Effect of High Intensity Training on Changes Leukocytes Subsets in Men Football Player

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ABSTRACT: We know that Type, intensity and duration of exercise, determining the effect of exercise on the immune system. This study is aimed to investigate the of high intensity training on Changes of Total Leukocytes and Leukocytes subsets counts in men football player. 11 male college football player of Jahrom University who had at least six months football training, participated in this quazi-experimental study. The means±SD age, height, weight and BMI of subjects were as follow: (21.90 ±0.87 yr, 170 ± 0.04 cm, 64.42 ± 6.44kg and 22.05 ± 1.68 kg / m² ). In this study, subjects, runs for 30 min at 80 % [high-intensity training] maximal Heart rate. Blood was drawn immediately before and after exercise. The data were analyzed using SPSS21 with dependent t-student test and statically significance was set at P ≤ 0.05. The result showed that Total Leukocytes, Lymphocytes and Neutrophils counts increased and Monocytes and Eosinophil counts decreased after high intensity training. These data demonstrate that a session high intensity training leads to Levels changes of leukocytes and subsets, but these changes not significant.

Key Words: football, leukocyte, Lymphocytes, Monocytes, Neutrophils, high intensity training

INTRODUCTION

Physiological functioning of the immune system's defense against pathogenic microbes. However, even non-pathogenic foreign agents could be causing immune responses. The human immune system is a defence system that divided into two parts; Innate and acquired immunity (Rosa et al., 2011).

Research has shown that physical activity has different effects on different body systems. In most cases, exercise is a positive and constructive role in the functioning of these systems, but it is different from the human immune system (Büttner et al., 2007; Wolin et al., 2009). It is known that the human immune system as well as other physiological systems, significantly changes in response to exercise (Koch, 2010). Many factors affect the immune system one of them is exercise, so that a considerable amount of research has been devoted to investigate the effects of exercise on the immune system. In this research, the effects of different types of exercise intensity and duration on the different parameters of the immune system have been studied. It is known that physical activity (Type, duration and intensity) influences on the immune system (restes et al., 2007; Bonyadi et al., 2010; Senchina et al., 2007).

It is estimated from the results of studies that Type, intensity and duration of exercise have different effects on the immune system parameters of people with different physical condition leaves. For example, regular moderate exercise, with improve the immune system function, increased the body's resistance against infections (Nieman, 2000). However, intense exercise, significantly reduce the body's resistance to such infections (Mackinnon, 1992; Nieman et al., 2003) And also, peak and colleagues (2004) and Moran and colleagues (2002) examined the effect of exercise intensity on the immune system (peak et al., 2004; Moran et al., 2002).

Therefore, the effect of exercise on the immune system must be examined separately. Rigorous study of the effects of exercise on the immune system due to the complexity and extent is very complex and difficult. However, surveying the immune system parameter and study the effect of physical activity on the immune system could answer some of the questions in the immune response to exercise. Accordingly, in the present study we examined the Effect of High Intensity Training on Changes Leukocytes Subsets in Men Football Player.
METHODS

Subjects
11 well-trained male college football player between 20 and 22 years participated in this study, which had at least six months football training. All participants were informed about the purpose and risks of the study before written, informed consent was obtained.

Subjects’ history of heart disease - cardiovascular, hypertension, diabetes, smoking or using drugs not specified. During the study, subjects were asked not to participate in any activities other than training. Demographic data of all subjects summarizes in Table 1.

<table>
<thead>
<tr>
<th>Age (yr)</th>
<th>Height (cm)</th>
<th>Weight (kg)</th>
<th>BMI (kg/m²)</th>
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<tr>
<td>21.90 ± 0.87</td>
<td>170 ± 0.04</td>
<td>64.42 ± 6.44</td>
<td>22.05 ± 1.68</td>
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Values are Means ± SE; n = 12 subjects; BMI = body mass index

Maximal Heart Rate testing
The Karvonen Formula is a method that uses your age and fitness level to determine your target heart rate training zones. Developed by Dr. M Karvonen, the Karvonen Formula offers a more personalized number than the standard equation and is considered the most accurate means of determining heart rate.

HR target = % Intensity (HR max – HR rest) + HR rest

The resting heart rate is calculated by measuring your heart rate before getting out of bed in the morning, each day, for 3 days. Add the 3 resting heart rates together and divide that sum by 3 so that you have your average resting heart rate. (As fitness improves the resting heart rate usually goes down.) The maximum heart rate can be determined by subtracting your age from 220.

Exercise protocols
Once Maximal Heart Rate was determined, the athletes completed 60-min exercise trials at 80% (high-intensity exercise) maximal Heart rate (Table 2).

<table>
<thead>
<tr>
<th>Intensity</th>
<th>Time</th>
<th>Load</th>
<th>Type of exercise</th>
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<tr>
<td>Moderate-intensity exercise</td>
<td>30 min</td>
<td>80% Maximal Heart Rate</td>
<td>Running outdoors</td>
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During training, maximal Heart rate was measured, as described above, was measured every 5 min throughout trials to ensure that each athlete was exercising at the correct relative intensity. Trial was conducted between 7:00 AM and 9:00 AM.

