Muscular balance of the upper limb and trunk and its relation to the performance of certain skills in gymnastic

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Abstract

The importance of research lies in determining amount of strength between the muscles as well as muscular balance between the both limbs of the player and the one limb and between the trunk and abdomen and the importance of research in identifying an important aspect and attention toward the distribution of nerve signals between the limbs of the body and between working and counteracting muscles, the search problem summarized is that most trainers train some muscles with more attention than other muscles such as agonist or antagonistic muscles and this affects the muscular balance especially between the agonist muscles in the performance of the athlete, which makes the performance and the movement do not go smoothly correctly. The aim of the research was to identify the correlation value between muscle strength of the limbs and the balance of the limbs of the body and the skill of jumping the hands and jump the hands on the jumping platform.

The research community included Al-Qadisiyah University’s players in Gymnastics for the academic year (2017-2018). There were 10 players representing the research sample.

Photography of technical performance of skills

1- Evaluation of the performance of the hand jump.
2- Evaluation the performance of the jump of the hands on the jumping platform.

The researchers photographed the players when the two skills were performed on the gymnasium hall and then the video was shown on experts and specialists in the Gymnastics field and the tests were then conducted to evaluate the muscle strength of the body parts as follows:
1- Biceps muscles of the arm (right, left)
2- Half Squat muscles of the arm(right ,left)
3-Muscles of abdominal flexion
4-Muscles stretching back

Data were statistically processed by extracting the value of the correlation coefficient between the variables of the study and through it we can conclude the following:
1 - All the muscles of the players of the University of Qadisiyah (under study) in Gymnastic balanced whether between the left and right limbs or one limb of the body (Biceps - Half Squat) as well as the muscles of the trunk.
2-The strength of the back muscles have a big role in the performance of the skill of the hand jump in the players of the University of Qadisiyah team in Gymnastic.

Key words: muscular, balance, gymnastic, skills


1. Introduction and importance of research

The world has been witnessed especially in the recent times , progress in various areas where scientific research has become one of the most important necessities of our modern society in all aspects of life to reach the highest levels, especially the sports side in an attempt to achieve the greatest possible benefit from the development of science, which contributed to achieve high achievements and break the numbers and the beauty of performance and its speed and one of these sciences is the science of
sports training, which has seen great progress in recent years where the efforts of specialists and those interested in this field have doubled to search for the best ways and means of training to develop the physical and technical level of skills, especially in the game of Gymnastics. This sport in which muscle strength and balance play a major role in the technical performance and score points significantly including the jump of the hands and the jump of hands on the jumping platform whereas the muscular strength of the arms as well as has a big role as the force of the trunk muscles to perform this skill most trainers do not care about the balance of muscular strength in the limbs of the body whether between the muscles of one limb (biceps and half aquat muscles) or between the left and right limbs of the body thus, any defect in the work of these muscles can be the main cause of lack of proper technical performance also the balance between the muscles of the abdomen and back has great importance in achieving the correct technical performance here lies the importance of research in identifying the strengths of muscles as well as muscle balance between the limbs of the player and one limb and between the trunk and abdomen and the importance of research in the identification of an important aspect and attention towards the distribution of nerve signals between the limbs of the body, and between agonist and antagonistic muscles

2.1 Research problem:

Most trainers train some muscles with more attention than other muscles, such as agonist or antagonistic muscles and this affects the muscular balance especially between the agonist muscles in the technical performance of the athlete which makes the performance and the movement do not move smoothly and correctly and this may cause weakness in the technical performance of the skill and lose the muscle balance of the player. Therefore, the researchers wanted to go into this problem and recognize the value of the balance between the agonists muscles and antagonists of the players and their relationship with the skills of the hand jump on the floor and movements of hands on the jump platform.

