active group (G1) and 40,1 kgW in the sedentary group (G2) ($p>0.05$). When we had compared the hand grip of the students with hearing impairment, aged 16-19, to normal population, we saw that the hand grip of the students with hearing impairment was "below the average" (Davis et al, 2000).

In present study, we determined that vertical jump values of the active (G1) and sedentary (G2) groups were 53,6 cm and 45 cm respectively. Comparing our subjects' vertical jump values with the 16-19 aged normal population, we saw that the active group (G1) was "above the average" and the sedentary group (G2) was "around the average" (Davis et al, 2000). McMillan et al. (2005) have determined that the counter movement jump height values of the young soccer players, aged 16.9±0.4, were 52.0±4.0 before the training and they were 53.4±4.2 after ten weeks' training. We can say that the active group's vertical jump value resembles that which was mentioned in the above study, but the sedentary group's values were lower.

Anaerobic power was calculated using Lewis formula. According to this formula, we may say that the anaerobic power of the active group (110,2 kg/m/sec) was statistically more than

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that of the sedentary group (100,4 kg/m/sec). Also in our study, we determined that the 30 m run values of the active and sedentary group were 4.31 sec. and 4.59 sec. Respectively, which was a statistically significant difference ($p<0.05$). When compared to the 16-19 aged normal population, it was found that the velocity of the active group (G1) was "average" and that of the sedentary group was "below the average" (Davis et al, 2000).

In conclusion, it can be said that there was a favorable result in favor of the physical fitness level of the students with hearing impairment who had participated in a soccer training workout at least twice a week and, by means of that, we may say that their physical fitness level resembled that of the ones with no hearing impairment.

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