Blood sampling
A 6-ml blood sample was drawn from a forearm vein by venipuncture immediately pre- (Pre) and post-exercise (Post) of training.

Statistical analysis
Statistical significance was set at P < 0.05. Data are expressed as means ± SD. The changes from pre-exercise to post-exercise were compared using Student’s paired t-tests. Statistical analysis was performed using SPSS version 21.0 for Windows.

RESULTS
In order to observe the changes of immune system parameter after high intensity exercise, total leukocyte, Lymphocytes, Monocytes, Neutrophils, Eosinophil and Basophil were analyzed from the blood collected at before and after high intensity exercise.

We show changes in pre-exercise and immediately after exercise (high intensity) values of Total leukocyte, Lymphocytes, Monocytes, Neutrophils, Eosinophil and Basophil counts in Table 3.
Table 3. Changes in Total leukocyte and subsets count immediately before and after 30 min of running at 80% maximal Heart rate (MHR)

Total leukocyte, Neutrophil and Lymphocytes counts
Total leukocyte count was higher than pre-exercise values immediately after high-intensity exercise (p = 0.140) (Fig. 1). Neutrophil count was higher than pre-exercise values immediately after high-intensity exercise (p = 0.074) (Fig. 1). And also, Lymphocytes count was increased immediately after high-intensity exercise (p = 0.521) (Fig. 1).

Monocyte and Eosinophil counts
Monocyte count was decreased immediately after high intensity exercise (p = 0.324). In addition to, Eosinophil count decreased after high intensity exercise (p = 0.587).
In this study we observed the changes in the immune system parameters in relationship with Intensity of exercise. 11 male college football player completed the exercise programs with blood samplings at 2 different checkpoints of pre and after high intensity exercise. In connection with the effect of physical activity on Total Leukocyte and Leukocytes subsets, the results of this study showed no significant effect on the Total Leukocyte and Leukocytes subsets by high intensity training.

The studies that have been conducted to determine the effect of exercise training on the immune system have shown that exercise has contradictory effects on the immune system; based on some studies, moderate-intensity exercise can improve the immune system (Lowder et al., 2006). While intense and exhaustive exercise, has a negative impact on many aspects of immune function (Kapasi et al., 2005). The findings of this study showed that high intensity training has been Monocytes and Eosinophil reduced, and also Total Leukocytes, Lymphocytes and Neutrophils counts increased but this change was not statistically significant (Table 3).

Present results are consistent with the results of the other study by nameni and colleagues (2011), Penkman and colleagues (2008), Peake and colleagues (2008), Radom-Aizik and colleagues (2008), Büttner and colleagues (2007).

For example, zar et al. (2010) reported that moderate endurance training increased the circulation neutrophils level, and also demonstrated that increase concentration on neutrophils was significant. In this study, subjects (men college judoists), 60 min at 60% maximal Heart rate running on treadmill. Blood samples were drawn pre-exercise and immediately post-exercise (zar et al., 2010). Penkman et al (2008) in their study showed that the 200-meter canoe race increases the concentration of leukocytes, lymphocytes and monocytes in the 7 women (Penkman et al., 2008). Peake and colleagues (2008) in their study showed that 90 minutes of cycling in cold weather can increases leukocyte levels compared to pre-exercise exercise (Peake et al., 2008). Radom-Aizik et al (2008) showed that non-aerobic activity for 30 minutes on a bicycle ergometer with 80% vo2peak, significantly increased leukocyte levels in 12 men with an age range is 19 to 29 years (Radom-Aizik et al., 2008).

Although all of the studies are of the opinion that sport and physical activity can increase leucocytosis, but the intensity, duration, type of training, fitness level subjects, the protocol used, gender, time of sampling in research projects are different.

Mechanisms by which exercise can cause changes in the immune system is multifactorial and includes factors neuroendocrine such as adrenaline (epinephrine), noradrenaline (norepinephrine), growth hormone and cortisol. Concentrations of these hormones are increased during exercise and after exercise in a short period returned to normal. But it seems that in the early recovery period (recovery) have effects on neutrophils and lymphocytes. Adrenaline and noradrenaline mediate the effects of exercise on lymphocytes and, while the increase in growth hormone and catecholamine are mediated effect on the neutrophil (Pedersen and Toft, 2000).

Circulating stress/inflammatory cells concentration (e.g. monocytes, neutrophils and lymphocytes subset: T, B, and natural killer (NK) cells) elevated by acute intense training. And also these cells increased during physical activity by increase in recruitment of leucocytes to the peripheral circulation (Helle et al., 2000).

In summary, we found that, levels of leukocytes (lymphocyte, monocytes, and Neutrophils), changed in response to high intensity training. Postexercise levels of Leukocytes, Lymphocytes and Neutrophils increased in compare to base line level and Monocytes and Eosinophil counts decreased after high intensity training. In conclusion, our data suggest that high intensity training cause a increase in Total Leukocyte. Therefore, we think that exercise training have improving effects on immune function in football player men.

REFERENCES


