THE EFFECTIVENESS OF VITAMIN D2 IN THE LEVEL OF DISRUPTIVE ACTIVITY FOR SKELETAL MUSCLES UPON EXPOSURE TO ANAEROBIC PHYSICAL EFFORT

Mohammed Hazim Younis1, Roqaya Fouad Lafy2
1College of Physical Education and Sports Science
University of Mosul
Mohammed.h.younis@uomosul.edu.iq
2College of Agriculture and Forestry
University of Mosul
roqayafouad@uomosul.edu.iq

ABSTRACT

The problem of the present research has been consisted in raising the level of disruptive activities of skeletal muscles accompanying the mechanic processes as a result of being subjected to anaerobic physical effort. So, it’s essential to find out if some of nutraceuticals such as vitamin D2 could possibly lower the high level of these disruptive activities, particularly those of a high-intensity. It mainly aimed to reveal the effectiveness of Vitamin D2 on the level of disruptive activity of the skeletal muscles between pre and post tests for the experimental group. It also aimed to compare the disruptive activity level of the skeletal muscles between the two post tests for the experimental and control groups. Besides, it attempted to find out the effectiveness of vitamin D2 at the level of digital achievement for a 400-meter freestyle run between the two pre and post tests for the experimental group, and to compare the level of digital achievement for a 400-meter freestyle run between the two post-tests for both groups; the experimental and control.

The researchers have assumed that there are differences in the level of disruptive activity of the skeletal muscles between the pre and post tests for the experimental group, differences in the level of disruptive activity between the two post tests for the experimental and control groups, as well as differences in the physical achievement level between the pre and post tests and between the two post tests for a 400-meter freestyle run for both the experimental and control groups.

This research has been conducted on a sample of sports activity practitioners, where the researchers have adopted experimental approach in designing two groups for pre and post tests to suit the nature of the research. The sample consisted of (14) individuals, deliberately selected and randomly divided into two experimental and control groups; each consists of 7 individuals, where their average age, weight, and height ranged from (17- year), (65 Kg) and (171 Cm) respectively.

Experiments were conducted on Classico stadium from 12-12-2019 to 15-12-2019. The members of the sample were subjected to two main experiments. The first experiment included the pre-measurements for the experimental and control groups, in which the functional measurements taken before the physical effort for a 400-meter run had been performed. The second experiment, on the other hand, included the post-measurements, in which the physical effort for a 400-meter run, performed before the functional measurements for the experimental and control groups were taken. The experimental group was given vitamin D2, (18) hours before conducting the post-physical and functional measurements in the first experiment, and then functional measurements were taken upon completion of physical effort for a 400-meter run. In the second experiment, vitamin D2 was given in a period of 7 minutes. Data was statistically processed by using the arithmetic mean and standard deviation for the associated samples (T-test), while coefficient of variation and Pearson correlation coefficient were used for the independent samples.

The researchers have found that giving vitamin D2 has considerably contributed to increasing the level of vitamin D3 for the experimental group members in comparison with the control group after experiencing the
physical effort of a 400-meter run race. There was also a decline in the disruptive activity severity for muscle tissue in terms of lactic acid for the experimental group members who were given vitamin D2 when performed a 400-meter run race comparing to the control group.

The researchers have recommended taking advantage of the present study results through adopting the outcomes and data achieved to be employed in the area of training.

1.1. Introduction and Significance of the Study

Every physical effort has its own response on the level of human body in general as well as on the level of skeletal muscles in particular. Moreover, the effects of physical effort have been inferred through a number of functional measures including lactic acid. Such effects decrease the efficiency of musculature as a result of the mechanic pressure on and from the body due to the physical effort in general and as a result of the anaerobic effort such as a 400 meter run in particular.

The nutritional side is very important, at the level of body in general and the musculature in particular, especially for sports individuals. A study was conducted by (Bonout et al. 2006) on two groups of old people whose level of vitamin D recorded 16 nanogram/ml. This number is less than the normal levels. The two groups were told to do resistance exercises. The experimental group received vitamin D. The study has shown an increase in the level of serum of vitamin D in all the groups. More importantly, the highest level of vitamin D is seen in the individuals who received vitamin D. Besides, the study found an improvement in the power of quadriceps as well as in the timing and the level of short physical performance (Bonout et al., 2006 746-725).

