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Comparing the Components of Children's Physical Fitness in Relation to the Role of Air Pollution in Tehran, Iran

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ABSTRACT: The aim of this study was to compare the components of children's physical fitness in relation to the role of air pollution in Tehran, Iran. The research method was a causal-comparative study. To achieve the research goals, 80 students of elementary school in fourth grade (10.3 ± 0.1) in Tehran, Iran were selected through available sampling. In the research phase, the researcher referred to Tehran Quality Control System, and based on the average of pollutant indicators in the past month, two Districts of Tehran, Iran were selected; District 1 (Aghdasiyeh) as the least infectious and District 20 (Rey) as contaminated. Then, the arrangement was performed to carry out physical fitness tests. The data was collected in two days. On the first day, participants performed physical fitness tests at Negin Shahr Rey Club and on the second day at the Royal Club in Aghdasiyeh district. Data was analyzed by independent t-test. The results showed that there was a significant difference between speed and agility components in two Districts 1 and 20, while there were no significant differences between power and flexibility components. Comparison of means indicated that children in area 1 had better performance than District 20. According to the results, it is suggested that the high amount of air pollution prevent children from engaging in physical activity and consider physical education teachers to take on activities that require less energy requirements.
Keywords: Physical Activity, Air Pollution, Fitness, Vulnerability, Diseases.

1. INTRODUCTION

Human beings cause environmental pollution by burning fossil and non-fossil fuels, creating organic compounds and releasing them in the open air, producing various types of anomalies, etc., (Safavi, 2002). Air pollution is one of the most important parameters in urban microclimate due to urbanization, population growth, excessive use of fossil fuels, the lack of friendly environmental technologies usage and, importantly, the lack of proper environmental management. The World Health Report indicates that airborne particles (ie particles that are too small that they can enter the lungs) are an important contributing factor to respiratory illnesses and an inescapable relationship to other deaths due to cardiac problems and have pulmonary symptoms (Pourianejad, 2005). The observed effects of air pollution on health including: increasing the respiratory symptoms, decreasing of lung function, increasing of hospitalization of respiratory and cardiovascular diseases in hospitals, increasing of absenteeism from work and school due to respiratory illness, increasing of death in cardiac patients and respiration (Pope et al., 1995) and poor balance of heart rate (mild anemia) are the non-specific activation of the immune system and delaying the competing of bones in children (Wichman et al., 1995). World Health Organization (WHO) studies have shown that 1.4 billion people from all over the world breathe the air that its pollution exceeds the standard (WHO) beyond and unhealthy. One of the most important sources of air pollution in Europe is automobiles, whose effects on the health of citizens are increasing

rapidly (Pourinejad, 2005). The effects of air pollution on human health have long been considered. Even before, classical and modern studies in this area have occurred, events such as a sharp increase in the level of particle size in England, which has been accompanied by a sharp rise in the number of deaths in a short space of time, has attracted the attention of researchers and the public. Since the early 1990s, air pollution in cities, especially metropolitan cities in developing countries, has been recognized as one of the most important environmental concerns of the world. Over the past decade, in spite of the existence of several indicators for assessing the environmental footprint, the poor weather conditions in developing countries are still ongoing and effective implementation of air pollution policy face with difficulty in these countries. Air pollution in developing countries is due to population growth, inadequate vehicle design, and extensive use of fossil fuels. Other causes of air pollution are neglect of this issue and its modalities. The expansion of cities, the development of immigration, the disproportionate expansion of industries and the lack of attention to its proper location are also important factors in increasing environmental pollution. On the other hand, proper hygiene will improve people's well-being and increase the potential and actual power of the workforce, and the workforce will have a significant contribution to increase production and economic growth. Growth in terms of income increases the health promotion. Today, most societies regard health as a basic need for life (Hulk, 2005). However, little information is available on the effects of short-term exposure to air pollution (Schwartz, 1991). The harmful effects of increasing the concentration of suspended particles, carbon monoxide and other pollutants in several studies have been shown to increase hospital admissions and referral to the emergency department for respiratory illnesses. Additionally, increasing hospital admissions for cardiovascular disease are numerous in American, Canadian and European studies related to suspended pollutants and carbon monoxide (Jaakkola et al., 2001). These findings indicated that air pollution is not only a risk factor for respiratory illnesses, but also for acute cardiovascular events, including acute coronary syndrome and myocardial infarction. Contaminated air inhalation can lead to an exacerbation of acute heart attacks through inflammation of the lung and increase systemic coagulation (Schwartz and Maurice, 1995). Increasing of plasma and C-reactive protein levels have been observed in healthy subjects after a period of exposure to contaminated air (Seaton et al., 1995). Increasing of heart rate and increasing the risk of discharge of the fibrillation plant implanted in the heart indicated the response of the autonomic nervous system to contact with air pollutants, especially carbon monoxide (Routledge et al., 2005). Pollution caused by vehicles is known as the most important source and consisted of a combination of pollutants (Kymisis 2008). Carbon monoxide (CO, nitrogen oxides, NOx, ozone (O3), suspended particles of less than 10 microns, sulfur dioxide (SO2) and volatile organic compounds are the main pollutants of urban air (Carlisle and Sharp, 2001; Kargarfard et al., 2011). Air pollutants can have simple effects such as stimulation, burning and watering up to severe effects and even death depending on the concentration and duration of exposure to humans, (Golkar and Farahmand, 2010). The environment, including temperature, contamination, height, humidity and time, has been a great importance for exercising sports practitioners, especially physiologists, for several reasons (Rail and Vatrmvs, 2005). When the air is stagnant or the temperature inversion happens, some of these pollutants reach dangerous concentrations and significantly affect the performance of the exercise. High levels of air pollutants can lead to a reduction in the maximum oxygen consumption, which may be due to lower oxygen transfer rates (Kargarfard et al., 2011; Lawrence, 2002). Physiologically, CO is the primary contaminant, because it changes the ability of red blood cells to carry oxygen to skeletal muscle and other tissues (Lawrence, 2002). About 80-90% CO absorbs hemoglobin (Hb) and makes carboxy hemoglobin (COHb) (Katsouganni, 2003). It seems that maximum exercise has a negative relationship with COHb concentration (Lawrence, 2002). Many air pollutants reach the bloodstream quickly and without significant change, and their harmful effects are shown on blood, bone marrow, spleen and lymph nodes (Nikolic et al., 2008). Damage to red blood cell membranes and interference with cellular metabolism result in a shortening of the life of each cell are the harmful effects of airborne contaminants (Kargarfard et al., 2011). Thus, Nikolic et al. (2008) observed a significant difference in the prevalence of anemia in children

