THE INFLUENCE OF LEG MUSCLE STRENGTH AND STATIC BALANCE ON SHOOTING IN PETANQUE SPORT

Resa Sukardi Massa¹, Khoirul Anwar Pulungan²*

¹,²Prodi Pendidikan Kepelatihan Olahraga, Fakultas Olahraga dan Kesehatan Universitas Negeri Gorontalo
E-mail: resa.massa@ung.ac.id¹, khoirul.anwar2021@ung.ac.id²*

10.31602/rjpo.v6i2.12179

ABSTRACT

The sport of petanque has the aim of throwing an iron ball as close as possible to a wooden ball known as a cochonnet/jack/boka while keeping the feet in a narrow circle. The main objectives of this research are to (1) determine the results of petanque shooting on leg muscle strength. (2) how static balance affects shooting results in petanque. (3) what are the results of shooting in a petanque match on leg muscle strength and static balance. This research was conducted in the lab. sports achievement and in the Gorontalo State University petanque field in March - June 2023. The method used is survey method with correlation technique. With total sampling technique, the sample numbered 20 people from a population of 20 people. Data analysis techniques used are simple correlation and regression techniques. The data analysis technique used is simple correlation and regression techniques. Based on the problems raised and supported by the description of terrorism, existing research data, and data analysis that has been carried out, it can be concluded that: 1). There is a significant relationship between leg muscle strength and shooting results as big as 0,4290 (42,90 %). 2) There is a significant relationship between static balance and shooting results as big as 0,4556 (45,56 %). 3) There is a significant relationship between leg muscle strength and static balance on shooting results as big as 0,6395 (63,95 %).

Keywords: Petanque shooting; Leg muscle strength; Static balance.

Submitted : 7 August 2023, Accepted : 5 December 2023, Published : 9 December 2023

INTRODUCTION

Sports activity is a development of the body created by skeletal muscles that requires energy. (Sunita, 2011). Exercise is sustainable, controlled, and routine body growth to improve health. Exercise is intentional, repetitive growth that occurs over time.(Palar et.al., 2015). Sports according to (Afwardi, 2011). that sport is structured and rhythmic physical activity with intensity over a certain period to improve physical fitness. This physiological response to exercise can influence changes in the structure and role of body organs that are more permanent as a result of exercise carried out regularly over a certain period. (Mach & Greenberg, 2003).

The goal of the game of petanque, a variation of boule, is to throw an iron ball as close as possible to a wooden ball called a cochonnet/jack/boka while keeping your feet in a compact circle. This game can also be played on surfaces other than hard surfaces. In the game of petanque, which is a variation of boule, the goal is to throw an iron ball as close as possible to a wooden ball called a cochonnet, jack, or boka. This game can be played on grass, sand, or other ground surfaces other than hard courts. However, hard courts are used for national and international competitions. Petanque is one of the sports competed at the 2011 Sea Games in Palembang, Indonesia. To form a petanque organization, KONI of South Sumatra Province immediately appointed PDPDE (South Sumatra Province Regional Company). To advance developments after SEA GAMES XXVI-2011 and to compete in national and international multi-event activities, KONI appointed FOPI to establish the FOPI organization and immediately develop this sport throughout Indonesia. One of the locations where the sport of petanque has developed over the last four years is Gorontalo State University. With competitions held and competitions watched

This is and open access article under the CC-BY 4.0 Licence. Copyright © 2023 by journal.
at national and international levels, the sport of UNG petanque has grown. Eleven divisions in national and international petanque competitions, including shooting men, shooting women, single men, single women, double men, double women, mix double, triple men, triple women, triple2w1m, triple2m.

Based on the information above, Gorontalo State University’s petanque sport has achieved significant success at the national level. However, even though UNG’s petanque athletes took part in world tournaments, they were unable to compete with players from other teams. The researchers observed that the UNG sport of petanque had very low shooting success in recent international championship matches, which may have lowered performance. Grip the ball, body posture facing the target, static foot balance, low body position, and lean forward, relax the ball, follow through. is the shooting mechanism.

