The effect of relaxing music on changes in blood lactate level during recovery following a maximal exercise session in young female athletes

Roza Ghavam-Bakhtiar¹, Hojjatolah Nikbakht², Navid Ziaee ³, Maryam Mohammadi¹

1- MSc in Physical Education
2- Professor at IAU, Science and Research Branch
3- MSc in Natural Resources

Corresponding Author: Email: ros.ghavam@yahoo.com

Abstract

The purpose of the present research was to examine the effect of relaxing music on changes in lactate level during recovery following a maximal exercise. 15 young female athletes (24.6 ± 3.5 years; 168.5 ± 3.6 cm height; 63.5 ± 9.07 kg weight) were randomly selected as sample form 100 volunteers in Al-Zahra Sport Complex in Tehran City. Before the test, all the subjects participated in a program consisting of warming up, resting, blood sampling, and lactate level measurement. Blood lactate of the subjects was measured before the exercise, immediately after the exercise, and 7 and 15 minutes into recovery both with and without music. The results showed that during recovery with music (up to 15 minutes after exercise) blood lactate decreased by 25%, while it only decreased by 8% during recovery without music. It can thus be concluded that relaxing music can reduce stress and contribute to faster recovery in fatigued athletes.

Keywords: relaxing music, blood lactate, recovery, maximal exercise

Introduction

Movement is a manifestation of life. It becomes more pleasing and graceful once it is combined with music and rhythm. The effects of music as a driving factor in improving motor performance has been recognized and extensively studied. Researchers believe that slow music reduces physiological and psychological arousal during submaximal exercise and increases endurance performance (Boutcher, 1990). Also music can motivate athletes to continue exercise (Lai, 2004) and it can postpone fatigue by reducing perception of effort (Nemati, 2003; Wilmore et al., 2004; Farajollahi, 2010; Ghaderi, 2002; Karageorghis et al., 1996; Seath et al., 1995). Research on perception of effort has shown that music narrows attention, diverts the mind from exercise-induced feeling, affects psychological arousal, and acts as a stimulus before and after the exercise (Fathollahi, 2006; Copeland et al., 1991).

One of the issues that have received much attention from sport scientists is the quality of performance and constant readiness for participation in tournaments. Fatigue and exhaustion are among the main setbacks of successful performance. There are various physiological, biomechanical, psychological, and nutritional factors that can help athletes achieve highest levels of performance. Physiologically, fatigue is due to changes that occur first in muscles and then in the chemical factors of blood serum. Experts believe that the major causes of fatigue are depletion of energy sources (including phosphagen, anaerobic glycolysis, and oxidation), accumulation of metabolic by-products, alterations in the nervous system, and failure of muscle fiber’s contractile mechanism. Obviously, none of these factors alone can account for all the aspects of fatigue. But in high-intensity anaerobic activities, fatigue is most probably caused by accumulation of metabolic by-products such as lactate and hydrogen ions in muscles (Khorram, 2001). Due to its acidity, lactic acid can attenuate many muscle metabolic processes by releasing hydrogen ions and can cause severe muscle failure. Thus,
this compound must not be accumulated in muscle cells and must be absorbed by blood and burned as a fuel (Sanadgol, 1995; Robergs et al., 1997). Lactate is a major metabolite which is generated through intercellular reactions. Under these conditions, the key to the success of athletes is to overcome exercise-induced fatigue and get ready for the next practice or competition. Coaches and sport scientists must constantly search for methods that would help athletes overcome exercise limitations and improve their performance. One of the most effective methods is to incorporate recovery into training. Proper recovery accelerates restoration between training sessions, reduces fatigue, and increases supercompensation. Research has often focused on the effect music on performance from the perspective of motor sciences and seldom has this issue been addressed from the biological and psychological perspective. Moreover, studies have mostly studied the effect of music during practice or researchers have compared different types of recovery without any music. For instance, Ramezani et al., (2003) studied the effect of active and passive recovery on blood lactate level and heart rate following a maximal exercise. Therefore, the purpose of the present research is to examine the effect of relaxing music on changes in blood lactate level during recovery following high-intensity exercise in young female athletes.

