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Original Research Paper

Comparison of White Corpuscles' Components between Two Levels of Body Fitness of Athletes and Non-athletes' (VO_2MAX) among Boys' High School Students

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This study aimed at comparing white corpuscles' components between two levels of body fitness (vo2max) of athletes and non-athletes among boys' high school students in Izeh, Iran. This research was an action research with a quasi-experimental study. It was done through training protocol. The research population included the boys' high school students in Izeh. They passed training courses and finally 30 students were selected as the research sample. The blood test of CBC in the pre and post-test was collected and the test showed all Leukocytes, Neutrophil, Lymphocyte, Monocytes, Basophiles, and Eosinophils. Data were analyzed through descriptive by means of inferential statistics of Independent Samples t-test using SPSS version 18 and Excel software. Results showed that the amount of leukocytes, neutrophil and lymphocyte blood components were different among athletes and non-athletes among boys' high school students. However, the number of Monocytus, Basophiles, Eosinophils were not different among athletes and non-athletes ($p<0.05$).

Keywords: Leukocytes, Neutrophil, Lymphocyte, Monocytes, Basophiles, Eosinophils, Athletes, Non-athletes.

INTRODUCTION

The body of human being is complex and filled with mystery and secrets that is amazing. In spite of the efforts of scientific progress, experts are still discovering many of the wonders of the human body which remained unknown (Galun, Burstein, & Assia, 1987). The thoughtful man has always sought ways to have a better life and in line with the thinking on the various sciences related to the early embryos of human beings. Thus the scientific method was formed to examine these wonders and the world is increasingly witnessing the birth of new sciences (Shek, Sabiston, Buguet & Radomski, 1995). One of the valuable sciences is sports and physical education that benefits the individuals in physical, psychological, and cultural aspects of social life which is clear and obvious. Therefore, various countries in the world make much scientific macro-investment efforts to realize the objectives of the special physical training (Ndon, Snyder, Foster & Wehrenberg, 1992). In our country, we have also tried to promote scientific research and development along with the growth of research and a strong support to create scientific and experimental perspectives and views on the new alternative sports replaced by traditional ones (Nieman, Simandle, Henson, Waren, Suttles, Davis, Buckley, Ahle, Butterworth, Fagoaga & Nehlsen-Cannarella, 1995).

The human body as one of the wonders of creation has different systems, such as neuromuscular respiratory, circulatory, etc (Mackinnon, Ginn & Symour, 1993). Although neuromuscular section generates the human body movement, it facilitates the other organs and systems to move that plays a very important role in this respect. It also helps the human being to be able to communicate with other persons and makes adjustment against the incoming pressure of physical activities (Scharhag, Meyer, Gabriel, Schlick, Faude, & Kindermann, 2005).

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White blood corpuscles are cellular elements which are the vital components of the blood circulation and play a defensive role in the body's immune system and defend the body against the influx of microbes, viruses and other pathogens to protect human beings' physical activities and fitness (Shuja al-Din, 2004). Therefore, these components are effective in protecting different systems; moreover, most of the above items can be a positive and valuable. The changes in the amount of each may change the number and distribution of the components of the white blood corpuscles (Lewicki, Tchorzewski, Denys, Kowalska & Golinska, 1987). The body's immune system could be affected by these factors influencing the physical activities and influence the athletes and non-athletes' activities. In recent years, the attention of the researchers has focused on these issues.

The literature (e.g., Pazouki, 2004; Hosseini, 2006) shows that the researchers have tried to elevate body's immune system through training variables such as exercise intensity, duration and time, as well as recycling the body's immune function. In fact, the body reacts to all these microbes or their products in the environment by the body immune system. These microbes may be in foods, chemical drugs, the pollen of plants or animals' skins and hair. Complete network or a combination of immune system cells, tissue, members, mechanical and secretion of molecules create an immunized system against infectious agents from entering or penetrating into the blood. White corpuscles prevent and remove infectious agents entered into the body and prevent systemic disease. Research on the effect of different fields of the immunized system has shown that the majority of them has reached the conclusion that researchers (e.g., Shinkai, Shore, Shek & Shephard, 1994) believe that lack of capability of the white corpuscles system and endurance exercises rather than other non-endurance exercises will cause loss of human body's immunized function (Hack, Strobel, Weiss & Weicker, 1994). Subsequently, these findings have led the athletes involved in endurance disciplines have been advised to avoid the complications of these microbes and use various supplements such as glutamine and carbohydrate during the training program (Fry, Morton, Garcia-Webb, Crawford & Keast, 1992). They are also advised to be more of careful after their activities. Important and constant changes during exercise can also be seen during leukocytosis that increases the number of white blood cells in the circulation (Maccarthy & Dale, 1998). The number of white blood cells in the circulation may be increased up to 4 times before the relaxation time.