The present study is an attempt to link between the efficiency of vitamin D use and the level of muscular tissue destruction after doing an aerobatic physical effort; running for 400 meters. This topic has long been the concern of researchers who attempt to manifest the efficiency of using vitamin D supplement in eliminating the level of muscle catabolism and physical performance especially in young sport individuals.

1.2. Problem of the Study

The problem of this study is manifest in the increasing level of destructive activities of skeletal muscles which are associated with the mechanical processes occurring as a result of doing physical efforts especially the extreme aerobatic physical efforts. Therefore, the present study seeks to find out whether it is possible to eliminate the increasing level of destructive activities of skeletal muscles, as evident in the lactic acid when individuals are exposed to the physical efforts of 400 meters run, by using vitamin D2 supplements. It also seeks to find whether the use of such a vitamin before doing any aerobatic physical activity, for one time, is relevant with the level of physical performance and digital achievement while running free 400 meters.

1.3. Objectives of the Research

To know the effect of using vitamin D2 on the level of vitamin D3 after a 400 meters’ run in the two study groups; the experimental and the controlling.

To reveal the effect of using vitamin D2 on the level of lactic acid after a 400 meters’ run in the two study groups; the experimental and the controlling.

To compare between the levels of destructive activity of skeletal muscles in terms of lactic acid in the two post tests for the two groups; the experimental and the controlling.

To reveal the effect of vitamin D2 use on the level of 400 meters running achievement for the two groups; the experimental and the controlling.

To compare between the levels of (400 meters) running achievement of the two groups; the experimental and the controlling.

1.4. Hypotheses of the Research

There are significant differences between the levels of destructive activity of skeletal muscles in terms of lactic acid in the pre and post tests for the two groups; the experimental and the controlling.

There are significant differences between the levels of destructive activity of skeletal muscles in terms of lactic acid in the two post tests for the two groups; the experimental and the controlling.
There are significant differences in the time of running completion (400 meters) between the pre and post tests of the two groups; the experimental and the controlling.

There are significant differences in the time of running completion (400 meters) between the two post tests of the two groups; the experimental and the controlling.

1.5. Scope of the Research:

1.5.1. Population the Research

The population of the present study includes a number of young individuals who perform physical activities.

1.5.2. Time

The present study is conducted within the period from December 12, 2019 to December 15, 2019.

1.5.3. Place

The present study is conducted in Classico Stadium, Dr. Redhwan Al-Jammas Lab for histological and pathological examinations, Mosul, Iraq.

I. PROCEDURE OF THE RESEARCH

2.1. Methodology of the Research

The researchers have used the experimental approach. They divided the study sample into two equivalent groups so that they become consistent with the research procedure.

2.2. Sample of the Research

The sample of this research includes a number of 14 young individuals who are selected to represent the team of education for square and field sports. They were purposively selected and, using the draw, they were randomly divided into two groups; experimental and controlling. Each group consists of seven individuals.

2.3. Homogeneity and Equivalence of the Two Samples of the Research

The homogeneity and equivalence of the two samples of the research are tested in the following tables (1) and (2) respectively.

Table (1): Arithmetic Mean, Standard Deviation and Value of Variation Coefficient for the Prescribed Values of Research Samples Homogeneity

<table>
<thead>
<tr>
<th>Variables</th>
<th>Measurement Unit</th>
<th>( \bar{X} \pm P )</th>
<th>Variation Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>Centimeter</td>
<td>171,285 1,380</td>
<td>4,87</td>
</tr>
<tr>
<td>Weight</td>
<td>Kilo Gram</td>
<td>65,428 4,320</td>
<td>9,46</td>
</tr>
<tr>
<td>Age</td>
<td>Year</td>
<td>17,714 0,487</td>
<td>6,96</td>
</tr>
</tbody>
</table>

Table (1) made it clear that all values of variation coefficient for the prescribed values of research samples homogeneity are less than 30%. This indicates the homogeneity of the study samples.
Table (2) made it clear that all probability values of the prescribed variables in the homogeneity of the research samples do not reach the level of significance. This indicates the homogeneity of the two samples; the experimental and the controlling.

