The effect of using cross training exercises on some Anaerobic abilities, Enzymatic Antioxidants, and lactic acid for handball players.

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Abstract.

The present study aims at:

Preparing cross-training exercises.

Identifying the effects of using cross-training exercises on some anaerobic and enzymatic antioxidants and lactic acid for handball players.

The experimental approach whose pre-post tests was used as it fits the nature of the present study. The study is conducted on (14) players of Wasit handball team. Six (6) players were deliberately chosen to represent the research sample. The tests used in the present study are:

- Measuring lactic acid in blood.
- Measuring the variables; (GSH-MDA) in a (5cc) vein blood.
- Performing (defensive movement, launching for striking in a curve, speed, and hitting) tests.

The results showed a significant development in the concentration of lactic acid in the post tests, which indicates the physiological effectiveness of the exercises. (GSH, MDA) significantly varied, which indicates the improvement of the functions of these enzymes as a result of the exercises. The level of anaerobic abilities; (defensive movement, launching for striking in a curve, speed, and hitting) tests improved as a result of the exercises.

Keywords: Cross training, Enzymatic, Antioxidants, lactic acid

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1. Introduction and value of the research.

1.1 Introduction.

The level of performance in handball mainly depends on training and physiological factors. These factors highly influence the physical level in handball. All that is closely related to the items of training process through which body vital organs get adapted. Cross-training exercises play an important role in almost all sports activities and events. The level of achievement during training and competition through the ability of the individual to perform physical and skillful duties develops. Due to the unstable nature of performance in handball as the performance of the player and his movements change according to the positions, the player should meet these requirements by making a great physical effort to raise his abilities; physically and skillfully. Anaerobic abilities are important requirements of handball players. Using cross-training exercises develops these abilities as the primary means to develop the physical requirements of the handball player. The field of sport is witnessing a competition to obtain means to ensure physical and physiological development. Biochemical changes occur as reactions because of physical exertion. Enzymatic antioxidants (GSH-MDA) and the concentration of lactic acid (LA) are considered biochemical blood variables that occur as a result of the physical effort of handball players. Many things related to the development and codification of training programs to serve those involved in the field of sports, especially handball training, should be paid a great deal of interest.

1.2 The problem of the present study.

Anaerobic abilities are important in the development of skillful and physical requirements of handball. Hence, cross training exercises were use in order to develop the abilities of handball players. In sports exercises, the player needs high ratios of oxygen in comparison with resting state. These ratios increase during physical exertion more than in normal cases. As a result of the need for continuous and increasing oxygenation by muscle cells in order to produce the necessary energy, these free electrolytes affect the work of energy production cells within the muscle causing significant damage to these cells. As a result, the number of cells producing energy, which results in the deficiency and fatigue of the athlete. Hence, the role of antioxidant enzymes in the body of the athlete to balance these free electrolytes, preserve the cells of the body of the athlete, and maintain the ratio of lactic acid in the blood. The anaerobic nature of the game may be an important cause of early fatigue of players. Therefore, it is necessary to study, analyze, and identify the normal level of this variable to maintain the players safe.

1.3 The objectives.

Preparing cross-training exercises.

Identifying the effects of using cross-training exercises on some anaerobic and enzymatic antioxidants and lactic acid for handball players.

1.4 The hypotheses.

1. Post-test measurements significantly exceed pre-test measurements in anaerobic abilities of handball players.

2. Post-test measurements significantly exceed pre-test measurements in enzymatic antioxidants and lactic acid of handball players.
1.5 The Research Fields.

1.5.1. The human field:

A sample of the players of Wasit handball team.

1.5.2 The spatial field:

The playground of the Faculty of Physical Education and Sports Sciences.

1.5.3 The time domain: from 17/2/2019 to 20/4/2019.

2.1 The methodology.

The experimental approach whose one experimental group composed of pre and post tests was used as it fits the nature of the present study.