This will remain at the high level after the exercises have been finished. Generally, it seems that the amount of Leukocytes is a negative relationship with the amount of exercise and the readiness of the individual (Mujika, & Geeyssant, 1996). Moreover, the amount of Leukocytes may be affected under the reactions adjusted by the human body. One of these reactions is the release of corticosteroids, which show the role of these hormones in the distribution of white corpuscles. The increase of white corpuscles may happen when training is begun and the number of Neutrophils is less than that of the Lymphocytes (Keen, Mccarthy, Passfield, Shaker & Wade, 1995). However, the number of Monocytes may be increased. About 7000 white corpuscles or Leukocytes can be found in the immunized system of the human body in each squared millimeter of the blood. The number of Leukocytes is 1.700 of the Erythrocytes (i.e., white corpuscles). The life duration of the white corpuscles except Monocytes may be from several hours to several weeks.

It seems that the early increase in the white corpuscles, Lymphocytes and Neutrophils is due to the rapid increase of Epinephrine and Growth hormone. Moreover, the late release of Cortisol during exercising and after that the number of Neutrophils gradually increases and the number of Lymphocytes decreases. This model has been confirmed by recent researches which noted it as the normal range of the current Neutrophils. Researchers (e.g., Nieman, Berk, Simpson-Westerberg, Arabatzis, Youngberg, Tan, Lee & Eby, 1989) have shown that the capacity of Neutrophils among athletes decrease compared with non-athletes (Blannin, Chatwin, Cave & Gleeson, 1996).

In recent years, with respect to the researches (e.g., Baum, Liesen & Enneper, 1994), the lack of physical activity is an important risk factor for susceptibility to the diseases like heart disease, obesity, hypertension, diabetes, and osteoporosis. These diseases are the main causes of death and regular exercises could be a good strategy in the control of these diseases. The science of immunology in relation to behavioral sciences, physiology, and medicine has spread quickly and has helped social health and the prevention of the diseases (Soppi, Varjo, Eskola & Laitinen, 1982). Thus, the knowledge of body immunization and the qualitative and quantitative changes in exercises could be necessary to respond to the argument that prevention is better than cure (Castel, Newshole & Poortmants, 1996). Therefore, in this study, the components of white corpuscles including Lymphocytes, Monocytes, Neutrophils studied between two levels of body fitness high and low groups (Vo2max) of athletes and non-athletes.

METHOD

Design

This study is a quasi-experimental research that followed pre-test and post-test approach in which two groups of athletes and non-athletes were randomly selected.

Participants

The research population included 6775 senior boys' high school students in Izeh, Iran. The sample population comprised 30 senior boys' high school students who were divided into two experimental (athletes) and control (non-athletes) groups.

Research Variables

The research variables in the present study included:
(1) The independent variable of the session of exercising,
(2) The dependent variables of the blood immunization components, including Leukocytes, Neutrophil, Lymphocyte, Monocytus, Basophiles, and Eosinophils.

Instrumentation

The various research instruments were used in the present study included the followings:

a) The researcher-made questionnaire that gathered the participants' data on their health history and athletic background.
b) The use of Treadmill model T-700 made in Taiwan that was used to measure the oxygen used by the participants.
c) Using chronometer to measure the field tests.

d) Using the participants' blood sampling for the white corpuscles' components analysis (i.e., each sample included 3 CC).
e) Using test laboratory to measure the participants' blood samples (i.e., lam, syringes, tubes, etc.).
f) The laboratory scale to measure weighting (i.e., brand name was Hedeyeh and made in Iran).
g) Height gauge for measuring the height of participants in an upright position (i.e., Height gauge is made in Iran).