2.4. Tools, Equipments and Instruments used in the Research

2.4.2. Tools
- Functional measurements.
- Body (Physical) measurements.
- Physical Tests.
- Scientific Resources.
- Personal Meetings.
- Forms for noting down the functional measurements, the physical tests and the body measurements.

2.4.2. Equipments and Instruments
- (Cobas C311) German product.
- (Cobas 411) German product.
- (Ymato) for measuring weight and length, Japanese product.
- (Delta Trak); an electronic measurement tool for measuring surrounding temperature and relative humidity.
- A number of 56 plastic containers (Caps) for saving blood samples.
- A number of 4 Chinese timer clocks.
- 50 meters long measuring tape (1).
- One computer for statistical processes.
- Plastic poling (4).
- Plastic chairs (10).
- Syringes + gauze + antiseptic + tourniquet.
- One hand calculator (Casio), Chinese product.

2.5. Research Measures
2.5.1. Functional Measures
First: Lab Procedures for Measuring Vitamin D:
The analysis of vitamin D was done after taking blood samples (5 cc) from the individuals. For getting the blood serum, the blood samples were put into the centrifuge. Then the serum was processed in a machine called Cobas e411, from the German company Roche and produced by the Japanese Hitache. It was processed with taking 15 micro-liters of blood serum. The chemiluminescence (CL) was followed. Then the results were rated by certain detectors. This is done for the purpose of getting a close analytical reading and an electronic view of the results.

Second: Lab Procedures for Measuring Lactic Acid:
The analysis of vitamin D was done after taking blood samples (5 cc) from the individuals. For getting the blood serum, the blood samples were put into the centrifuge. Then the serum was processed in a machine called Cobas c311, from the German company Roche and produced by the Japanese Hitache. It was processed with taking 15 micro-liters of blood serum. The chemiluminescence (CL) was followed. Then the results were rated by certain detectors. This is done for the purpose of getting a close analytical reading and an electronic view of the results.

2.5.2. Body Measures
Length and Weight
The length and weight of each individual of the study sample are measured after asking everyone to stand barefooted on the base of a Ymato machine, wearing nothing but his sport short. The length is measured by a metal plate, emplaced on a metal stick, touching the head of the testee. The number at which the plate’s indicator stops represents the testee’s length in centimeter, to the nearest 0.5 centimeter, while the number which appears on the digital screen of the machine represents the weights of the person to the nearest gram.

2.5.3. Physical Tests
Testing the physical effort for running free 400 meters
The researchers conducted their study by adopting anaerobic physical effort test which represents both the dependent and the independent variables of the research. The testees from the two groups; the experimental and the controlling, were asked to do anaerobic physical test; a free run for 400 meters distance. It is a lactic anaerobic muscular physical effort. The farthest tensors were identified and fastened for conducting the physical test for every individual through the pilot experiment. Furthermore, the time and place conditions related to the two main experiments of the research were delimited.

5.3. The Pilot Experiment
The researchers conducted a pilot experiment on Saturday, December 07, 2019 at 10:00am. This experiment aimed to:

- Measure the length, weight and age of all sample individuals.
- Identifying the maximum speed of every testee in running 400 meters. This is done through competitive tests and only for one time for each testee.

6.3. The Main Experiments
6.3.1. The First Main Experiment (Pre-Measurement)
The first main experiment was conducted on Thursday, December 12, 2019 at 09:00am after the assisting team members had taken their places. The names of all members of the experimental and controlling groups were registered in a special form at the site of experiment. The time interval between an individual and another was 3 minutes to control the experiment procedures.

6.3.1.1. Description of the first Main Experiment Procedures
First: Reporting to the 400 meters site of experiment.
Second: A period of 5 minutes is given for relaxation and ambience adaptation.
Third: Taking a blood sample from each individual’s left hand.
Fourth: Preparation and wearing running clothes as per the serial numbers of the testees.
Fifth: Doing a warm-up process for 5 minutes. It includes certain exercises like stretching, flexibility and short run.