infected with air as compared with children in a healthier environment. Their findings indicated that air pollution can have negative effects on red blood cells in children. Suitable physical activity is important in childhood as it increases the fitness of the components of physical fitness. For example, bone development stimulates the lung capacity and helps blood circulation, blood pressure and reduces cholesterol levels. Physical activity also affects self-concept, improves body image, perfectionism and self-discipline. It indirectly affects fitness, so that children are more conscious when they are physically fit and they pay more attention to assignments (Gallahue and Donnelly, 2007). Moreover, physical fitness helps children in mental and physical stress situations, and also, plays an important role in weight control. Therefore, it is important to recognize factors affecting children's readiness factors. Today, air pollution in Tehran, Iran is considered as one of the most important environmental problems of the country (Babran and Ghamkhar, 2005). Tehran is one of the capitals of different political, industrial, cultural and artistic political functions. Rapid population growth, rural migration, plant expansion, vehicle density (Mohamadi, 2002), high fossil fuel consumption, low fuel consumption in the transportation sector, Economic and social weakness, non-management and ... in transportation affect the climate (conference of air pollution and its effects on health, 2005). Lead Tehran's topography and natural factors to become one of the most polluted cities in the world. Therefore, the purpose of this study was to compare the components of physical fitness of children in relation to the role of air pollution in Tehran.

2. MATERIALS AND METHODS

The present study is a quantitative research and, considering its purpose, is a type of applied studies. Also, in the classification based on the method, the present study is a descriptive-comparative study. The statistical population of the study consisted of all 4th-grade elementary school students who were 80 boy students (10.3 ± 0.1) from Tehran, Iran, they were selected by sampling (Aali and rezazadeh, 2013). At the initial stage of the research, the arrangement and director needed to introduce the researcher to the elementary schools in District 20 (Rey city) of Tehran. After identifying the participants in the study, they were asked about the method of implementation and the benefits of participating in the project, and written consent was obtained from the students' parents. Before the study, participants were asked to complete a questionnaire. This questionnaire, the personal details of the participants, including history of the disease, history of sport and ... were asked. The participants were advised to have complete sleep at night before the tests, and to avoid activities that lead to fatigue. Regarding ethical considerations, participants were convinced that they can leave the test whenever they want, and all information would be kept confidential. Then, according to the coordinates, a certain time was set for the execution of the tests. In the research phase, the researcher referred to Tehran Quality Control System, and based on the average of pollutant indicators in the past month, two Districts of Tehran were selected, District 1 (Aghdasiyeh) as the least infectious and the 20th district (Rey) as contaminated. Then, the coordination was performed to carry out physical fitness tests. The data was collected in two days. On the first day, participants performed physical fitness tests at Negin Shahr Rey Club and on the second day at the Royal Club in Aghdasiyeh District.

