

Effect of Eight Weekly Aerobic Training Program on Auditory Reaction Time and MaxVO₂ in Visual Impairments

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Received: February 17, 2016

Accepted: March 31, 2016

Online Published: August 25, 2016

doi:10.5539/ies.v9n9p67

URL: <http://dx.doi.org/10.5539/ies.v9n9p67>

Abstract

The aim of study was to examine the effect of eight weekly aerobic exercises on auditory reaction time and maxvo₂ in visual impairments. Forty visual impairment children that have blind 3 classification from the Turkey, experimental group; (age=15.60±1.10 years; height=164.15±4.88 cm; weight=66.60±4.77 kg) for twenty subject and control group; (age=15.40±1.09; height=166.30±3.87 cm; weight=65.20±3.94 kg) for twenty subject, participated as volunteer in this research. The audio reaction time in dominant hand assessments were made by Newtest 1/1000 sensitive reaction timer. This study that used the 20-m shuttle run test to estimate peak oxygen consumption (VO₂max) for visual impairment children in experimental and control groups on a wooden gymnasium floor. Exercise intensity was determined according to the workload reached during the maximal graded exercise test. Reserve heart rate was calculated as the difference between peak and resting heart rate, multiplied by the intensity of exercise and added to resting heart rate, according to the Karvonen method. MaxVO₂ was significantly different between experimental and control group in pre-test (P<0.05). On the other hand, auditory reaction time was insignificant differences between experimental and control grouping pre-test (P>0.05). Auditory reaction time and MaxVO₂ was significantly different between pre-test and post-test in experimental group (P<0.05). On the other hand, auditory reaction time and MaxVO₂ was insignificant differences between pre-test and post-test in control group (P>0.05). In conclusion, regular aerobic training programs in visual-impaired ones will lead to improvements in auditory reaction time and maximal oxygen capacity and sweep their disadvantages in comparison to their peers.

Keywords: aerobic training, auditory reaction time, MaxVO₂, visual impairments

1. Introduction

Sportive activities have become an indispensable part of healthy life for years. Exercise is an instrument which aims to develop individuals' physical and mental behaviors. Physical activities which are presented to individuals in society, are important for individuals to grow up well and more healthily in society. People feel relieved in physical and mental aspects and have new social environments when doing exercises. Exercises also develop individuals with functional deficiencies in terms of physical and psychological situations, increase their self-confidence and reintegrate them into society. When mentioning about these types of activities, disabled individuals must not be forgotten and these opportunities must be provided to them as well (Karaküçük, 1999). Among disabled ones, the issue of disability is divided into parts including medical model of disability and social model of disability (Burcu, 2007). As incidence degrees, incidence time, type, cause of disability include physical approaches, sportive and social activities are included in social approaches (WHO, 2009).

Visual-impaired individuals are individuals who cannot fulfill functions of eyesight and thus cannot benefit from visual training materials. In visual-impaired individuals, situation of visual disability is determined in accordance with loss rate of eyesight. Following all treatments, if eyesight is less than the rate 20/200 or lower than the degree 20 in spite of corrective lens, an individual is described as blind (Anastasrow, 2003). A thing which normal persons see away from 60 meters, persons called blind ones can see away from 6 meters (Keener, 2004). Since these persons cannot use their eyes enough and are devoid of visual stimulants, they keep themselves away from physical activities. This deficiency creates problems in neural system and muscle coordination and leads to inefficacy in motor skills. This visual deficiency can be compensated with the development of other perceptions. Discussions in the 1st International Physical Education Congress showed that disabled individuals performing

physical activities had higher perceptions than disabled individuals not performing physical activities (Erkmen et al., 2011). Visual-impaired individuals face with physical problems due to sedentary life. It is highly important to take part in regular physical programs in order to become individuals who can meet a major part of their needs by themselves in society, among visual-impaired individuals confronted with these problems (Terzi, 2011).

