The Effect of Land Walking on White Blood Cell and its Sub-Fractions in Young Women

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Abstract: Movements have a beneficial effect on immune system; however the anti-inflammatory role of aerobic training on immune system in sedentary young individual those who have inactive lifestyles is poorly investigated. Thus, the current study sought to examine the impact of aerobic exercise training in the form of walking seclude on immune functions in part WBC and sub - types as preventive interventions among inactive young women with different body compositions. The participant were 18 (Exe [O] =9 & Con [O] =9) obese and 20 slim (Exe [S] =10 & Con [S] =10) BMI-matched women (21.5 ± 1.6 yr). Prior to study all subjects underwent somatic (age and height, weight and BMI) assessments and blood sampling (WBCs, neutrophil, lymphocyte, eosinophil and monocyte and RBC) tests and all measurements (except age and height) were repeated at post exercise intervention. After 8 weeks in experimental groups WBCs [(Exe [O]: 5977.77 ± 552.9 & 6422.2 ± 754.7 Cumm vs Con [O]: 6288.88 ± 449.5 & 6466.66 ± 463.7 Cumm) and (Exe [S]:5530.23±203.6 & 5960.55±543.4 vs Con[S]:5680.45±698.1 vs 6040.76± 123.8)] did not show any significant change compared with control groups, P = 0.354 and WBC sub-fractions (neutrophil, lymphocyte, eosinophil and monocyte) did not alter either P > 0.05. RBC [(Exe [O]:4.35±21& 4.98±88 vs Con [O]: 4.76±84 & 4.91±19 and (Exe [S]: 4.34±12 & 4.41±20 vs Con[S]:4.46±25 & 4.50±08)] also remained unchanged P>0.05 over two months study period. The obese experimental group (Exe [O]) however significantly (p<0.001) reduced their body mass by 2% and BMI by 3%. Consequently, the consensus of this study demonstrate walking seems to be a safe exercise to optimize health through huge potential savings to immunize bodily system from many disease over time.

Key words: Walking • Immune System • Diseases

INTRODUCTION

White blood cells (WBCs) which also termed leukocytes are the cells of the immune system that produces from bone marrow that circulate into the bloodstream [1, 2]. Diverse types of white blood cells exist including basophile, lymphocyte, neutrophil and monocyte which defeat infections invade the body [3, 4]. In fact, the white blood cells account for clinical marker of inflammation and elevated WBC and its sub - fractions count are considered directly to be related with all cases of cardiovascular diseases, cancers and ultimately early death [5, 6].

Movements have a beneficial effect on immune system [7, 8]. Researches indicate that exercise supports immune function through anti-inflammatory action [9, 10]. Ortega et al. (2005) stated that moderate exercise in sedentary young individuals stimulates the phagocytic capacity of neutrophils which can last for at least 24 hours [11]. Shimizu et al. [12] in another study demonstrated that exercise training may boost monocyte - mediated immunity in elderly individuals. Regular physical activity is correlated with white blood cells sub - fraction' concentration [13]. Sedentary individual are prone to develop a decrease in their immune system function while doing exercise for a little amount each day may be helpful to protect WBC subgroups' compartment [14] (Petersen and Pedersen, 2005). Among different of sport' activities, aerobic exercise is well - known in health promotions [15,16]; however the anti-inflammatory role of aerobic training on immune system in sedentary young individual those who have inactive lifestyles is poorly investigated. Thus, the current study sought to examine the impact of aerobic exercise training in the form of
walking seclude on immune functions in part WBC and sub − types as preventive interventions among inactive young women with different body compositions.

MATERIALS AND METHODS

Initially, 40 untrained obese (n=20 [O] BMI = 30) and slim (n=20 [S] BMI = 20) young women (21.5 ± 1.6 yr) volunteered to participate in this study and then they were randomly assigned into two experimental and two control groups, each consisting of 10 obese (Exe [O]=10 & Con[O]=10 ) and 10 slim(Exe [S]=10 & Con[S]=10) BMI-matched subjects. Prior to study volunteers underwent medical examination and were found clinically healthy. They were free from any muscle or skeletal injury, cardiovascular disease, were non-smoker and had not been engaged in any specific sport activities for at least two years. All subjects submitted their written consents to participate prior to the study which was approved by the local Committee of Ethics.

Anthropometric Measurements: The body weight at kilogram (kg) in light clothing, without shoes was measured using an electronic weighing scale (Seca model 707, Digital Scales Ltd. Japan) and the height in centimetre (cm) was assessed with a local - constructed wooden stadiometer (Seca, Stadiometer Scales Ltd. Iran). Body mass index (BMI) was computed as (weight / height^2, kg/m^2). All somatic assessments occurred in environment controlled exercise physiology laboratories at the University of Guilan by the same equipment at the baseline (pre) and after 8-weeks (post) of the study screening.