2.1. Research tool

Physical fitness tests were used for data collection.

Physical fitness Tests: To measure the fitness of participants, agility tests (t- test), explosive power (long jump test), flexibility and speed test (40 yard) were used (6).

Statistical methods: In data analysis, K-S test was used to check the distribution of the data and independent t-test was used to compare the variables in the two groups. All analyzes were performed at 95% confidence level using SPSS software version 15.

3. RESULTS

The results of Kolmogorov-Smirnov test showed that the distribution of data was normal ($p>0.05$). Also, Levine test was used to investigate the homogeneity of variances. The results of this test showed that the variance of the groups is consistent ($p> 0.05$). T-test was used to compare the variables in two groups. The results showed that there was a significant difference between velocity and agility components in the two Districts 1 and 20 ($p<0.05$, Table 3), while there were no significant differences between

power and flexibility components p>0.05, table 1). Comparison of meanings indicates that children in District 1 had better performance than District 20 (Figures 1 and 2).

Table 1: T-components of physical fitness in two groups

Variable	Average and standard deviations		Freedom degree	t	p
Agility (in seconds)	District 20 group	16.1± 49.46	78	3.493	0.001
	District 1 group	14.2 ±96.1			
Speed (in seconds)	District 20 group	7.0 ±14.76	78	2.21	0.034
	District 1 group	6.0± 73.84			
Flexibility (cm)	District 20 group	12.0 ±6.86	78	-0.638	0.525
	District 1 group	12.0 ±71.89			
Explosive Power (cm)	District 20 group	113.3± 2.48	78	-1.579	0.118
	District 1 group	114.2 ±41.95			

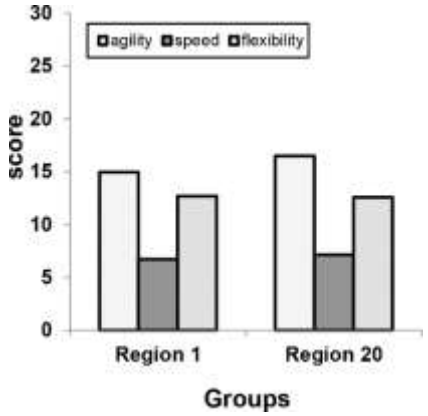

Figure 1: Comparison of components of physical fitness (agility, speed and flexibility) in District s 1 and 20

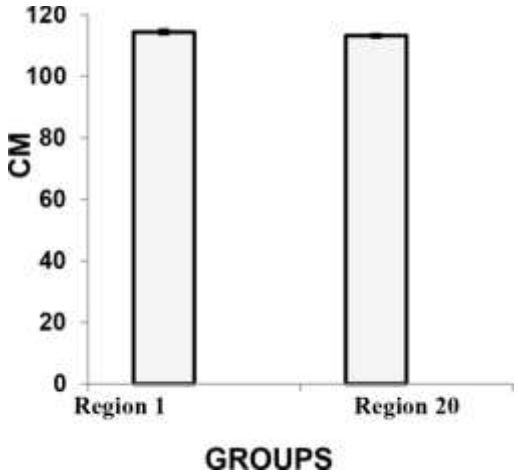

Figure 2: Comparison of the Explosive Power Component in District 1 and 20

4. CONCLUSION

The purpose of this study was to compare the components of physical fitness of children in relation to the role of air pollution in Tehran, Iran. The results showed that there was no significant difference between power and flexibility components in District s 1 and 20, while there was a significant difference between speed and agility components of two District s. It can be said that air pollution has affected the performance of physical fitness components of speed and agility. Thus, participants in District 1 performed better than District 20. It can be said that air pollution contributes to blood parameters. According to Bae et al. (2009), exposure to air pollutants increases the amount of oxidative stress in students. Koseoglu et al. (2011) in their study did not report a significant difference on the detection of the most prominent hemolysis process indices for analytes such as albumin, keratin kinase, haptoglobin and alanine. The effect of hemolysis on analyte such as bilirubin, potassium and lactate dehydrogenase was more pronounced. In the Wu et al. (2004) study on eleven international marathon runners, total bilirubin, direct bilirubin and alkaline phosphatase increased significantly after severe endurance activity. Hem was found to be due to ergot analysis by the enzyme oxygenase Hem Billy Verdin is then converted to bilirubin by the Bialur Reductase enzyme. A fraction of it is excreted in combination with bile and excess free bilirubin in the blood is increased if it is produced (Firouzi et al., 2012). The air pollution through oxidative stress can damage the cells, including the red blood cell membrane, resulting in the release of red blood cells into the plasma and ultimately the formation of bilirubin. Following this research, Peeling et al. (2009) conducted a study on ten endurance athletes. Their findings showed that after 10 km of running with intensity 75-95% of maximum oxygen consumption, hemoglobin levels were significantly higher and Haptoglobin was significantly lower than pre-exercise levels. They stated that hemolysis