1-3 Research Objectives

1- Identify the values of muscular balance between one limb (agonists and antagonists muscles) and between the limbs of the body (right agonists and left agonists) (left antagonists and right antagonists).
2- Evaluation of the technical performance of the skills of the hand jump and the jump hands on the jumping platform for the players of the University of Qadisiyah in Gymnastics.
3- Identify the value of the association between the muscular strength of the limbs and the balance of the body's limbs and the skill of jumping hands and jumping hands on the jumping platform.

1-4 Research hypotheses

1- The muscle balance of the trunk has a big role in the technical performance of the skill of jumping hands.
2. There is a strong correlation between the muscular balance of the arms and the skill of jumping hands on the jump platform.

1-5 Research areas

1-5-2 Spatial domain: Gymnasium Hall at the college of Physical Education and Sports Sciences University of Qadisiyah.
1-5-3 Human domain: Players of Al-Qadisiyah University team in Gymnastics.

3. Research methodology and field procedures

3.1 Research Methodology
The researchers used the descriptive method in the survey method because of its suitability in solving the problem of research.\(^1\)

### 3.2 Research community

The research community included Al-Qadisiyah University's players in Gymnastics for the academic year (2017-2018). There were 10 players representing the research sample.

#### 3-2-1 homogeneity:

The homogeneity of the sample and the calculation of the difference coefficient were performed for the purpose of adjusting variables (length, weight, age, performance evaluation of the two skills under study), as shown in Table (1).

**Table (1): Shows the value of the arithmetic mean, the standard deviation and the value of the difference coefficient between the individuals of the research sample.**

<table>
<thead>
<tr>
<th>No</th>
<th>Variables</th>
<th>Arithmetic mean</th>
<th>standard deviation</th>
<th>Difference coefficient%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Length</td>
<td>171.22</td>
<td>1.02</td>
<td>0.59</td>
</tr>
<tr>
<td>2</td>
<td>weight</td>
<td>66.400</td>
<td>3.200</td>
<td>4.81</td>
</tr>
<tr>
<td>3</td>
<td>Age</td>
<td>23</td>
<td>1.50</td>
<td>6.52</td>
</tr>
<tr>
<td>4</td>
<td>Performance evaluation of the hand jump</td>
<td>7.07</td>
<td>0.84</td>
<td>11.88</td>
</tr>
<tr>
<td>5</td>
<td>Performance evaluation of the jump of the hands on the jumping platform</td>
<td>6.31</td>
<td>0.66</td>
<td>10.45</td>
</tr>
</tbody>
</table>

### 3.3 Means of gathering information and devices used

#### 3.3.1 Means of information collection

1-Personal interviews and expert opinion.
2-Observation and analysis
3-Software and applications used in computers (Excel, format factory, Kinovea-0.8.26-win32_3)

#### 3.3.2 Tools and devices used

1-Fast Video Camera number (2).
2-A modern computer
3-Metric measuring tape and medical balance
4-Watches timing number(2)
5-Ground movements device and the device of Jumping platform.
6-Multi-purpose dynamometer (150 kg)
3.4 Field research procedures

3.4.1 Reconnaissance Experiment:

The reconnaissance experiment was conducted on Wednesday, 28/2/2018 on a sample of four students outside the sample, at 10 o'clock in the morning and at the Gymnasium Hall in the college of Physical Education and Sports Sciences / University of Qadisiyah, for the purpose of identifying the obstacles that may face the work of the researcher. The aim of the exploratory experiment was to ascertain the following matters:

- The efficiency of cameras
- Identify the dimensions of the cameras for the player site to show full movement.
- Recognize the height of the cameras from the ground level.
- Ensure the efficiency of the assistant work force.

3.4.2 Main experiment

3.4.2.1 Pre-Tests:

The pre-test of the research sample was conducted on Sunday, 4/3/2018, at 9:00 am in the gymnasium hall in the college of Physical Education and Sports Sciences / Al Qadisiyah University.