Blood Sampling: 10 ml of venous blood sample was taken from appropriate arm (right or left) in sitting position between 8 to 11 am after an overnight fast. Selected hematology samples after that was centrifuged at 1500 rpm for 30 min at 4°C within 2 h and serum samples were stored frozen at -20°C until assayed. The white blood cells (WBCs) and red blood cell (RBC) was analyzed using fully automated hematology analyzer Sysmex KX-21N (Sysmex, Corporation, KX-21N, Japan) and each WBC sub-fraction (neutrophil, lymphocyte, eosinophil and monocyte) was quantified as total percentages of 100% of WBC count. The same technician in clinical chemistry laboratory performed all blood measurements at both pre- and post - testing.

Exercise Intervention: Experimental groups involved at 8 weeks training at 60 % HRmax at intensity equal with 40% VO_{max} consisting of 30-minute supervised indoor walking exercise 3 days per week at a normal controlled environment condition with temperature degree 21°C and relative humidity (RH) 20%. During the exercise session heart rate was monitored by a digital heart monitor (PE 4000, Polar Electro Oy and Finland, 2004) and exercise was performed with music to stimulate the subjects to walk in their optimal predicted maximum heart rate (as 220 - age). All control (Con) participants were asked to carry on their sedentary lifestyle throughout the research period and this was checked by constant communication via telephone or weekly visit.

Statistical Data Analysis: The data were analyzed using Statistical Package for the Social Sciences (SPSS) (version 18; SPSS Inc. Chicago, IL USA). Mean and standard division (X ± SD) were used as descriptive statistics. Unpaired t -test was used to quantify the Pre-Post changes studied variables, where the level of P < 0.05 binge considered significant.

RESULTS

In the beginning 4 people (Exe [O] =1, Con [O] =1 and Exe [S] =2) of total 40 subjects had a WBC below 4500 Cumm that was less than the normal number of WBCs (4.500-10.000 per Cumm) in the bloodstream. Flowing this, 95% of subjects completed the study because 2 obese people one from control (n=1) and another from experimental (n=1) group did not take part at the post - measurement tests and 38 people in total 18 subjects from obese (control, n=9 & experimental, n=9) and 20 subjects from slim group (control, n=10 & experimental, n=10) were the population of this research entirely. The subjects were not significantly in mean age (Exe [O] =22.2 ± 1.9 vs Con[O] =22.6 ± 1.5 & Exe [S] =21.1± 1.7 vs Con[S]= 21.9± 1.2 year) and height (Exe [O]=157.7 ± 5.1 vs Con[O]=159.1 ± 1.5 and Exe [S]= 159.9± 7.5 vs Con[S]= 162.7± 6.6 cm) p > 0.05, yet they were substantially different in body mass index (BMI, Exe [O] =30.2±1.8 vs Con[O]=30.9± 3.3 and Exe [S] = 17.8± 1.2 vs Con[S]=17.5± 1.1) p < 0.05 (Table 1). After 8 weeks in experimental groups WBCs [Exe [O]: 5977.77 ± 552.9 & 6422.2 ± 754.7 Cumm vs Con [O]: 6288.88 ± 449.5 & 6466.66 ± 463.7 Cumm] and (Exe[S]:5530.23±203.6 & 5960.55±543.4 vs Con[S]:5680.45±698.1 vs 6040.76± 123.8)] did not show any significant change compared with control groups,
Table 1: Changes in variables in subjects’ pre and post assessments (X ± SD)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Pre</th>
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<th>Pre</th>
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</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>22.2 ± 1.9</td>
<td>22.6 ± 1.5</td>
<td>21.1 ± 1.7</td>
<td>21.9 ± 1.2</td>
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<tr>
<td>Height (cm)</td>
<td>157.7 ± 5.1</td>
<td>159.1 ± 5.1</td>
<td>155.9 ± 7.5</td>
<td>162.7 ± 6.6</td>
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<td>Weight (kg)</td>
<td>75.0 ± 8.1</td>
<td>78.1 ± 10.9</td>
<td>78.1 ± 10.1</td>
<td>46.9 ± 5.3</td>
<td>46.4 ± 5.2</td>
<td>46.5 ± 5.7</td>
<td>46.3 ± 5.2</td>
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<tr>
<td>BMI (kg/m²)</td>
<td>30.2 ± 1.8</td>
<td>30.9 ± 3.3</td>
<td>30.3 ± 3.2</td>
<td>17.8 ± 1.2</td>
<td>17.8 ± 1.5</td>
<td>17.5 ± 1.1</td>
<td>17.6 ± 0.1</td>
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<tr>
<td>WBC (Cumm)</td>
<td>5977.77 ± 552.9</td>
<td>6288.88 ± 449.5</td>
<td>5503.23 ± 203.6</td>
<td>5960.55 ± 543.4</td>
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<tr>
<td>RBC (mil/micl)</td>
<td>4.35 ± 21</td>
<td>4.76 ± 19</td>
<td>4.34 ± 12</td>
<td>4.41 ± 20</td>
<td>4.46 ± 25</td>
<td>4.50 ± 28</td>
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<tr>
<td>Neutrophil %</td>
<td>56.78 ± 77</td>
<td>56.22 ± 52</td>
<td>49.8 ± 11</td>
<td>45.4 ± 11</td>
<td>43.0 ± 15</td>
<td>39.8 ± 01</td>
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<tr>
<td>Lymphocyte %</td>
<td>38.89 ± 88</td>
<td>39.33 ± 03</td>
<td>41.77 ± 18</td>
<td>45.4 ± 11</td>
<td>36.6 ± 24</td>
<td>39.8 ± 01</td>
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<tr>
<td>Eosinophil %</td>
<td>2.44 ± 12</td>
<td>2.11 ± 10</td>
<td>2.89 ± 14</td>
<td>2.7 ± 33</td>
<td>2.8 ± 17</td>
<td>2.7 ± 26</td>
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<tr>
<td>Monocyte %</td>
<td>1.89 ± 88</td>
<td>2.33 ± 09</td>
<td>1.55 ± 26</td>
<td>1.4 ± 24</td>
<td>1.7 ± 06</td>
<td>1.9 ± 02</td>
<td>1.7 ± 21</td>
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Significantly different from the respective ‘Pre’ value p < 0.05*
*Exe = Exercise * Con = Control