Regular physical activities are significant factors in solving problems in visual-impaired individuals like in normal individuals; they are used as therapy instruments in their rehabilitation process and trainings. Positive effects of regular physical activities by disabled individuals will reflect on both them and their environments. Sportive activities to be done will make contributions to their healthy development by making disabled individuals cling to life (Gür, 2001). So when physical activity programs in visual-impaired individuals adjust their muscle and joint coordinations close to normal individuals' levels, they become socialized.

When we look at national and international publications, more studies are available about visual-impaired individuals. More studies must be done for visual-impaired individuals to create a suitable environment, make them participate in sportive activities and organize physical activity programs in accordance with visual-impaired individuals in order to do sport. Because if these individuals are guided to individual and team sports without achieving physical developments, their success will be negatively affected and this will cause loss of self-confidence.

2. Method

Forty visual impairment children that have blind 3 classification from the Turkey, experimental group; (age=15.60±1.10 years; height=164.15±4.88 cm; weight=66.60±4.77 kg) for twenty subject and control group; (age=15.40±1.09; height=166.30±3.87 cm; weight=65.20±3.94 kg) for twenty subject, participated as volunteer in this research.

2.1 Measurements

2.1.1 Body Height

Body height of adolescent children was measurement with 0.1 kg sensitive electronic stadiometer (SECA, Germany) (Lohman et al., 1988).

2.1.2 Body Weight

Body weight of adolescent children was measurement as bare feet, shorts, T-shirts with 0.1 kg sensitive electronic weighbridge (SECA, Germany) (Gordon et al., 1988).

2.2 Reaction Time

The audio reaction time in dominant hand assessments were made by Newtest 1/1000 sensitive reaction timer. We expressed to press the button with forefinger in three second with ready command after concentrate on test from subject. Each subject was given five attempts that are out of the evaluation. Later, each subject applied five times in reaction time dominant hand. Lowest and highest reaction time was out of the evaluation. The other three measurements means were recorded as reaction time (in ms). The reaction times of subjects were taken in same conditions (Tamer, 2000).

2.3 20-M Shuttle Run Test to Estimate Peak Oxygen Consumption

This study that used the 20-m shuttle run test to estimate peak oxygen consumption (VO_{2max}) for visual impairment children in experimental and control groups on a wooden gymnasium floor. In brief, participants were required to run between two lines 20 m apart, while keeping pace with audio signals emitted from a pre-recorded CD. The initial speed was set at $8.5 \text{ km}\cdot\text{h}^{-1}$ ($2.4 \text{ m}\cdot\text{s}^{-1}$), which was increased by $0.5 \text{ km}\cdot\text{h}^{-1}$ ($0.1 \text{ m}\cdot\text{s}^{-1}$) each minute (one minute equals one stage). The CD used was calibrated for duration of one minute. Participants were instructed to run in a straight line, to pivot and turn on completing a shuttle, and to pace themselves in accordance with the audio signals. The test ended when the participant stopped due to fatigue, or when they failed to reach the end lines concurrent with the audio signals on two consecutive occasions. The participants were constantly encouraged to run for as long as possible throughout the course of the test. The last completed half-stage of the 20-m shuttle run test was recorded (e.g. if 5 stages plus a half-stage were completed: 5.5) and used in the estimation of VO_{2max} (Léger et al., 1988).

2.4 Aerobic Training Program

Table 1. Aerobic training program during 8 weeks

Weeks		Monday	Wednesday	Friday
During weeks	1-4	40-70% pulse	40-70% pulse	40-70% pulse
		5-10 min. dynamic warm up	5-10 min. dynamic warm up	5-10 min. dynamic warm up
		5 min walk-5 min run	5 min walk-5 min run	5 min walk-5 min run
		Four repeated	Four repeated	Four repeated
		5-10 min. active cooling down	5-10 min. active cooling down	5-10 min. active cooling down
During weeks	5-8	40-70% pulse	40-70% pulse	40-70% pulse
		5-10 min. dynamic warm up	5-10 min. dynamic warm up	5-10 min. dynamic warm up
		10 min walk-10 min run	10 min walk-10 min run	10 min walk-10 min run
		Three repeated	Three repeated	Three repeated
		5-10 min. active cooling down	5-10 min. active cooling down	5-10 min. active cooling down

Exercise intensity was determined according to the workload reached during the maximal graded exercise test. Reserve heart rate was calculated as the difference between peak and resting heart rate, multiplied by the intensity of exercise and added to resting heart rate, according to the Karvonen method.