2.2 The research community and sample.

The researcher’s mission was to determine the research community and its items. The study is conducted on (14) players of Wasit handball team. Six (6) players were deliberately chosen to represent the research sample.

2.3 Means, tools, and devices used in the research:

Arabic and foreign sources.

- The Internet.

- The tests.

- Handball court.

- Ten hand balls.

- Chinese Lenovo Laptop.

- Stopwatch.

Medical Injections, Gel Tube, Chinese Tube, and Box to keep blood samples.

Various blocks for measuring (GSH-MDA).

Japanese Lactate Pro 2 device.

Different fitness devices.

2.4 The tests.

2.4.1 Conveyor belt test (for Cunningham and Volkins)

This test requires that the test runs at full speed on the treadmill at a 20% degree and at a speed of 8 mph. The time of work until fatigue is recorded. It is also possible to measure the concentration of lactic acid in the venous blood in the 5th and the 12th minutes after work [2].
2.4.2 Measurement of lactic acid in the blood.

The researcher used the handheld lactate acid concentration meter type (Lactate Pro 2) second generation at the time of rest and after effort (test: after (5) minutes to ensure the transfer of lactic acid from muscles to blood [8]. The measurement method was by choosing one of the fingers to be pricked, the first drop of blood is wiped, blood drop for a second time is placed on the tape measure connected to the device to draw blood towards the tape, and then the result of measuring the concentration of lactic acid within (15) seconds is shown.

2.4.3 Measurement of Malidedahide (MDA) [15].

Malhydedahide is a by-product of lipid oxidation. Measuring it in the blood serum depends on the interaction of Thiobarbigurate acid (TBA) with Malondi Aldehyde to produce a pink compound whose light absorption is measured along the wavelength (532) nm by standard the method.

2.4.4 Measurement of Clotathione (GSH) [6].

Reduced Clotathione is measured by Godin method, which relies on the interaction of Clotathione with DTNB to produce a substance whose light absorption is measured at (412) nm, which is directly proportional to the concentration of Clotathione.

2.4.5 Defensive movement test and launching for striking in a curve [4].

The purpose of this test is the quick defensive movement and launching for striking for a distance of (22) miles in a curved line.

The tools: 3 flags, 6 medical balls, and stop Watch.

The performance method:

Defensive action is performed once, launching for striking, and time is calculated.

Recording: The time of defensive movement is calculated and launching to finish line.

2.4.6 Speed and hitting tests. [4]

Tools: Handball court, five hand balls, high jump, keel, 4 medical balls, and stopwatch.

The performance method:

The player stands in the middle of the midfield where five balls are placed on the ground. When he hears the signal from the referee, he picks up one of the balls and runs between the medical balls to reach the bar located at a height of (2-2.5) m to hit The ball from above using the jump hitting and then back again to pick up the second ball and repeat the same action to hit the five balls.

2.5 The field research procedures.

2.5.1 The pre tests.

The pre-tests of lactic acid in the blood, taking (5cc) intravenous blood to measure (GSH-MDA), implementing (defensive movement, launching for striking in a curve, speed., and hitting) tests were carried out on (the 17th/2/2019) at Five o'clock in the handball field of the College of Physical Education and Sports Sciences.
2.5.2 Cross-training exercises.

The exercises started on (the 18th/2/2019) in the playgrounds of the Faculty of Physical Education and Sports Sciences.

The exercises included jogging, using bike, swimming, stretching for swimming, weightlifting exercises, which include weight training using modern devices, halls football for being close to handball, rotation and diversification in exercises with different muscle groups, and competition between two or more people in one exercise, which increases excitement where the time of exercise was between 45-60 minutes. The duration of the application of exercises is (8) weeks; three training doses per a week. The total number of training doses is (24) training doses. The training doses were completed on (the 18th/04/2019).

2.5.3 Post tests.

The post-tests were conducted on (the 20th/2/2019). The researcher was committed to the procedures, conditions that were followed in the pre-tests in terms of time, place, the method of performance, equipment, and tools.