First: portray the artistic performance of my skill

1- Evaluation of the performance of the hand jump.
2- Performance evaluation of the jump of the hands on the jumping platform. The researchers filmed the players when performing the skills in the gymnasium hall and then the videotape was shown on experts and specialists in the Gymnastic field. The skill were measured from (10 degrees).

Second: physical tests

The tests were conducted to evaluate the muscle strength of the body parts as follows:

1- Biceps muscles of the arm (right, left)
2- Half Squat muscles of the arm(right ,left)
3- Muscles of abdominal flexion
4- Muscles stretching back

3.5 Statistical means

To identify the results of the sample of the study, the researchers used in the extraction of the results of all tests, the statistical package of social sciences (SPSS), extracted through the following statistical means:

1- The arithmetic mean
2- Standard Deviations
3- Percentage
4- Simple correlation coefficient Pearson
5- Difference coefficient

4- Presentation, analysis and discussion of results
Table (2): The arithmetic mean and standard deviations of the research variables under study are shown by using the dynamometer.

<table>
<thead>
<tr>
<th>No</th>
<th>Variables</th>
<th>Measuring Unit</th>
<th>SMA</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Strength of abdominal muscles</td>
<td>Newton</td>
<td>38.43</td>
<td>3.10</td>
</tr>
<tr>
<td>2</td>
<td>Strength of back muscles</td>
<td></td>
<td>33.86</td>
<td>3.67</td>
</tr>
<tr>
<td>3</td>
<td>Strength of muscles bend arm left</td>
<td></td>
<td>23.50</td>
<td>1.71</td>
</tr>
<tr>
<td>4</td>
<td>Strength of muscles bend arm right</td>
<td></td>
<td>26.29</td>
<td>1.11</td>
</tr>
<tr>
<td>5</td>
<td>Strength of the Biceps muscles for the left arm</td>
<td></td>
<td>19.93</td>
<td>1.17</td>
</tr>
<tr>
<td>6</td>
<td>Strength of the Biceps muscles for the right arm</td>
<td></td>
<td>21.57</td>
<td>0.79</td>
</tr>
<tr>
<td>7</td>
<td>Technical performance of the hand jump</td>
<td>Degree</td>
<td>7.07</td>
<td>0.84</td>
</tr>
<tr>
<td>8</td>
<td>the jump of the hands on the jumping platform</td>
<td></td>
<td>6.31</td>
<td>0.66</td>
</tr>
</tbody>
</table>

Table (3): It shows the arithmetic and the percentage between the muscles of the biceps and the half squat muscles at the one limb that participate in the performance.

<table>
<thead>
<tr>
<th>No</th>
<th>Variables</th>
<th>Biceps muscles</th>
<th>Half Squat muscles</th>
<th>Muscular balance</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Strength of trunk muscles</td>
<td>33.86</td>
<td>38.43</td>
<td>88.10</td>
<td>11.90</td>
</tr>
<tr>
<td>2</td>
<td>Strength of left arm muscles</td>
<td>19.93</td>
<td>23.50</td>
<td>84.80</td>
<td>15.20</td>
</tr>
<tr>
<td>3</td>
<td>Strength of eight arm muscles</td>
<td>21.57</td>
<td>26.29</td>
<td>82.07</td>
<td>17.93</td>
</tr>
</tbody>
</table>
The above table shows the muscular balance between the strength of the back and abdomen muscles and the balance value (88.10). The muscular balance between the biceps and the half squat muscles for the left arm muscles was (84.80) either The muscular balance between the biceps and the half squat muscles for the right arm muscles reached (82.07) which confirms that all the muscles involved in the performance of the players of the university team in Gymnastics in a serious balance when the balance is greater than the proportion of the estimated (80%) and this confirms that the muscles balanced where (Abu Ela Hamad Abdel Fattah 1997) that "Muscular balance is the strength, ability, tolerance or lengthening of a muscle or muscle group for a muscle or other muscle group “he also mentions that” muscular balance is the strength of one muscle or muscle group and its relative relationship to another muscle or group and often expresses the muscular balance of the relative limits of muscle strength (2)."