2.4.1 Karvonen Formula

Maximal heart rates were estimated using Karvonen's (220-age)

Reserve heart rate = maximal heart rate - resting heart rate

Target heart rate = (%60-70 x Reserve heart rate) + resting heart rate

2.5 Statistical Analysis

We used average and standard deviation as descriptive statistics. Kolmogorov-Smirnov test was applied to verify the homogeneity of the same ones. Due to the nature found distribution, it was preferred in the inferential statistics to use the independent T-test, being used as point of it accepts of the significance of the differences of the averages the p-value < 005. We used SPSS 16.0 for the necessary statistical procedures the software.

3. Result

Table 2. Mean values and standard deviation of age and height and weight for experimental and control group

Variables	Experimental Group (N=20)	Control Group (N=20)
Age (years)	15.60±1.10	15.40±1.09
Height (cm)	164.15±4.88	166.30±3.87
Weight (kg)	66.60±4.77	65.20±3.94

Table 3. Comparison of auditory reaction times and MaxVO₂ of intergroup in pre-test and post-test

Variables	Auditory reaction time (ms)			MaxVO ₂ (ml.kg ⁻¹ .min ⁻¹)		
	Experimental	Control	P	Experimental	Control	P
Pre-test	245±16.07	243±17.12	0.757	28±1.77	30±1.16	0.000*
Post-test	230±17.67	243±19.72	0.034*	32±1.55	30±1.33	0.000*

Table 3 shows auditory reaction time and MaxVO₂ was significantly different between experimental and control group in post-test. Also, MaxVO₂ was significantly different between experimental and control group in pre-test. On the other hand, auditory reaction time was insignificant differences between experimental and control grouping pre-test.

Table 4. Comparison of pre-test–post-test of auditory reaction times and MaxVO₂ of intragroup

Variables	Experimental Group (N=20)			Control Group (N=20)		
	Pre-test	Post-test	P	Pre-test	Post-test	P
Auditory reaction time (ms)	245±16.07	230±17.67	0.000	243±17.12	243±19.72	0.973
MaxVO ₂ (ml.kg ⁻¹ .min ⁻¹)	28±1.77	32±1.55	0.000	30±1.16	30±1.33	0.201

Table 4 shows the auditory reaction time (in ms) and MaxVO₂ (ml.kg⁻¹.min⁻¹) in experimental and control group. Auditory reaction time and MaxVO₂ was significantly different between pre-test and post-test in experimental group. On the other hand, auditory reaction time and MaxVO₂ was insignificant differences between pre-test and post-test in control group.

4. Discussion

Visual-impaired individuals' physical motor skills are limited rather than normal individuals and they have to perform physical activities regularly to improve their disadvantages. Regular participation in physical activities facilitates their adaptation with social and work life, it provides individuals to be more productive, high self-confident and to have developed motor skills (Martihö, 2004).

Our study was to analyze the effect of regular aerobic training programs on auditory reaction time and maximal oxygen capacity in visual-impaired individuals. Physical and physiological developments in visual-impaired individuals were related with insufficient participation in exercise programs rather than normal individuals (Ponchillia et al., 2005).