Sixth: Starting testing a 400 meters run after the testee stands at the start line. Getting a hint from the referee, the testee starts a slow run. Timing starts from the moment of starting until the testee reaches the final line of 400 meters distance. Then the timer clock is stopped and the duration of running achievement is recorded.

6.3.2. Vitamin D2 Dose
The dose of vitamin D2 (liquid), made by Sothema – Morocco, was given on Saturday, December 14, 2019 at 03:00pm, with a concentration of 600000 international units (1.5 ml). Every individual of the experimental group received an oral ampoule, just 18 hours before starting the second main experiment.

6.3.3. The Second Main Experiment (Post-Measurement)
The second main experiment was conducted on the two groups; the experimental and the controlling, on Sunday, December 15, 2019 at 09:00am, just 18 hours after giving the experimental group testees oral doses of vitamin D2. The same procedures of the first main experiment were followed except the tie of functional measures which were taken after the physical effort.

6.3.3.1. Description of the second Main Experiment Procedures
The same procedures of the pre-measure are followed. However, at this stage, every testee, after completing the running test, was asked to set in a special place for a period of 7 minutes during which a blood sample is taken from his left hand. This is applied on all members of the two groups.

7.3. Points Considered While Conducting the Research
- All sample individuals should be close in age.

- All sample individuals should be from the same locality.

- All sample individuals should be players of futsal at the Classico Stadium, Al-Noor Neighborhood - Mosul.

- The first main experiment was conducted in an air temperature around 18º and 27% humidity.

- The second main experiment was conducted in an air temperature around 17º and 29% humidity.

- The blood samples, in the pre-measure stage, were interrelatedly taken from all testees in the first main experiment after doing the physical effort of 400 meters run for 7 minutes.

- The blood samples, in the post-measure stage, were interrelatedly taken from all testees in the second main experiment after doing the physical effort of 400 meters run for 7 minutes.

- Temperature and humidity were measured for experimental control.

- To ensure the experimental control, the entrance of the sample members was organized. The two main experiments were conducted one after another. The time interval of performing the test, from one individual to another, was 2 minutes.

- The post-experimental procedures of the second main experiment and the two groups were conducted 18 hours later after giving oral vitamin D2 doses exclusively to the experimental group.

- It was confirmed that none of the sample members performed hard physical activities in the previous two days before conducting the two main experiments. This was done to avoid any …on the results of the independent variables.

- The physical tests were conducted on all the sample members under the same spatiotemporal circumstances.

- It was confirmed that all sample members were uninfected by any organic disease or physical injury which would affect the results of the research independent variables.
- It was considered that all sample members should not be champions of run events in order to avoid any side effects on the research independent variables.

- For the sake of experimental control, it was taken into account that all sample members had the same meal 16 hours before conducting the second main experiment.

8.3. Statistical Tools
The statistical software SPSS, version 21, was used for getting results. It was used for finding out the following:
- Arithmetic mean.
- Standard deviation.
- Variation coefficient.
- T-test for linked sampling.
- T-test for independent sampling.
- Pearson correlation coefficient.

II. RESULTS
4.1. Viewing and Discussing the Results of the Effectiveness of Vitamin D2 at the level of the Vitamin after Exposure to an Aerobatic Physical Effort:

Table (3): Arithmetic Means, Standard Deviations, Calculated (t) value and the Level of Probability of Vitamin D between the pretest and the post-test for the experimental and the controlling groups

<table>
<thead>
<tr>
<th>Group</th>
<th>Measure</th>
<th>±X</th>
<th>±P</th>
<th>Calculated (t) Value</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental Group</td>
<td>Pre</td>
<td>23.142</td>
<td>2.734</td>
<td>15.743-</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>Post</td>
<td>38.285</td>
<td>4.386</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Controlling Group</td>
<td>Pre</td>
<td>23.000</td>
<td>2.943</td>
<td>3.357-</td>
<td>0.015</td>
</tr>
<tr>
<td></td>
<td>Post</td>
<td>24.857</td>
<td>2.609</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Relative error ≤ 0.05

Table (3) has shown, through the statistical analysis of the results of measuring vitamin D, that there is a statistical significant difference for the post-test in comparison with the pretest and for the two groups; the experimental and the controlling. The level of probability is 0.000 and 0.015 respectively.