2.6 The statistical means.

The data obtained by the researcher was processed using SPSS.

3. Presentation, analysis, and discussion of results.

3.1 Presentation and analysis of the results of pre- and post-test.

To measure the concentration of lactic acid in the blood (after effort before application of exercise and after effort after application of exercise)

Table (1) measure the concentration of lactic acid in the blood

<table>
<thead>
<tr>
<th>Significance</th>
<th>T/table value</th>
<th>T/calculated value</th>
<th>post p</th>
<th>pre p</th>
<th>Measuring unit</th>
<th>Tests</th>
</tr>
</thead>
<tbody>
<tr>
<td>significant</td>
<td>2.26</td>
<td>9.52</td>
<td>0.564</td>
<td>16.93</td>
<td>0.762</td>
<td>20.71</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>M mol/l</td>
<td></td>
</tr>
</tbody>
</table>

3.2 Discussing the results of measuring the concentration of lactic acid in the blood.

There is a lack of difference between the pre-post tests. The concentration of lactic acid in blood was within the normal rate during rest. The researcher attributes this to the reason that the lactic acid system is known through the diabetic non-oxygenic test. It refers to the conversion of sugar into glucose without oxygen to produce (ATP). This system works with high-intensity activities with a relatively long working time (30 seconds - 3 minutes). When resting, the rate is either fixed or low; (1-2) mmol / L blood. Muscles produce lactic acid even at rest time, but the lactic acid production rate at rest equals its consumption rate which makes leaving The rest in both muscles and blood be almost stable as this concentration does not exceed (1.0 mmol / L) which slightly increases or decreases. When lactic acid exceeds (2.0 mmol / L), this indicates a medical condition [7]. The results showed an improvement between the pre- and post- tests of the concentration of lactic acid in blood. Post-test showed a significant decrease in the concentration of lactic acid, which is consistent with what (Risan Khraibet), indicated. Athletes should take into account the activities and stresses in the process of Training, which require additional energy to some extent. The lack of necessary energy in the athlete’s food will lead to the consumption of reserves of nutrients in the organs when practicing various exercises [14]. The nature of the game depends on the anaerobic work in obtaining the necessary energy to perform the necessary skillful and physical requirements in the game; striking, defending, rapid
jogging, some physical qualities that are also related to this system such as the maximum fixed and mobile power, maximum speed, distinctive force speed, and explosive power. The anaerobic action is a set of anaerobic variables that result in chemical changes in the working muscles through which it produces the energy needed to perform the effort while not using air oxygen."[11] With the repetition of the work, players need to tolerate speed, force, performance; defensive or offensive, where the source of energy is the use of glycogen or glucose to produce energy (ATP), which leads to the accumulation of lactic acid in muscle and blood. Anaerobic tolerance is the ability of the muscle to work for the longest time in the production of anaerobic energy, which ranges from (30 s to 3 m) with maximum intensity, requires efficiency in the ability of the muscle to withstand oxygen, increase its ability to use anaerobic energy systems, and withstand the increase in the concentration of lactic acid."[16]. The development of anaerobic potential requires the implementation of large training with the use of an intensity that increases the anaerobic threshold, that is, the intensity that leads to an increase in the concentration of lactic acid in the blood of 3-4 mmol / L.[1]. In handball, the player relies on anaerobic action to obtain the energy needed to perform the strong and fast movements required by playing conditions such as passing, hitting all kinds, and jumping movements during striking and defending, as well as fast running as occurs in hitting, or quick return to defense, in addition to performing muscle work with maximum strength and speed to face fatigue caused by the accumulation of lactic acid in muscle (anaerobic tolerance).