The training group's physical measurement averages in visual-impaired individuals participated in the study were of age 15.60±1.10 years, the control group had age 15.40±1.09 years. As reaction time is slow in children, this time becomes shorter in the development age rapidly and reaches at the quickest rate in ages 15-20. Then when age becomes older, reaction time starts to be longer. But reaction time of a person aged 60 is shorter than reaction time of a child aged 10. This shows that our trial group had enough maturity in terms of reaction time development. As the slowest values regarding reaction time are taken from old people not doing sport, the quickest values are taken from young athletes (Keskin, 2008). A research on children aged 8 indicates that reaction time progresses in parallel with age, it is more stable in the age interval 7-12 rather than other ages (Güzel et al., 2005). The highest level of maximal oxygen usage is between the ages 18-20. The level of maximal oxygen usage falls between 8%-10% once in each ten years dating from the age 30. The reason of fall with age is decrease in maximum heart rate and heart beat volume (Özçaldiran, 1994).

Regular physical activities have an important place in solving problems resulting from unsedentary situation in visual-impaired ones. When visual-impaired ones participate in physical activities, they have skills in movement forms and develop their reaction time (Gür, 2001).

When we evaluate the measurement values of personal reaction time in our study, a statistically meaningful difference was found between the pre-test and post-test measurement results belonging to the training group, a meaningful difference was not found between the pre-test and post-test measurement results belonging to the control group.

When we analyze other studies, a training program of muscle power was applied to 27 females and 17 males and their reaction time seemed to develop. Also, reaction time of the mental-disabled group doing sport was better than the group not doing sport (Kaya, 2003). Bakır (2005) stated that reaction time of hearing-impaired ones involved in sportive activities was better than reaction time of Gençlerbirliği footballers but reaction time of visual-impaired group not doing sport was worse than these footballers' reaction time. Juodzbalienė and Muckus (2006)'s research showed that balance values of visual-impaired ones were better than values of individuals who can see, but eyes of individuals who can see, are closed, their balance values were worse.

A study on baseball and basketball players suggested that reaction time of baseball and basketball players was lower than persons not doing sport (Nakamoto & Morri, 2008). When we study another research, a statistically

significant difference was found in favour of the training group, when compared to reaction time of the training group and the control group, as a result of trainings which were done in physical education and sport course for one hour in a week during eight weeks (Çetinkaya, 2011). Orhan (2001) studied reaction time of groups actively interested in sport, groups not performing sport and sedentary groups and found that reaction time of sedentary groups and groups not doing sport actively were longer than reaction time of groups doing sport actively. Physical activity stimulates auto regulator mechanism which regulates blood flow going to brain. Due to this, developing brain performance plays an important role to make reaction time shorter (Muratlı, 1998). Studies suggested that motor skills of visual-impaired individuals having physical potentials same with their peers were behind normal individuals (O'Connell et al., 2006).

In values of maximal oxygen capacity levels; there was a statistically significant difference between the pre-test and post-test measurement values of the training group; there was not a statistically significant difference between the pre-test and post-test values of maximal oxygen capacity level in the control group.

Visual-impaired individuals included in our study have great difficulties in sportive activity opportunities because of lack of facility and technical staff. That's why, aerobic development in visual-impaired individuals is not developed enough compared to other individuals. Hopkins et al. (1987) found that physical feasibility levels were less in visual-impaired children who were less active in comparison to their peers in terms of physical activity. Also, aerobic capacity was lower in visual-impaired ones than normal peers. Rowland (1985) informed that physical activity was related with maximal oxygen capacity and maximal oxygen capacity of children doing sport was higher. Another study indicated that aerobic exercises in visual-impaired ones led to decreases in body mass index values (Blesing et al., 1993). Another research stated that organism showed more reactions to endurance trainings in young ages, a certain increase occurred in maximal oxygen usage and respiratory functions in this period (Kıyar, 2011).

In sensory-motor development, a sense of eyesight is a substantial input. Visual-impaired ones' motor developments have lower levels rather than normal individuals because of this inadequate condition (Enç, 2005). In conclusion, regular aerobic training programs in visual-impaired ones will lead to improvements in aural reaction time and maximal oxygen capacity and sweep their disadvantages in comparison to their peers.

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