Table (4): Explains the arithmetic and the percentage between the two limbs of the body (Biceps-Biceps) and Half Squat-Half Squat that participated in the performance of the two skills.

<table>
<thead>
<tr>
<th>No</th>
<th>Variables</th>
<th>Right</th>
<th>Left</th>
<th>Muscular balance</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>SMA</td>
<td>SD</td>
<td>SMA</td>
<td>SD</td>
</tr>
<tr>
<td>1</td>
<td>Biceps muscles of the arm</td>
<td>26.29</td>
<td>1.11</td>
<td>23.50</td>
<td>1.71</td>
</tr>
<tr>
<td>2</td>
<td>Half Squat muscles of the arm</td>
<td>21.57</td>
<td>0.79</td>
<td>19.93</td>
<td>1.17</td>
</tr>
</tbody>
</table>

The above table shows the muscular balance between the strength of the half squat muscles of the left and right body limbs, and the balance value was (89.40) while the muscular balance between the biceps muscles for the right and left limbs of the body reached (92.38) Which confirms that all the muscles involved in the performance of the players of the university team in the Gymnastics balanced muscle between the limbs of the body because the measurement of the strength of their muscles according to the prescribed ratios (90%) and this confirms that the muscles balanced Where (Mackenzie Mackenzie 2007 m) sees that "This balance is an important factor for the player's skill during performance and there is parity of muscle strength between the agonists muscles and the antagonists muscle groups to ensure that it helps to meet the requirements of technical performance, especially those that require high strength such as gymnastic skills."

Table (5): Shows the correlation between the variables under study and the performance of the hand jump and the jump of the hands on the jumping device.

<table>
<thead>
<tr>
<th>No</th>
<th>Variables</th>
<th>Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>hand Jump</td>
</tr>
</tbody>
</table>

Abu Alaa Ahmed Abdel Fattah: a source previously mentioned, p.146
Mackenzie: How to test your strength and muscular balance. Sport coach1 2007. paje 1
<table>
<thead>
<tr>
<th></th>
<th>Muscle Description</th>
<th>Correlation</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Strength of abdominal muscles</td>
<td>0.15</td>
<td>-0.15</td>
</tr>
<tr>
<td>2</td>
<td>Strength of back muscles</td>
<td>0.71</td>
<td>0.83</td>
</tr>
<tr>
<td>3</td>
<td>Strength of half squat muscles for the left arm</td>
<td>0.61</td>
<td>0.14</td>
</tr>
<tr>
<td>4</td>
<td>Strength of half squat muscles for the right arm</td>
<td>-0.56</td>
<td>0.94</td>
</tr>
<tr>
<td>5</td>
<td>Strength of the biceps muscles for the left arm</td>
<td>0.60</td>
<td>-0.49</td>
</tr>
<tr>
<td>6</td>
<td>Strength of the biceps muscles for the right arm</td>
<td>-0.07</td>
<td>-0.24</td>
</tr>
</tbody>
</table>

The above table shows the correlation between the strength of some agonists muscles in the trunk and the arms and the skill of the hand jump where most of correlation were weak (strength of the muscles of the abdomen, the strength of the half squat muscle for the right arm, the strength of the biceps muscle for the right arm, the strength of the biceps muscles for the left arm) the strength of the back muscles was a significant correlation and good reached (0.71) which underlines the importance of the strength of the back muscles in this skill which plays a big role especially when the technical level is high, performance requirements increase after the body is wrapped around the axle and this erection in the trunk contributes significantly back muscles this is confirmed by (Foud Suleiman, 1989) that the improvement of any technical performance in the Gymnastic game there must be muscles contribute significantly to the success of this performance and will be meaningful and effective in its success.4