increases at high intensities. Robinson et al. (2006) considered the cause of intrahepatic hemolysis in osmotic stress and lipid peroxidation membrane rats by free radicals released from active leukocytes. According to the results of the study, Vujovic et al. (2010), students (12-15 years old) who lived near petrochemical plants and exposed to high levels of pollutants, had higher levels of oxidative stress compared to those who lived in the village. It has been suggested that the anaerobic activity of the lung ventilation pattern differs from that of aerobic activity, and the inflow of air is lower in each tail and is more rapid than the lung (Edington, 2004), resulting in anaerobic activity in contaminated air, the amount of air entering the lung in each tail is lower and penetrates into the lung less than aerobic activity, and far more quickly than the lung. Therefore, in the present study, the components of velocity and agility are of an anaerobic type, so the difference in the performance difference between two District s can be attributed to it. On the other hand, it can be said that industrial and chemical contaminants produce free radicals. Free radicals enter the body through the lungs, skin, mucous membranes such as the eyes of the eye, the ears, nose and the digestive tract. In other words, the accumulation of free radicals in the body when contaminated by air increases due to the free radicals which are unstable oxides, look for a place to react with a cell and oxidizes, in other words free radicals are free oxygen that binds to tissues and cells of the body, causing them to be destroyed or destroyed or their nature changed. Thus, with the accumulation of free radicals in the air due to air pollution, a destructive and inflammatory process occurs, causing destruction of the cells, damage the DNA, and subsequent to it, the occurrence of various chronic diseases such as bronchitis, tumors and cancerous masses, and increase some other diseases. So, contaminated particles in the air enter the body in various ways and then enter the bloodstream, and since blood is in contact with the whole body, this contaminated blood contributes to the body's cells and causes chronic diseases. Contaminated blood when enters the brain causes a headache, when it enters the nervous system, it reduces people's tolerance, early fatigue and aggression, and moreover, darkness, wrinkles, hair loss, bloating, bloating, and other chronic diseases are the other signs of air pollution (Bae et al., 2009). Crystals, carbon monoxide, deoxygenated nitrogen, ozone, organic pollutants, other unusual particles, such as asbestos, are much smaller than grains and multi-micron in diameter, which easily travel through the lungs and even pass through and stick to the blood cells with great adhesion. Prolonged in the small vessels, it causes inflammation of the vessels (similar to atherosclerosis), cerebrospinal fluid, decreased blood circulation to the eyes and burning eyes (in the long run cause cataracts), frequent coughing, dyspnea, decreased function of the heart, lungs and so on. With air pollution, the lungs of all residents in the city are experiencing a problem because each person within 24 hours receives 7 thousand liters of contaminants in his lungs, so now and in the current climate of Tehran's air pollution, all the lungs of the inhabitants of the province are affected. You might find ways out of infected environments. But it cannot be completely protected from its dangers, and the foul weather will have its effect on people. Having a strong immune system can reduce your body's vulnerability and air pollution risks. Air pollution also affects the cardiovascular system, like other internal devices, on short and long term destructive effects. Air pollution and fine particles of less than 2.5 microns can disturb the heart rate, disturb the heart rate and disturb the heart rate. Other human organs also enter the lungs through the respiratory system and directly transmit the particles and contaminate the bloodstream, which is very harmful to health. The respiratory system is one of the various organs of the body that is directly related to airborne particles, and this member of the body is the first center of contact with airborne contaminants. Air pollution can exacerbate respiratory diseases in affected people or cause some respiratory diseases in healthy people. To be at the time of air pollution, the pollen structure of the airborne plants that are not allergenic under normal conditions may change and become allergic; in these conditions, people who have not had allergies may also be allergic to altering the pollen structure. Based on results in the Iranian Asthma and Allergy Association, 35% of children in Tehran metropolis have symptoms of asthma. Due to the fact that the inhabitants of the city spend their daily life in indoor environments and, on the other hand, the concentration of air pollution in indoor environments is higher in air pollution than open air due to lack of air and ventilation, the symptoms of respiratory problems are constantly increasing. According to

the latest studies on the world's leading asthma disease in 2008, about 10 to 15 percent of 10-15-year-old Iranian children have symptoms of asthma, and at a lower age, about 13 percent have the symptoms. The World's Symposium Indicates that allergic asthma is increasing day by day around the world, especially in developed and developing countries; according to these statistics, the number of people with allergies in Iran is moderate compared to other countries (Firouzi et al., 2012). According to the results, it is suggested that, when the amount of air pollution is high, children should be prevented from participating in physical activities and physical education teachers have to consider activities that require less energy.

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