There are many mistakes in shooting techniques in the petanque game played at Gorontalo State University, one of which is the static balance of the legs. Leg muscle strength and static balance are part of the static balance of the legs. To support the upper body organs and tolerate more movement throughout the shooting swing, leg muscle strength is used. When shooting, the straightness of the ball throw is controlled by static balance. Because athletes have to take into account distance, strength, throwing angle and straightness when shooting. In the game of petanque, there are two different types of throws: pointing and shooting. A type of throw called pointing brings the target’s boka closer than the opponent’s boka. Simple Pointing Method: Less than three meters from the circle, throw the bosi while rolling along the arena towards the target boka. Soft Lob / Half Lob throws the bosi slightly higher in a curve and the bosi falls and rolls to the target boka. The ball is thrown higher, almost vertically, with a High Lob or Full Lob, where the ball rolls into the target ball. Based on the information above, Gorontalo State University’s petanque sport has achieved quite good achievements at the national level. However, even when UNG petanque athletes compete in international competitions, they are still unable to compete with players from other teams. The researchers observed that UNG petanque club athletes had a very low shooting success rate in the final matches of international championships, which may have reduced performance. In shooting, there are components that influence shooting, namely, ball grip, body position towards the target, static balance of the legs, low body position and leaning forward, relax the ball, follow through. Sensory information systems, postural muscle response synergy, muscle strength, adaptive systems, and joint range of motion are factors that influence balance. The two categories of balance are static and dynamic. Maintaining an attitude or posture while resting is known as static balance. Maintaining a stance or posture while moving is known as dynamic balance. Shooting is a type of activity that requires balance to maintain self-control over the body’s organs when carrying out basic to complex actions, both while still and moving. Therefore, it is very important to maintain balance when playing petanque, especially when shooting. Athletes must be able to maintain their balance because they have to use a lot of energy to throw the ball a certain distance, which will impair their ability to balance themselves.

METHOD
This research is quantitative research. Creswell (2009), explained that quantitative research is research that studies data that has been collected in the form of numbers and then processed through statistical analysis.

Survey methods combined with a correlational approach will be the research methodology used. The dependent variable is the shot result, while the independent factors are leg muscle strength and static balance. For data collection, each participant will be evaluated for leg muscle strength, static balance, and shooting results. 20 petanque players from Gorontalo State University formed the population of this study. Total sampling is the sampling strategy used in this research. The entire population, or 20 people, was sampled using this method. Measurements of leg muscle strength, static balance, and shooting performance were used to collect data for this study. Measurement of static balance and leg muscle strength. Measurement Technique: Within 10 minutes, the sample warms up and starts rotating. If the ball lands inside the target circle, the sample must hit the target. Samples were taken 20 times. If the thrown ball lands outside the target circle and the foot lifts and walks over the circle, then the sample is considered a failure.

RESULTS AND DISCUSSION
RESULTS
Measurements of leg muscle strength, static balance, and study results were collected for research purposes. This information can be explained as follows:
1. Data from measurements of leg muscle strength
The measurement results for leg muscle strength show that the average value is 155.5, standard deviation 45.17, median 169, and variance 1975.753. The lowest score is 66 and the highest score is 215; the range is between these two values. The frequency distribution table of the first test and final test can be used to summarize the results of leg muscle strength measurements that have been obtained and described:

**Tabel 1. Frequency distribution of Leg Muscle Strength tests**

<table>
<thead>
<tr>
<th>No</th>
<th>Interval Class</th>
<th>Middle value</th>
<th>Frequency</th>
<th>Absolute</th>
<th>Relatively</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>66-96</td>
<td>81</td>
<td>3</td>
<td>3</td>
<td>15 %</td>
</tr>
<tr>
<td>2</td>
<td>97-127</td>
<td>112</td>
<td>3</td>
<td>4</td>
<td>20 %</td>
</tr>
<tr>
<td>3</td>
<td>128-158</td>
<td>143</td>
<td>4</td>
<td>8</td>
<td>40 %</td>
</tr>
<tr>
<td>4</td>
<td>159-189</td>
<td>174</td>
<td>8</td>
<td>2</td>
<td>10 %</td>
</tr>
<tr>
<td>5</td>
<td>190-220</td>
<td>205</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>20</td>
<td>100 %</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. Data from Static Balance Measurement Results

The lowest number, 3, and the highest 65, were obtained using static balance measurement data. The mean value is 33.45, with a standard deviation of 17.75, a median of 31, and a variance of 305.685. The first test and final test frequency distribution table below describes the static balance measurement findings collected as follows:

**Tabel 2. Frequency distribution of Static Balance tests**

<table>
<thead>
<tr>
<th>No</th>
<th>Interval Class</th>
<th>Middle value</th>
<th>Frequency</th>
<th>Absolute</th>
<th>Relatively</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3-5</td>
<td>9</td>
<td>2</td>
<td>2</td>
<td>10 %</td>
</tr>
<tr>
<td>2</td>
<td>16-28</td>
<td>22</td>
<td>6</td>
<td>6</td>
<td>30 %</td>
</tr>
<tr>
<td>3</td>
<td>29-41</td>
<td>35</td>
<td>6</td>
<td>6</td>
<td>30 %</td>
</tr>
<tr>
<td>4</td>
<td>42-54</td>
<td>48</td>
<td>2</td>
<td>2</td>
<td>10 %</td>
</tr>
<tr>
<td>5</td>
<td>55-67</td>
<td>61</td>
<td>4</td>
<td>4</td>
<td>20 %</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>20</td>
<td>100 %</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3. Shooting Measurement Results Data

Using shooting measurement data, the average value is 7.55, with the lowest value being 3 and the highest being 15, as well as a standard deviation of 3.3317, a median of 9, and a variance of 11.549. The frequency distribution table of the first test and final test can be used below to describe the shooting measurement data that has been obtained and has been discussed previously.