Methods of Measurement and Procedure of the Research

In this research, the data were collected through the public call for about 1,000 senior boys' high school students who were athletes and non-athletes. Then 300 people were selected through the Cooper Smith test in the third stage, the level of physical fitness of the athletes and non-athletes were specified through using the maximum capacity of the test (with a treadmill) and the oxygen consumption (VO_2max) was measured in the two groups. Therefore, the students who have their maximum oxygen consumption (VO_2 Max) below 30 were considered as weak, labelled as non-athletes. The participants with VO_2max were between 40 and 50 as strong participants were recognized as athletes. At this point, the random selection was done by students' level of VO_2max. In the fourth stage, a general description of the participants and the purpose of doing research were explained to the participants and the implementation of the study was modified. The final list of the selected students was completed along with a written consent to participate in this research.

Thus, the statistical sampling was done and the athletes and non-athletes compromised of two groups. After a 20 hours rest and a lack of sports activities under the supervision of the researcher, each participant with the observance of the health and safety issues, with the cooperation of laboratory technicians of 3 cc of their blood were taken from the participants' vein in the resting position and put the samples in the test blood tube. Then the samples are labelled for specific tests for the participants of each group and send for analysis to a modern laboratory. The results of the participants\ blood test were reported in a list named CBC list that was given to the researcher.

In doing the exercising, the participants were attending the city's Takhti gym and the groups of athletes practiced for a week Protocol to carry out athletic activities for ten minutes. The warm up and heating programs of stretching, movement was lasted about 45 minutes, and the athletes practiced the fitness tasks such as strength, speed, stamina, etc. They also did the compound exercises about 5 minutes to cool down the body and perform recovery of active rest. Finally, after 48 hours, the athletes attended the gym to cycle for 5 minutes. Then immediately their blood samples were taken to measure the blood test components and were handed the researchers again. The non-athlete group's (i.e., the control group) blood test was done twice with the interval of two hours between each and reported in a two lists with specific times of the blood tests.

DATA ANALYSIS

The CBC forms of both groups were analyzed as data of both experiments, control groups, and were put into descriptive analysis to measure the means, SD, variances, the maximum, and minimum of the blood test parameters. The inferential statistics of Independent Samples t-test through SPSS version 18 and EXCELL was also used to estimate the analysis of Leukocytes, Neutrophil, Lymphocyte, Monocytus, Basophiles, Eosinophils. The significant difference between the groups' means was estimated through the level of significance ($p<0.05$). The results are shown in Table 1 to 3.

Table 1: Participant of the Study

Research Population	Research Sample	Athletes	Non-athletes
6775	30	15	15

Table 2: Descriptive Statistics

Groups	N	Age Average	Height Average	Weight Average	VO_2MAX
Athletes	15	16.83	169.13	61.87	41.06
Non-athletes	15	16.82	166.47	60.13	24.29

Table 3: Exercising Protocol

Stages of Exercising	Time (minutes)	Kind of Exercising
Warm up	10	Stretching, body movement
Exercising	45	Various body activities including speed, endurance, stamina, power, etc.
Recovery	5	Rest in active position
Time	60 mins, three days a week	

In Table 4, the white corpuscles of athletes and non-athletes were illustrated, the amount of Leukocytes, Neutrophil, Lymphocyte, Monocytus, Basophiles, Eosinophils in each group. The significant differences between the pre and post-tests were shown with an asterisk (*). Results are presented in Table 4.

Table 4: Athletes and Non-athletes' Blood Components

Variables	Groups	Pre-test	Post-test	Sig. (2-tailed)	
Leukocytes	Athletes	4666.67	8926.667	0.00005	*
	Non-athletes	7146.667	7300.000	0.001	*
Neutrophil	Athletes	3976.333	4621.2	0.00005	*
	Non-athletes	3931.067	4007.2	0.055	---
Basophiles	Athletes	0.0000	0.0000	---	---
	Non-athletes	0.0000	0.0000	---	---
Eosinophils	Athletes	87.7333	94.9333	0.039	*
	Non-athletes	164.8	136.333	0.309	---
Monocyte	Athletes	7.06666	7.06666	1.000	---
	Non-athletes	19.7333	21.2666	0.123	---
Lymphocyte	Athletes	2395.533	4203.467	0.00005	*
	Non-athletes	3058.4	3135.2	0.00005	*

*****Significance at ($p<0.05$)

Table 4 shows that the blood components' means of Leukocytes and Lymphocyte in both athletes and non-athletes

are significantly different. There is a significant difference between the pre and post-tests among the athletes regarding Neutrophil and Basophiles but there is not a significant difference among non-athletes concerned with Neutrophil and Basophiles.