P = 0.354 (Figure 1) and WBC sub-fractions (neutrophil, lymphocyte, eosinophil, and monocyte) did not alter either P > 0.05. RBC [(Exe [O]:4.35±21& 4.98±88 vs Con [O]: 4.76±84 & 4.91±19 and (Exe [S]: 4.34±12 & 4.41±20 vs Con[S]:4.46±25 & 4.50±08)] also remained unchanged P>0.05 over two months study period (Figure 2). The obese experimental group (Exe [O]) however significantly (p<0.001) reduced their body mass by 2% and BMI by 3% (Table 1).

**DISCUSSION**

The immune system response to exercise depends on the nature of exercise [17]. While widely is accepted that acute and chronic exercises alter the number and function of circulating cells of the innate immune system (e.g. neutrophils, monocytes) [18] a 30-min walking bouts with 60 % HRmax 3 times per week at 8 weeks in this study did not change WBCs counts and
its sub- fraction (neutrophil, lymphocyte, eosinophil and monocyte) in young women (21.5 +/- 1.6 yr). Nieman et al. [15] similarly demonstrated a 30-minute walk at approximately 60% VO_{2max}, three sessions did not notably alter the pattern of several components of immunity (e.g. neutrophils, lymphocytes, monocytes) in female subjects (37.5 +/- 3.1 yr). Suggesting a simple programme of aerobic routine of walking even at low intensity level is able to balance immune function to reduce the chance of developing high blood pressure, diabetes, heart disease, osteoporosis and cancer over time. Michishita et al. [16] earlier stated that aerobic ergometer exercise after 6 weeks training had cardiovascular protective effects as a result of decreased leukocyte, monocyte and neutrophil counts in which inhibited inflammatory processes in aged women (53.4 +/- 9.8 years). Johannsen et al. [19] also reported that 6 months of aerobic exercise reduces total WBC and neutrophil counts in sedentary postmenopausal women (51.2 +/- 1 years) and decreased in neutrophil count was associated with approximate 4% reduction in CHD risk factors. Further, while cycling, running and swimming have been shown to cause RBC damage[20] walking training at current study did not caused any deformity at red blood cells (RBCs) in experimental groups after exercise intervention and they still had normal reference range of RBC for female adults (4.5-5.1mil /micl). This implies a balanced oxygen (O_2) transport to exercising muscles and tissues during exercise to boost immune action as anti-inflammatory effects of walking training [21]. More interestingly, the 4 or 40 % of people who had a WBCs count below normal range (4,500-10,000 per Cumm) (that points to a blood disorder or other medical conditions ) at the beginning did not show abnormality at WBCs count after post - exercise measurement that partially can be explained by an immune enhancing benefit of exercise programme in experimental groups (Exe [O] =1 and Exe [S] =2) and to somewhat because of the informative aspects of this research in one obese control subject (Con [O] =1) by behavioral changes that may occurred.

In conclusion, to wide extent of knowledge, this is the first research that exhibits a balanced training such as walking simply boost immunity in young adult as an efficient preventive design in several clinical conditions (i.e. cardiovascular diseases such as hypertension, diabetes and cancers) since the consensus of this study demonstrate walking seems to be a safe exercise to optimize health through huge potential savings to immunize bodily system from many disease over time.

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REFERENCES


