A comparative study between male & female students attending submaximal exercise in regard to recovery heart rate & blood pressure.

Abdulrahman Jihad Manssor*, Hassna O. Al-janabi*, Nasreen Kader Kamel**, Mossa M. Marbut*
*Department of Physiology, College of Medicine, University of Tikrit
**Dept. of Pharmaceutical science, College of Pharmacy, Tikrit University

Abstract
The recovery period depends on how intense of an exercise perform, as well as the overall fitness level. A variety of reasons can cause abnormalities in a pulse. The aim of the study is to investigate the differences between male & female students of same age regarding cardiovascular fitness parameters. One hundred healthy student subjects belonging to age group of 19-23 years, of medical students. The study conducted at 2008-2009 at department of physiology. The pulse rate and blood pressure before and after exercise were measured. The subjects were asked to come in the morning hours in the laboratory with a light breakfast. A total 5 minutes warm up was given for each subject, then 9 minutes of exercise was applied to the students with a gradually increasing intensity every 3 minutes (starting from 50, 100 & 150 watts) up to 75% of their maximal heart rate. The recovery heart rate of male students return to expected normal value at the 3rd minute post exercise (119.5 ± 3.5 b/min), as compare with female students (129 ± 5.6). While heart rate after 5 minutes post exercise there is no significant difference between male & female student.

Key words Sub maximal exercise, fitness, recovery heart rate, blood pressure, BMI

Introduction
The amount of time it takes for your pulse to return to normal resting rate after exercise is known as the recovery period (1). The recovery period depends on how intense of an exercise perform, as well as the overall fitness level of the subjects (2). Cardiovascular fitness is the ability of your heart, lungs and vessels to respond to exercise, adjusting to the increased oxygen needs and then recover efficiently. When the body is able to efficiently deliver oxygen and nutrients to the working muscles, the endurance of muscles also improves. As the oxygen delivery system improves, so does the ability of the muscles to extract the oxygen from the blood. The more efficient this process is, the more fit you are (1,2,3).

A variety of reasons can cause abnormalities in a pulse, such as tachycardia -- a condition affecting the electrical signals that produce heart beats. As a result of the misfiring electrical impulses, the heart's chambers pump irregularly. Another cardiac condition that can affect your pulse is atrial fibrillation, which also causes your heart to beat arrhythmically (3).

When the value of body mass index (BMI) exceed 35 kg/m2 it has been associated with increased...
cardiovascular diseases, obesity & increase rate of mortality, with lower value of BMI generally correlating with longer lifespan. Because ethnicity has been shown to require adjustments to the levels of concern for the BMI, care must be taken when comparing different population groups. This variation can be explained by body type (4,5).

BMI and waist circumference have been used to evaluate health risks associated with overweight and obesity. Because both are easy measures to do, standardization of both are encouraged for widespread use as a reference, (6,7,8,9). Additionally, the two measurements have been used in an algorithm with a cardiovascular risk index, a recovery heart rate was added as a measure of fitness (1, 2, 10,12,13). The aim of the study is to investigate the differences between male & female students of same age regarding cardiovascular fitness parameters.

**Subjects and Methods**

One hundred healthy student subjects belonging to age group of 19-23 years, of medical students. The study conducted at 2008-2009. This research marked had been conducted in the laboratory of Physiology college of Medicine, University of Tikrit. Body weight, height and body mass index were measured.

The pulse rate and blood pressure before and after exercise were measured. The subjects were asked to come in the morning hours in the laboratory with a light breakfast. The height was measured in centimeter (cm) on a wooden stadiometer, weight was recorded in kilogram (kg) on weighing scale, the body mass index (BMI) was derived by Quetelet’s index from body weight/(height²).

Physical fitness index was measured by using bicycle ergo meter [9]. A total 5 minutes warm up was given for each subject, then 9 minutes of exercise was applied to the students with a gradually increasing intensity every 3 minutes (starting from 50, 100 & 150 watts) up to 75% of their maximal heart rate. Heart rate & blood pressure were measured at resting state before starting exercise & 1, 2, 3, & 5 minutes after the end of exercise (recovery heart rate)

All data were presented as a mean & standard deviation (SD). Student T test was used to compare the differences between values. The accepted level of significance for differences was equal to or less than 0.05 for all tests (P value < 0.05).

**Results**

Table 1 gives the general characteristics of subjects namely age, body weight, BMI and pulse rate of the study volunteers. Table 1 show the characteristic features of male & female subjects. It shows that statistically not significant but there is slight increase in body weight, & BMI of subjects as compared male to female students.

In this study the mean BMI of female students & male students were found to be within the normal range for their respective age groups. The recovery heart rate of male students return to expected normal value at the 3rd minute post exercise (119.5 ± 3.5 b/min), as compare with female students (129 ± 5.6). While after 5 minutes post exercise there is no significant difference between male & female students (table 1).
A comparative study between male & female students attending submaximal exercise in regard to recovery heart rate & blood pressure.