The use of vitamin D and the physical effort of 400 free run have caused a significant increase in the arithmetic mean of vitamin D level for the experimental group. At the same time, only the physical effort caused a significant increase in the arithmetic mean of vitamin D level for the controlling group. The higher level was in favor of the experimental group whose members used doses of vitamin D. The arithmetic mean of the vitamin increased from 23.142 to 38.285 and from 23 to 24.857 for the experimental group and the controlling group respectively.

The researchers attribute this positive change in the arithmetic means of vitamin D to both the use of vitamin D and the anaerobic physical effort as for the experimental group. In case of the controlling group, only the anaerobic physical effort caused such a positive change. This result agrees with the study of Nicolaos et al. (2004) which found that the physical effort of football exercises, including anaerobic efforts like jumping exercises and fast running for strengthening the muscle power, resulted in a significant increase in the level of vitamin D (Nicolaos et al, 2014, 1371-1384). The present study also agreed with (AL-Othman et al, 2012). AL-Othman compared between the levels of vitamin D when the lifestyle of people changed. The researcher proved the existence of a positive relationship between the increase of vitamin D levels and the physical activity when it was compared with those who did not perform any physical activity. That is, the physical activity helped in increasing the level of vitamin D in those who practice sport activities in comparison with those who don’t
practice such activities (Al-Othman et al., 2012, 1471-2431). Another study in this regard was conducted by Younis (2017) which found that the increase of vitamin D level after a 400 run was attributed to the increase of the parathormone. According to this study, the hormone of parathormone stimulated the increase of the activation rates and the phase transformations of hydroxycholecalciferol-25 to dihydroxycholecalciferol-25.1 which is the overall effective formula of the vitamin (Younis 2017).

The researchers add that the use of vitamin D would be much beneficial especially for those whose levels of vitamin D are below the normal level. In this regard, a study was conducted by (Książek et al. 2019, 1800-1812). This study emphasized that the use of vitamin D supplements positively strengthened the skeletal muscles through the functional strengthening of mitochondria on one hand and through reducing the state of myotrophy on the other. A significant statistical improvement in the upper limbs and lower limbs muscles was noticed in women. Moreover, the same study pointed out that the individuals who suffered from a decrease in the levels of vitamin D, below the normal level, benefited more from vitamin D supplements which positively affected the functions of the skeletal muscles in comparison with those whose vitamin D levels were so high (Książek et al. 2019, 1800-1812).

4.2. Comparing and Discussing the Results of the Efficiency of using Vitamin D at the Vitamin Level between the two Post Tests

Table (4): Arithmetic Mean, Standard Deviation, Calculated (t) Value and Probability Level of Vitamin D Variable between the two Post Tests for the two Groups; the Experimental and the Controlling Group

<table>
<thead>
<tr>
<th>Group</th>
<th>Measure</th>
<th>±X</th>
<th>±P</th>
<th>Calculated (t) Value</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental</td>
<td>Post</td>
<td>38.285</td>
<td>4.386</td>
<td>6.961</td>
<td>0.55</td>
</tr>
<tr>
<td>Controlling</td>
<td>Post</td>
<td>24.857</td>
<td>2.609</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Relative error ≤ 0.05

Table (4) has shown, through the statistical analysis of the results of comparing the post measures of vitamin D, that there is a statistical insignificant difference between the two groups; the experimental and the controlling. The experimental group, whose members received vitamin D doses, enjoyed higher arithmetic mean.

The researchers attribute such an insignificant statistical difference between the two groups to the possibility of low change between the two groups. It is also believed that the use of one dose of vitamin D by the experimental group was not enough to reveal the significance of differences between the post measures. Moreover, the limited time period given for testing the efficiency of using one dose of vitamin D, around 18 hours, contributed to bringing about the insignificant of differences. Regardless of this result, the use of one dose of vitamin D brought about an increase in the mean of vitamin D3. Further, the experimental group had a higher level of vitamin D3 than that of the controlling group; 38.285 and 24.857 respectively. Such an increase in the vitamin level in the experimental group helped in improving the functional efficiency of the muscular tissue as well as in reducing the disruptive level muscles with reference to the lactic acid in blood, with a higher level than it was found in the controlling group. The results of the present study, as it is shown in table (5), prove the researchers’ reasoning. That is, the post measures reflected that the experimental group had a lower increase in the level of lactic acid when it was compared with the controlling group; 11.857 and 14.857 respectively.