Table (5) shows the correlation between the strength of some agonists muscles in the trunk and arms and the skill of jumping of the hands on the jumping platform. The most weak correlation were (strength of abdominal muscle, strength of half squat muscle for the left arm, strength of biceps muscle for the right arm, strength of biceps muscle for the left arm). The strength of the back muscles was a significant correlation and good reached (0.83) and the strength of the half squat muscle of the right arm was (0.94) which confirms the importance of the strength of the back muscles in this skill, so trainers should pay attention to these muscles greatly because of their role in this great skill and this is confirmed by (KassemLezam ,2005) the technical performance of any skill if the physical elements supporting for this performance will improve significantly and that individuals who have the physical elements supporting for this technical performance, they get the development and success of performance, which increase this development experience on performance correctly and repeatedly5

The training path must always be corrected from one training period to another to find and maintain balance between muscle groups for its importance in maintaining and conserving muscle injury and meet skill requirements efficiently and without reaching the balance of muscle well according to the prescribed ratios, which confirmed in most research to be between biceps muscles and the half squat muscle(80%) of the strongest muscle and 90% between the left and right limbs of the body, which the limb the player is used to6.

5) George Dintiman, Rob ward :sports speed (third edition) human kinetic , 2003 , page 8-150
6) QasamLezam: topics in dynamic learning, Dar Al-Qalam for publication and distribution, Baghdad, Edition 1, 2005, p56

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Table (6): Shows the percentage of the balance between the muscles of the biceps and half squat in the one limb participating in the performance and the correlation coefficient with the skill of the jump of hand

<table>
<thead>
<tr>
<th>No</th>
<th>Variables</th>
<th>Muscular balance</th>
<th>Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>percentage</td>
<td>differential</td>
</tr>
<tr>
<td>1</td>
<td>Strength of trunk muscles (abdomen - back)</td>
<td>88.10</td>
<td>11.90</td>
</tr>
<tr>
<td>2</td>
<td>Strength of left arm muscles (biceps - half squat)</td>
<td>84.80</td>
<td>15.20</td>
</tr>
<tr>
<td>3</td>
<td>Strength of right arm muscles (biceps - half squat)</td>
<td>82.07</td>
<td>17.93</td>
</tr>
</tbody>
</table>

The muscular balance of the limbs of the body (right - left) (Biceps- Biceps) and (Half Squat- Half Squat)

<table>
<thead>
<tr>
<th>No</th>
<th>Variables</th>
<th>Muscular balance</th>
<th>Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>percentage</td>
<td>differential</td>
</tr>
<tr>
<td>1</td>
<td>strength of biceps muscle of the arm (left-right)</td>
<td>92.37</td>
<td>4.01</td>
</tr>
<tr>
<td>2</td>
<td>strength of half squat muscle of the arm (left-right)</td>
<td>89.54</td>
<td>7.36</td>
</tr>
</tbody>
</table>

Table (6) above shows the correlation between the strength of the right arm muscles (biceps - half squat) and this skill has a weak correlation relationship (0.34).

The value of the correlation between the skill of the hand jump and the muscular balance of the agonists muscles in this skill was the correlation between the muscular balance (abdomen - back) was large (0.95) the correlation between the strength of the left arm muscles (biceps - half squat) was also significant and reached (0.80) and this emphasizes the importance of balance especially between the strength of the abdominal muscles and back to perform this skill as the nature of performance. The muscular balance of the agonists muscles on the arms, especially the biceps, the correlation value was (0.88) it is a high correlation value which emphasizes the importance of the biceps muscles of the arm in this skill where the bending before the jump helps to generate a driving force to the body by stretching muscles and this confirms the importance of the strength of the biceps muscles of the arms in the success of this skill and because the muscles of the biceps of the arms act as a unit with the half squat muscle of the arms and therefore appeared to have a correlation of significant (0.80) with this skill as “muscle strength must form a large part of the training program in general, and the training module in particular because it helps to develop the achievement especially in events that require high...
amounts of muscle strength especially gymnastic activities and skills that require a quick and strong change of body conditions.  