3.3 Presentation of measurement results of GSH, MDA

<table>
<thead>
<tr>
<th>Significance</th>
<th>T- Table value</th>
<th>T- Calculated value</th>
<th>Post</th>
<th>pre</th>
<th>Tests</th>
</tr>
</thead>
<tbody>
<tr>
<td>Significant</td>
<td>2.87</td>
<td>9.615</td>
<td>0.056</td>
<td>2.908</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.287</td>
<td>1.784</td>
</tr>
<tr>
<td>Significant</td>
<td>9.817</td>
<td>1.829</td>
<td>17.802</td>
<td>2.898</td>
<td>28.030</td>
</tr>
</tbody>
</table>

3.4: Discussing the results of (GSH, MDA)

The defensive system of antioxidants of all kinds is the main pillar through which the body inhibits the damage caused by oxidation of free radicals of living components within the body. It works to make the internal environment as stable as possible to enable the body to perform its vital functions naturally without any damage. Antioxidants can be classified as either endogenous or exogenous by obtaining them from food sources rich in these substances. The factors that help form electrolytes during training and in sports are stray oxygen atoms where they play an important role as a cause of muscle rupture and inflammation of tissues, especially during high-intensity physical exertion, where blood flow increases during the muscles working hard, which leads to increased oxidation of phosphorus fat and cell membranes. Muscles need to consume 10-20 times of oxygen when performing physical training more than rest time. At the level of one muscle, oxygen consumption increases more than 200 times. This increase is accompanied by a very large increase of metabolism oxygen consumption, which leads to increased oxygen free radicals as manure that lost an electron [17]. Too much free electrolytes in the athlete lead to a rapid feeling of fatigue during the implementation of sports exercises. It also slows the recovery, which leads to the failure of conditioning operations, physical stress, and low level of sports gradually, especially if the athlete does not take antioxidants during his meals. In order to reduce the damage caused by the generation of free oxygen electrolytes, the athlete should take meals containing antioxidants or getting antioxidants through using supplements before training to reduce the damage of muscle cells, reduce the effectiveness of the oxygen free electrolytes, and increase the body's ability to secrete antioxidants including glutathione enzyme (GSH), Alcaltaz (CAT), and super Dessonaz oxide [9]. During intense exercise, blood shifts away from vital organs to the limbs and general muscles. Vital organs such as liver, spleen, stomach, and kidneys become oxygen deficient. For all living tissues exposed to hypoxia in the case of blood flows back to them loaded with free radicals. Despite some effects caused by sports activities of an increase in aerobic metabolism and the formation of free oxygen atoms that cause inflammation,
damage and rupture Cells and tissues, the danger occurs when they interact with important components of cells such as DNA, the nucleus, or the cell wall, leading to weakness in the efficiency of these cells during their work. Accordingly, sports activities should be based on scientific bases and curricula, under medical supervision, and periodic examinations to examine the deficiencies in these curricula and the calories they need through food in the functional construction of the individual by increasing the level of functional competence of the practitioners[12].

The chances of emergence of the cracks and the accumulation of stray oxygen atoms increase during tolerance exercises. The danger of anaerobic energy production stage is in the final stage immediately after the performance stop where it is called (re-perfusion) [18] to re-provide the working muscles and other quantities of blood loaded with oxygen efficiently. The intense muscular contraction at the time of performance reduces the amount that is provided to the muscle and some other organs in the body, which is consistent with study by Abul-Ula. Many studies have shown that physical performance increases the production of free oxygen cracks, which leads to the damage of cells. It is observed that physical performance increases the DihydrogenMalone level in blood during the body's processing of oxidative stress, the formation of loose cracks, the production of Aldehyde Malone, and the production of pentane exercise, which can be an indicator of fat oxidation, increase[18].

3.5 Presentation of the results of the pre- and post-tests to test the defensive movement and launching for striking in a curve.

Table (3) test the defensive movement and launching for striking in a curve.