4.3. Viewing and Discussing the Results of Vitamin D Efficiency in the level of Disruptive Activity of Skeletal Muscles upon Exposure to anaerobic physical effort

Table (5): Arithmetic Means, Standard Deviations, Calculated (t) Value and Probability Level of Lactic Acid (LA) between the Pretest and the Post Test for the two Groups; the Experimental and the Controlling Groups
Table (5) has shown, through the statistical analysis of the results of measuring lactic acid (LA), that there is a significant statistical difference for the pretest in comparison with the post-test and for the two groups; the experimental and the controlling groups. The level of probability is 0.000 and 0.000 respectively.

The researchers attribute this significant statistical difference between the pretest and the post test, for both groups, to the anaerobic physical effort of 400 meters run which increased the levels of arithmetic means of lactic acid in the experimental group and the controlling group; from 1.814 to 11.857 and from 1.800 to 14.857 respectively. This kind of physical effort highly stimulates the tissues of skeletal muscles of the whole body in general and the lower limbs in particular. Such muscles are important in sports of running since the nature of this physical effort demands full physical performance. It forces all muscles to resist the shift of the body for a distance of 400 meters, as per the action and reaction law, during a period of 70 seconds. This physical effort stimulated the moving units of the working muscles through their fast centralized and decentralized systoles which brought about an increase in the disruptive rates of the stimulated muscles tissues. This was emphasized in Bishop’s study (2012). According to this study, running exercises helped in increasing the level of some muscular cells outputs in blood as indications of muscular disruption (Bishop 2012, 836-41).

This reasoning is also noticed in (Manojlovic and Erculj 2019) who stated that the myotility in general and the central contracture in particular caused muscular pains which coincide with an increase in the level of skeletal muscles disruptive signs, as a result of the physical effort. Such an increase of disruptive signs was accompanied by an increase in the level of lactic acid. The increase of the concentration of lactic acid in blood after accomplishing a physical effort means an increase of the muscular disruptive signs in the sample members. The researchers suggested that lactic acid should be adopted as a sign of muscular disruption increase upon exposure to high physical effort (Manojlovic and Erculj 2019, 581-586).

4.4. Viewing and Discussing the Results of Comparing the Efficiency of using Vitamin D in the Muscular Disruptive Activity Level between the two Post Tests

Table (6) has shown, through the statistical analysis of the results of comparing the post measures of lactic acid (LA), that there is a significant statistical difference between the two groups. This statistical difference goes for the experimental group. The level of probability is 0.002.

As it is noticed in table (6), the concentration of lactic acid is increased in the post, comparably with the pretest of the controlling group. That is, the controlling group reflected a higher level of lactic acid than that of the
experimental group. Moreover, the concentration mean of LA for the controlling group and the experimental group was 14.857 and 11.857 respectively.

The researchers attribute the existence of such significant statistical differences of the post-measures, concerning the level of lactic acid in the two groups, to the dependent variable of the study. The experimental group’s use of vitamin D dose 18 hours before conducting the main experiment helped in reducing the level of lactic acid which would be increased as a result of the anaerobic physical effort. It eliminated the increase of disruption caused by the 400 meters run at the level of working muscles during the physical effort of the experimental group; 3 millimoles less than the controlling group whose members didn’t use vitamin D. What supports this reasoning is the relative improvement of the experimental group concerning the time of accomplishing the 400 run in the posttest, comparably with the controlling group. As it will be seen in table (7), the mean running time of the experimental group and the controlling group, for 400 meters, is 1.07 and 1.10 respectively. It is also supported by the little increase in the lactic acid variable in favor of the experimental group. It was emphasized by Ferrington et al., (2016) that the level of vitamin D in the body is strongly associated with the function of the skeletal muscles and the physical exercises that cause inflammation. That is, the deficit of vitamin D is associated with the increase in the disruptive outputs at the level of the skeletal muscles, causing muscle weakness and functional performance decline at the level of contraction unit (Ferrington et al., 2016, 1128-1136).