**Materials and Methods**

The population of the research consists of 100 young female athletes of Al-Zahra Sport Complex in Tehran City and 20 volunteers were randomly selected as sample. After performing the Bruce Protocol, 5 subjects were excluded from the study. Blood lactate of the subjects was measured before the exercise, immediately after the exercise, and 7 and 15 minutes into recovery both with and without music. Bruce Protocol was used as maximal exercise. Technogym treadmill (Runrace, Electronic Competition, HC 1200) and a lactometer (Boehringer Ingelheim, Germany) were used to measure the blood lactate level of the subjects. The lactometer measures blood lactate in mol/L. Repeated measures analysis of variance was used for data analysis. Moreover, Kolmogorov-Smirnov test was applied to normalize the data. All the statistical operations were done in SPSS at $\alpha \leq 0.05$ significance level.

**Results**

According to Table 1, the mean blood lactate level in the condition without music has increased from before the exercise to immediately after the exercise and to seven minutes into recovery. But it has decreased by 8% from 7 minutes into recovery to 15 minutes into recovery. With music, the mean blood lactate level of the subjects has increased from before exercise to immediately after exercise, but it has decreased by 8% from immediately after exercise to 7 minutes into recovery and has decreased by 18% from 7 minutes into recovery to 15 minutes into recovery. If we examine the changes from immediately after exercise to 15 minutes into recovery, it is revealed that the blood lactate level of the subjects has decreased by 26%. Therefore, it can be concluded that music has been effective in decreasing the blood lactate level of the subjects. The results showed that changes in blood lactate level in the condition with music have been significantly different than blood lactate level in the condition without music ($P > 0.05$).

**Table : Descriptive statistics of blood lactate level in eight repetitions**

<table>
<thead>
<tr>
<th>Factor</th>
<th>Mean (mmol)</th>
<th>SD</th>
<th>CI (5%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood Lactate</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Before exercise (no music)</td>
<td>4.140</td>
<td>0.773</td>
<td>2.392 - 5.388</td>
</tr>
<tr>
<td>Immediately after exercise (no music)</td>
<td>12.110</td>
<td>0.850</td>
<td>10.187 - 14.033</td>
</tr>
<tr>
<td>7 minutes into recovery (no music)</td>
<td>13.230</td>
<td>1.267</td>
<td>10.363 - 16.097</td>
</tr>
<tr>
<td>15 minutes into recovery (no music)</td>
<td>12.440</td>
<td>1.451</td>
<td>9.158 - 15.722</td>
</tr>
<tr>
<td>Before exercise (with music)</td>
<td>4.140</td>
<td>0.773</td>
<td>2.392 - 5.388</td>
</tr>
<tr>
<td>Immediately after exercise (with music)</td>
<td>12.110</td>
<td>0.850</td>
<td>10.187 - 14.033</td>
</tr>
<tr>
<td>7 minutes into recovery (with music)</td>
<td>13.713</td>
<td>8.487</td>
<td>1.155 - 11.100</td>
</tr>
<tr>
<td>15 minutes into recovery (with music)</td>
<td>11.250</td>
<td>6.930</td>
<td>0.955 - 9.090</td>
</tr>
</tbody>
</table>
Discussion and Conclusion

In most tournaments, the interval between two matches is not long enough to allow for regaining the lost energy. Incomplete recovery and sustained fatigue can decline the ability of athletes to perform physical activities. Although some scholars believe that lactic acid is responsible for fatigue and exhaustion in all types of sport, it must be noted that this compound is accumulated in muscle fibers only in intense physical activities (Wilmore, 1994). Lactate is considered as one of the anaerobic processes that cause fatigue in athletes and researchers are searching for ways of improving lactate removal and helping athletes achieve peak performance. For instance, Ramezani et al. (2003) reported increased blood lactate level after high-intensity exercise and reduced lactate level and heart rate during recovery. Moreover, in this study the highest amount of lactate removal happened at 15 minutes into recovery. Gayini and Abasali (2002) studied blood lactate level and heart rate at 5 and 12 minutes into passive recovery. They reported significant increase in blood lactate level, significant decrease in heart rate at 5 minutes into recovery, and significant decrease in blood lactate level and heart rate at 12 minutes into recovery. The results of this study is inconsistent with the findings of the present research in terms of changes in blood lactate level at 5 minutes into recovery, but the results of both studies are similar in terms of decrease in heart rate at 5 and 12 minutes into recovery.

Studies have shown that relaxing music can narrow attention, divert the mind from exercise-induced fatigue, affect arousal, and reduce blood lactate level of athletes. Therefore, it is possible that music enables athletes to forget pain and pressure (by focusing attention) and reduces muscle stress and fatigue. This suggests the decreased activity of sympathetic nerves and reduced blood lactate level.

References