Table (7): Shows the percentage of the balance between the muscles of the biceps and half squat muscles that participate in the performance and the coefficient of their association skillfully and perform a jump on the jumping platform.

<table>
<thead>
<tr>
<th>No</th>
<th>Variables</th>
<th>Muscular balance</th>
<th>Correlation percentage</th>
<th>Correlation differential</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Strength of trunk muscles (abdomen - back)</td>
<td>88.10</td>
<td>11.90</td>
<td>0.80</td>
</tr>
<tr>
<td>2</td>
<td>Strength of left arm muscles (Biceps - Half Squat)</td>
<td>84.80</td>
<td>15.20</td>
<td>0.90</td>
</tr>
<tr>
<td>3</td>
<td>Strength of right arm muscles (Biceps - Half Squat)</td>
<td>82.07</td>
<td>17.93</td>
<td>0.99</td>
</tr>
</tbody>
</table>

As shown in the table above the correlation between the skill of the hand jump and the muscular balance of the agonists muscles in this skill the correlation between muscular balance (abdomen - back) was significant and reached (0.80) the correlation between the strength of the arms of the right arm (Biceps - Half Squat) and the correlation relationship was weak (0.99) and the correlation between the strength of the left arm muscles (Biceps - Half Squat) was also strong and reached (0.90). This emphasizes the importance of balance especially between the strength of the abdominal muscles and back to perform this skill as the nature of performance…. The muscular balance of the agonists muscles on the arms, especially the biceps, the correlation value was (0.88) it is a high correlation value which emphasizes the importance of the biceps muscle of the arm in this skill where the flexion that exists before the jump helps to generate the momentum of the body by stretching muscles and this confirms the importance of the strength of the biceps muscles for the arms in the success of this skill and because the biceps muscles of the arms act as a unit with the half squat muscles of the arms therefore, a significant correlation was found reached (0.80) with this skill as "muscle strength must form a large part of the training program in general, and the training module in particular because it helps to develop the achievement, especially in activities that require high amounts of muscle strength, especially the activities of the gymnastics and skills that require changing the body conditions quickly.

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In general, the basis for the work of these receptors is the form of permanent contractions and contractions of the two types (prolonged - default) and either before the other and each muscle group before the other.

Conclusions and recommendations

5.1 Conclusions
3-All the muscles of the players of the University of Qadisiyah (under study) in Gymnastics balanced whether between the left and right limbs or one limb (Biceps - Half Squat) as well as the muscles of the trunk.
4-The strength of the back muscles has a big role in the performance of the skill of jumping players hands from the University of Qadisiyah in Gymnastics.
5-The strength of the muscles of the back and the strength of the half squat muscle of the right arm has a big role in the performance of the skill of jumping hands on the jump platform of the players of the University of Qadisiyah in Gymnastics.
6-Balance the strength of the trunk muscles (abdomen - back) and balance the left arm muscles (Biceps - Half Squat) has a significant role in the performance of the skill of the hand jump in the players of the University of Qadisiyah in Gymnastics.
7-Balance the strength of the right arm (Biceps - Half Squat) and the balance of the strength of the muscles left arm (Biceps - Half Squat) has a significant role in the performance of the skill of jumping hands on the jump platform in the players of the University of Qadisiyah.
8-While the balance of one limb, the strength of the biceps muscles of the arm (left-right) has a big role in the performance of the skill of jumping hands on the jump platform in the players of the University of Qadisiyah team in Gymnastics.

5.2 Recommendations
1-Attention to muscle strength because of its significant role in the performance of the skills of gymnastics, especially the skills of the hands jump and the hands jump on the jumping platform.
2-Attention to the muscular balance of the muscles of the body especially trunk muscles (abdomen - back) because of its significant role in the performance of these skills under study.
3-Attention to the strength of the muscular balance of the strength of the muscles of the limbs (one limb outstretched - and bending muscles) and the left and right limb of the biceps and half squat because of its significant role in improving the results of muscle strength and performance skills under study.