Another study conducted by Segila (2009) added that the use of vitamin D activated the initial lines of the cellular construction in the skeletal muscles (myogenesis). Besides, it increased the level of protein and its growth within the cells (Seglia, 2009, 628-633). As it was also found in (Książek et al., 2019), the use of vitamin D supplements by the sportsmen obviously helped in strengthening their skeletal muscles and their physical capabilities to exercise in a better way (Książek et al., 2019, 1800-1812). In this connection, a study was conducted by Larson et al. (2013) in which the researchers made it clear that preserving the stability of vitamin D at a level more than (30) nanograms may reduce the damage of tissues upon exposure to physical effort. This will strengthen muscle functions and reduce the inflammations in the whole body. Moreover, the dose of vitamin D is a positive effective factor for the health of sportsmen in general as well as for the training efficiency and the physical performance in particular (Larson et al., 2013, 109-121).

4.5. Viewing and Discussing the Results of the Efficiency of using Vitamin D in the level of physical effort for a 400 Meters Run

<table>
<thead>
<tr>
<th>Group</th>
<th>Measurement unit</th>
<th>±X</th>
<th>±P</th>
<th>Calculated (t) Value</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental</td>
<td>Pre</td>
<td>1.1</td>
<td>0.033</td>
<td>2.025</td>
<td>0.089</td>
</tr>
<tr>
<td></td>
<td>Post</td>
<td>1.07</td>
<td>0.048</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Controlling</td>
<td>Pre</td>
<td>1.10</td>
<td>0.035</td>
<td></td>
<td>0.356</td>
</tr>
<tr>
<td></td>
<td>Post</td>
<td>0.033</td>
<td>1.10</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Relative error ≤ 0.05

Through the statistical analysis of the results of measuring the time of achieving a 400 meters run, table (7) has shown that there are insignificant statistical differences between the pretest and the posttest for both the experimental group and the controlling group. The level of probability is 0.089 and 0.356 respectively.

It has become clear from table (7) that there is an insignificant statistical change in favor of the experimental group, comparably with the controlling group, and that the level of probability is 0.08 and 0.35 respectively. The researchers attribute such an insignificant statistical difference in the accomplishment time of 400 run between the pretest and the posttest, for both groups, to the possibility of change littleness in running 400 meters. That is, the existence of a significant difference, for such efforts, between the arithmetic means of the pretest and the post test is not only exclusive to the effect of a nutritional factor, but it needs prescribed training physical sessions in the sense that such training sessions are characterized by their high intensity and performed within a short period of time. However, giving a dose of vitamin D to the experimental group resulted in a better functional and
physical improvement than that of the controlling group, regardless of its smallness and the shortness of its effect period.

The increase of vitamin D arithmetic mean in the experimental group, from 23.142 to 38.285, is associated with an improvement in the 400 meters run time which is shortened from 1.10s to 1.07s. This is better than that of the controlling group whose members did not use vitamin D doses. In the controlling group, the level of vitamin D is increased only due to the physical effort, at a lower level comparably with the experimental group. This is the reason why the 400 meters run time for this group remains at 1.10s and it is not improved. Moreover, the non-improvement of the controlling group’s accomplishment is associated with an increase in the level of disruption, concerning LA which increased by 3 millimoles. This LA level is higher than that of the experimental group; 14.857 and 11.857 respectively.

This result is supported by the study of (Książek et al. 2019) which stated that it has become clear that the effects of vitamin D on the functions of the skeletal muscles are evident in the increase of the protein structure and the cellular abundance of the skeletal muscles. It is also evident in the increasing rate of calcium and phosphate transmission through the membranes of muscles cells. The data of the study revealed that the deficit of vitamin D has negative effects on the efficiency of muscles’ function. This is evident in the reduced size of the secondary muscles’ fibers. This has weakened the performance of the skeletal muscles. On the other hand, the use of vitamin D supplements increased the size of the muscular fibers, resulting in an increase of vitamin D receptors within the muscular cells, especially the secondary fibers (Książek et al. 2019, 1800-1812). This point is similar to the results of (Girgis et al., 2013) which found out that the weakness of the skeletal muscles was associated with muscular atrophy and negative changes in the morphology of such muscles in the case of adults. These two symptoms were associated with the deficit of vitamin D (Girgis et al., 2013, 33-83). In this regard, Nikolaos et al. (2016) made it clear that muscles are one of the main targets of vitamin D. That is, vitamin D stimulates the copying factors within the muscular cells, resulting in a growth of the muscular fiber tissues especially the secondary muscular cells (IIA). At the same time, vitamin D eliminates the production of myostatin that acts negatively on muscle cells. The researcher added that the deficit of vitamin D caused myotrophy (IIA). Moreover, using vitamin D supplements by males was strongly associated with the efficiency of physical exercises performance in youths. This was the result of the producing power and the neuro-muscular order efficiency (Nikolaos et al., 2016, 471-488).