<table>
<thead>
<tr>
<th>Significance</th>
<th>T- Table value</th>
<th>T- Calculated value</th>
<th>Post P</th>
<th>Pre S</th>
<th>Measuring unit</th>
<th>Tests</th>
</tr>
</thead>
<tbody>
<tr>
<td>Significant</td>
<td>2.26</td>
<td>6.98</td>
<td>1.56</td>
<td>42.78</td>
<td>Time</td>
<td>Defensive movement and launching for striking in a curve</td>
</tr>
</tbody>
</table>

3.6 Presentation and analysis of the results of pre- and post-test to tests speed and hitting.

Table (4) tests speed and hitting.

<table>
<thead>
<tr>
<th>Significance</th>
<th>T- Table value</th>
<th>T- Calculated value</th>
<th>post p</th>
<th>pre s</th>
<th>Measuring unit</th>
<th>tests</th>
</tr>
</thead>
<tbody>
<tr>
<td>Significant</td>
<td>2.26</td>
<td>5.83</td>
<td>0.37</td>
<td>1.26</td>
<td>time</td>
<td>Speed and hitting</td>
</tr>
</tbody>
</table>

3.7: Discussing the results of the tests of (defensive movement, launching for striking in a curve, speed, and hitting).

The results show a positive impact in the tests of (defensive movement, launching for striking in a curve, speed, and hitting). The researcher attributes this development to the physical and skillful nature of the exercises. This is required by the offensive aspects of handball. The correct arrangement of the exercises and their quality is by involving all muscle groups needed by handball players, the training method used (cross-training exercises), which includes rest periods, appropriate intensity and amount of loads, the work of muscle groups, which ensures the development of the players under a certain level without causing stress or exhaustion. Tolerance can be developed.
by increasing the number of training or increasing the training period at a time, Muneer Gorgas. Interval training, which is simple training, followed by a rest period, can be used throughout the training period. [13] The applied exercises were suitable for the research sample, especially the intensity, diversity, different distances, repetitions, competition, and excitement. Hence, the conditions are close to the requirements of handball; using balls or without balls, scoring or short, medium, or long passing, exchanging positions, and different movements in the playground. These exercises contributed greatly in developing the anaerobic abilities of the players. The performance in the ball games requires the body to increase the anaerobic abilities. The more speed of movements is required in the stadium, the more the various body organs consume anaerobic energy. In this case, the player cannot continue to perform efficiently all the time. Thus, the rules of such games allow changing the players during the game to achieve high levels in such games [3]. One of the basic principles for the development of anaerobic capacity of handball players is to repeat the performance as many times as possible, appropriate intensity, and appropriate periods of incomplete rest. Thus, the researcher was keen to make the exercises consistent with the nature of the sample of the research. In addition, the researcher tried to achieve the best possible positive results of developing the players’ performance through maintaining the rate of performance, the frequency per a week, and the recovery periods between training periods.

4. Conclusions and recommendations

4.1 Conclusions

1. The results show a significant development in the concentration of lactic acid (LA) in the post tests, which indicates the effectiveness of the exercises used on the physiological side of the research sample.
2. There is a clear difference in the results of (GSH, MDA) tests, which is an indicator of the improvement of the functions of these enzymes as a result of the exercises used.
3. The results show a clear improvement in the level of anaerobic abilities, (defensive movement, launching for striking in a curve, speed, and hitting) tests as a result of the exercises used that fit the research sample and resulted in this evident development.

4.2 Recommendations.

1. Using various cross training exercises in developing anaerobic abilities of handball players.
2. Conducting periodic tests for the variables; (GSH, MDA) and (LA) as they are indicators of the training and physiological status of the player in different preparation periods.
3. Linking the physical and physiological sides as they are important in developing the ability of the athlete and maintaining his health.

References

7. Hazza bin Muhammad Al - Hazza: Lactic Acid, published by the Saudi Federation of Sports Medicine, King Saud University, Riyadh, 2005.
8. Hazza bin Muhammad Al - Hazza: Physiology of physical effort, King Saud University, 2008.