DISCUSSION AND CONCLUSION

The findings of the study showed that the number of Leukocytes among the athletes and non-athletes are significantly different in the pre and post-tests. The means of the two groups were not equal; therefore, it is concluded that the body exercises affect both groups with high and low vo_2max but the exercises affect the athletes more than non-athletes. The amount of Eosinophils among the athletes and non-athletes were similar in the pre-test, but they were different significantly in the post-test. It could be concluded that the exercises did not affect the amount of Eosinophils on both the participants with high and low vo_2max (Hansen, Wilsgardn & Osterud, 1991). Thus the exercises cannot increase the number of Eosinophils among the athletes (Long, 2009).

The amount of Neutrophil in both athletes and non-athletes were significantly different. Thus the means of these two groups were not equal. It can be concluded that the exercises can affect the number of Neutrophil on the participants with high vo_2max rather than the low vo2max. This effect was seen more among athletes rather than non-athletes (Nieman, Berk, Simpson-Westerberg, Arabatzis, Youngberg, Tan, Lee & Eby, 1989). Basophiles were not affected in both pre and post-tests. In other words, the significance between the two tests was not important. Both athletes and non-athletes were not affected by the changes in the number of Basophiles since the blood tests of the participants in experimental and control groups were equal in both pre and post-tests. The number of Lymphocyte in both athletes and non-athletes were significantly different. However, the difference was higher among the participants with high vo_2max than the group with low vo_2max (Safikhani & Kheirandish, 2006).

The amount of Monocytus in the pre and post-tests showed that there was not a significant difference between the two groups of athletes and non-athletes with high or low vo2max. In other words, exercising and the athletic history of participants cannot affect the increase of Monocytus. The post-test showed that the number of Leukocytes, Neutrophil and Lymphocyte are different between the two groups of athletes and non-athletes. Moreover, the number of Eosinophils, Basophiles, and Monocytus are not different between the two groups of athletes and non-athletes in both pre and post-tests.
In a summary the research hypotheses and the answered provided by the researcher. The probable reasons and the studies which are in line or apposite to the results of the present study are presented in Table 5.

Table 5: Summary the Research Hypotheses

Hypothesis 1	The amount of the participants' Leukocytes with high vo_2max are different to the participants with low vo_2max
Studies support the findings of this study	Hosseini (2006), Gabreil, Schmitt & Kindermann (1991)
Studies do not support the findings of this study	Arazi (2008), Salami (2002), Green, Kaplan, Rabin, Sanitski, & Zdziarski (1981), Lehman, Mann, Gastmann, Keul, Vetter, Steinacker & Haussinger (1996), Motallebi (2007)
Reasons	This decrease in the white corpuscles may be due to the halt of cells and their movement towards the injured cells for treatment. Thus, the decrease may be seen in the post-test. Moreover, the everlasting exercises may be accompanied with the decrease in the number of the white corpuscles.
Hypothesis 2, 4 and 6	The amount of the participants' Eosinophils, Basophiles, and Monocytus with high vo2max are different to the participants with low vo_2max
Studies support the findings of this study	Hosseini (2001, 2006), Blannin, Chatwin, Cave & Gleeson (1996), Shuja al-Din (2004), Shinkai et al (1994)
Studies do not support the findings of this study	Arazi (2008), Pizza, Mitchell, Davis, Starling, Holtz & Bigelow (1995), Faramarzi (2005), Gabriel, Schwarz, Born & Kindermann (1992), Neimann (1997), Nickbin (2002)
Reasons	There are not significant differences between the two groups of athletes and non-athletes in both pre and post-tests.
Hypothesis 3 and 5	The amount of the participants' Neutrophil and Lymphocyte with high vo2max are different to the participants with low vo_2max
Studies support the findings of this study	Pizza, Mitchell, Davis, Starling, Holtz & Bigelow (1995), Arazi (2008), Hosseini (2006), Blannin, Chatwin, Cave & Gleeson (1996), Hansen, Wilsgard, & Osterud (1991), Nieman (1997, 1998)
Reasons	The use of hormones could increase the amount of the participants' Neutrophil and Lymphocyte, especially in the exercising of cycling and field sports.
Studies do not support the findings of this study	Green, Kaplan, Rabin, Sanitski & Zdziarski (1981), Motallebi (2007)
Reasons	The decrease in the number of Lymphocyte may be due to the destruction of Neutrophil which is needed to response the microbes.

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