6.4. Viewing and Discussing the Results of Comparison between the two Posttests concerning the Efficiency of using Vitamin D on the Level of Physical Achievement of 400 Meters Free Run

Table (8): Arithmetic Mean, Standard Deviation, Calculated (t) Value and Probability Level of the two posttests for the two Groups; the Experimental and the Controlling Groups, for the time of accomplishing a 400 free run

<table>
<thead>
<tr>
<th>Group</th>
<th>Variable (Run)</th>
<th>Measure</th>
<th>±X</th>
<th>±P</th>
<th>Calculated (t) Value</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental Group</td>
<td>400</td>
<td>Post</td>
<td>1.07</td>
<td>0.048</td>
<td>1.145-</td>
<td>0.274</td>
</tr>
<tr>
<td>Controlling Group</td>
<td>400</td>
<td>Post</td>
<td>1.10</td>
<td>0.033</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Relative error ≤ 0.05

Through the statistical analysis of the results of comparing the post measures of a 400 meters run, table (8) has shown that there is no statistical difference between the experimental group and the controlling group concerning time. The level of probability is 0.274. The researchers attribute the nonexistence of any significant differences to the possibility of the decrease in the size of the statistical differences between the pretest and the posttest concerning the 400 meters time run for both groups. According to the researchers, such a decrease in the size of statistical differences was responsible for the disappearance of significant differences between the two posttests. They added that the nonexistence of the significant statistical differences between the arithmetic means of the posttests, concerning the physical effort of 400 meters run, was attributed to what was already accounted for in
According to this table, one vitamin D dose as well as the limited time of its effect was not enough for bringing about significant statistical differences between the two groups in the two posttests. Yet there was a statistical advantage around three tenths of a second, in the results of the post test, for the experimental group comparably with the controlling group. This number is, according to such physical efforts and the experts’ views, an obvious achievement. Noteworthy, this improvement in the 400 meters time run has been associated with the lower increase of the disruptive sign of the lower limbs working muscles, concerning the lactic acid (LA), with an average of 3 millimoles in favor of the experimental group. The concentration mean of LA in the experimental group was 11.857, while it was 14.857 in the controlling group. This is attributed to the use of vitamin D supplement by the experimental group. As it was mentioned by (Mirian et al., 2020), the use of vitamin D has a positive effect on the skeletal muscles and the immunity functions for sportspeople as it improves their physical performance and reduces the level of future injuries (579).

III. FINDINGS AND SUGGESTIONS

5.1. Findings

5.1.1 Giving vitamin D2 to the members of the experimental group has helped in increasing the level of vitamin D3, with a higher average than that of the controlling group, upon exposure to the physical effort of 400 meters run.

5.1.2. The intensity of muscular tissue disruptive activity, concerning the lactic acid in the first group whose members received vitamin D upon exposure to 400 meters run, has been increased comparably with the controlling group.

5.1.3. There emerges an advantage in the accomplishment of 400 meters run for the experimental group comparably with the controlling group.

5.2. Suggestions

5.2.1. Making benefit from the results of the present study by adopting its achieved results and data to be employed in the training field.

5.2.2. Adopting lactic acid as an expressive factor of 400 meters run achievement efficiency.

5.2.3. Conducting relevant studies by focusing on the change, multiplicity and intensity of physical activities regardless of other nutritional supplements.

Arabic and English Sources

Arabic Sources


ENGLISH SOURCES