9Akram Hussein Jabr Al-Janabi and Ali Abdul-Amir Al-Hasnawi: Facilities for sensory receptors muscle (P.N.F) between rehabilitation and training, Germany, Al-Nour Printing, 2016, p. 28
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2- Abu El-Ela Ahmed Abdel Fattah: the science of sports training, Dar Al-Qalam for publication and distribution, Cairo 1998, p.146.


6- Adel Turki Hassan :: Principles of sports training, University of Qadisiya, College of Physical Education, Dar Al-Diaa Najaf, Edition .1, 2011.


12- George Dintiman , Rob ward :sports speed (third edition) human kinetic , 2003


Appendix (1)

Demonstrates the tests of maximum strength in the dynamometer (kg).

1-Test the strength of the half squat muscles of the arm

The aim of the test: Measure the maximum strength of the half squat muscles of the arm

Tools: dynamometer.

Performance description: The laboratory stands on the base of the dynamometer, holding the dynamometer by the iron bar attached to the device by the iron chain, which can be controlled by the length of the player. When the starting signal is given, the laboratory is drawn up with one hand. Taking into account the stability of the legs and trunk during the drawing process so that the force produced by one arm only, and retried on the other arm as shown in Figure (2).

Calculation of scores: Each laboratory is given two attempts and the best attempt is calculated.

Adel Turki Hassan :: Principles of sports training, University of Qadisiya, College of Physical Education, Dar Al-Diaa Najaf, first edition , 2011,p.373
2-Test the strength of the biceps muscle of the arm\textsuperscript{11}

The aim of the test: Measure the strength of the biceps muscles of the arm.

Tools: dynamometer, metal wire, home gym machine.

Performance Description: The laboratory stands on the base of the dynamometer device. The dynamometer is held by the iron handle attached to the home gym device which is controlled by the plastic wire, which can be controlled according to the length of the player. When the start signal is given, the laboratory should press down with one hand. Taking into account the stability of the two legs and trunk during the drag operation so that the force produced by one arm only, and retry on the other arm as shown in Figure (21)

Calculation of scores: Each laboratory is given two attempts for each arm and the best attempt is calculated.

\textsuperscript{11}Mohammed Hassan Allawi, Mohamed Nasr El DlinRadwan: Measurement in Physical Education and Psychology, Dar Al Ma'arif, Cairo, 2001, p. 207.
Figure (2) Measure the maximum strength of biceps muscles of the right and left arms.

Figure (3) shows the maximum strength measurement of the back muscles

Appendix (2)
Names of experts and specialists who have been interviewed and who were used by the researcher in evaluating the skillful performance of the gymnastic skills under study.
<table>
<thead>
<tr>
<th>No</th>
<th>Scientific title</th>
<th>Expert Name</th>
<th>Specialization</th>
<th>Workplace</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Prof. Dr.</td>
<td>Ali Jawad Abdul</td>
<td>Biomechanics-Gymnastics</td>
<td>University of Babylon - College of Physical Education and Sports Sciences</td>
</tr>
<tr>
<td>2</td>
<td>Prof. Dr.</td>
<td>Ali Badawi Tabor</td>
<td>Injuries and rehabilitation-Gymnastics</td>
<td>University of Qadisiyah - College of Physical Education and Sports Sciences</td>
</tr>
<tr>
<td>3</td>
<td>Prof. Dr.</td>
<td>BasmaTawfik Saleh</td>
<td>kinetic learning Gymnastics</td>
<td>University of Qadisiyah - College of Physical Education and Sports Sciences</td>
</tr>
<tr>
<td>4</td>
<td>Assist. Prof.</td>
<td>Ahmed Karam Omran</td>
<td>Biomechanics-Gymnastics</td>
<td>University of Muthanna - College of Physical Education and Sports Sciences</td>
</tr>
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