Exercise differences which in turn are due to the sex regarding exercising heart rate. However, it was found that there is no gender difference in the recovery duration with respect exercise heart rate. It is simply explained by the fact that both sexes exercise for 75% of maximal heart rate, (Table 1).

Female students have a low resting blood pressure as compare to male counterparts. Also, female students have a higher recovery systolic blood pressure (135.2 ± 6.6 mmHg) as compare to male students (131.5 ± 5.4 mmHg).

**Discussion**

All subjects are from medical students of same age. Also, the mean body weight & BMI of female students is non significantly differ from male counterpart (table 1). This result is in agreement with Western counterparts (10, 11). It indicates the adequate nutrition, similar socioeconomic condition and normal life style of the individuals. In this study the mean BMI of female students & male students were found to be within the normal range for their respective age groups (12).

Most comparison between normal physically trained with untrained groups has shown no differences in resting blood pressure (5). Also, exercise programs of those with normal blood pressure can usually be expected to cause reduction in Bp of only a few millimeters of mercury (6). There are non significant differences in regard to resting heart rate & systolic blood pressure of female students comparing with male students counterpart. This finding is differ from previous findings that female students have a low resting heart rate as compare to male students of the same age. Even so, the present findings with the standard normal healthy findings (1,2, 3,4).

Aerobic exercises, such running and swimming, are intense cardiovascular workouts demanding a high amount of oxygen for the body. This results in a faster pulse than when performing anaerobic exercises, such as push or pull strength exercises. The recovery period depends on how intense of an exercise you perform, as well as your overall fitness level (2, 4, 5). When recovery heart rate return to normal after cessation of exercise & reach 120 b/min after heavy exercise, this recovery heart rate regard as normal result & the subjects regard as a fit person (1, 2).

The present study show that the recovery heart rate of male students return to expected normal value at the 3rd minute post exercise (119.5 ± 3.5 b/min), as compare with female students (129 ± 5.6). While after 5 minutes post exercise there is no significant difference between male & female students regarding recovery heart rate.

The present study supported the hypothesis that relaxation & warm down after exercise caused faster recovery of physiological parameters namely pulse rate and blood pressure in comparison with relaxation in silence. It is consistent with other study which proved that exercise has the potential to reduce physiological indicators of anxiety including pulse rate and blood pressure [13,14]. However, in the present study it was found that there is no gender difference in the recovery duration with respect exercising heart rate. It is simply explained by the fact that both sexes exercise for 75% of maximal heart rate & that both males and females have the
A comparative study between male & female students attending submaximal exercise in regard to recovery heart rate & blood pressure.

The present study recommend that every person should exercise regularly & should notice that the pulse rate recover within a reasonable amount of time after cessation of exercise.

References
A comparative study between male & female students attending submaximal exercise in regard to recovery heart rate & blood pressure.

14-Yamamoto T, Ohkuwa T. Effects of pre-exercise listening to slow and fast rhythm music on supramaximal cycle performance and selected metabolic variables. Arch Physiol Biochem 2003;111:211-214

Table 1 Show the mean & SD of age, body weight, BMI, resting heart rate (HR), blood pressure & post exercise values of blood pressure & recovery heart rate of male & female subjects.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Female</th>
<th>Male subjects</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age years</td>
<td>24.7 ± 6.6</td>
<td>25.6 ± 6.5</td>
<td>NS</td>
</tr>
<tr>
<td>Body weight</td>
<td>58.0±7.1</td>
<td>55.0 ± 3.3</td>
<td></td>
</tr>
<tr>
<td>BMI</td>
<td>26.7 ± 5.3</td>
<td>24.6 ± 4.1</td>
<td>NS</td>
</tr>
<tr>
<td>Resting HR</td>
<td>76.2 ± 5.9</td>
<td>74.9 ± 6.7</td>
<td>NS</td>
</tr>
<tr>
<td>Resting BP</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SBP (mmHg)</td>
<td>115.5 ± 4.9</td>
<td>117.2 ± 5.0</td>
<td>NS</td>
</tr>
<tr>
<td>DBP (mmHg)</td>
<td>75.5 ± 4.9</td>
<td>79.6 ± 4.8</td>
<td>0.05</td>
</tr>
<tr>
<td>Exercising HR (beat/min)</td>
<td>149.3 ± 3.1</td>
<td>156.7 ± 12.7</td>
<td>0.05</td>
</tr>
<tr>
<td>Recovery BP</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Systolic BP</td>
<td>135.2 ± 6.6</td>
<td>131.5 ± 5.4</td>
<td>0.05</td>
</tr>
<tr>
<td>Recovery diastolic Bp</td>
<td>89.1 ± 4.4</td>
<td>91.2 ± 4.1</td>
<td>NS</td>
</tr>
<tr>
<td>3rd min. recovery HR</td>
<td>129 ± 5.6</td>
<td>119.5 ± 3.5</td>
<td>0.05</td>
</tr>
<tr>
<td>5 min Recovery HR</td>
<td>85.7 ± 5.4</td>
<td>83.5 ± 4.4</td>
<td>NS</td>
</tr>
</tbody>
</table>