**Tabel 3. Distribusi frekuensi tes Shooting**

<table>
<thead>
<tr>
<th>No</th>
<th>Interval Class</th>
<th>Middle value</th>
<th>Frequency</th>
<th>Absolute</th>
<th>Relatively</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3-5</td>
<td>4</td>
<td>6</td>
<td>6</td>
<td>30 %</td>
</tr>
<tr>
<td>2</td>
<td>6-8</td>
<td>7</td>
<td>5</td>
<td>5</td>
<td>25 %</td>
</tr>
<tr>
<td>3</td>
<td>9-11</td>
<td>10</td>
<td>5</td>
<td>5</td>
<td>25 %</td>
</tr>
<tr>
<td>4</td>
<td>12-14</td>
<td>13</td>
<td>2</td>
<td>2</td>
<td>10 %</td>
</tr>
</tbody>
</table>
4. Testing Between Leg Muscle Strength and Shooting Results

The regression equation = 15.757 + 0.667X1 describes the relationship between leg muscle strength (X1) and shooting results (Y). Before making conclusions, the correlation coefficient must be evaluated to determine its significance. The following table shows the findings from the correlation significance test which can be seen in the following table:

<table>
<thead>
<tr>
<th>Correlation coefficient</th>
<th>t_Count</th>
<th>t_table</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.655</td>
<td>3.695</td>
<td>2.101</td>
</tr>
</tbody>
</table>

Correlation coefficient ry1 = 0.655 is relevant because, according to the correlation coefficient significance test above, t_Count = 3.695 Higher than t_table = 2.101. Thus, this research data confirms the assumption that leg muscle strength influences shooting results, meaning that the stronger the leg muscle strength, the better the shooting results. Leg muscle strength determines 42.90% of shooting results, according to the coefficient of determination of leg muscle strength \((ry_1^2) = 0.4290\).

5. Testing Between Static Balance and Shooting Results

Regression equation = 16.756 + 0.657X2 states the influence between static balance and shooting results, which shows that shooting results can be known or approximated through a regression equation if the balance variable is static (X2) is known. Correlation coefficient ry1 = 0.675 describes the influence between static balance (X2) and shooting results (Y). Before making conclusions, the correlation coefficient must be evaluated to determine its significance. The following table shows the findings from the correlation significance test which can be seen in the following table:

<table>
<thead>
<tr>
<th>Correlation coefficient</th>
<th>t_Count</th>
<th>t_table</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.675</td>
<td>3.795</td>
<td>2.101</td>
</tr>
</tbody>
</table>

Correlation coefficient ry1 = 0.675 is relevant because, according to the correlation coefficient significance test above, t_Count = 3.795 Higher than t_table = 2.101. Thus, this research data confirms the assumption that static balance influences shooting results, meaning that the better the static balance, the better the shooting results. Static balance determines 45.56% of the shooting results, in accordance with the static balance determination coefficient of \((ry_{1,2}) = 0.4556\).

6. Testing Between Leg Muscle Strength and Static Balance and Shooting Results

The influence of static balance on shooting results is expressed by the regression equation \(\hat{Y} = 4.55 + 0.668X1 + 0.645X2\). This means that the shooting results can be known or estimated using the regression equation, if the variable is leg muscle strength (X1) and static balance (X2) is known.

Influence of leg muscle strength (X1) static balance (X2) with shooting results (Y) shown by the correlation coefficient \(Ry_{1,2} = 0.795\). The multiple correlation coefficient must be tested first for its significance, before being used to draw conclusions. The results of the correlation significance test can be seen in the following table:
The significance test of the correlation coefficient above shows that $F_{\text{Count}} = 15.304$ greater than $F_{\text{table}} = 3.59$, which means correlation coefficient $R_{y_1,2} = 0.795$ is meaningful. Thus, the hypothesis that says there is an influence of leg muscle strength and static balance on shooting results is supported by research data, which means that leg muscle strength and static balance together determine the level of shooting results. Coefficient of determination of leg muscle strength and static balance on deep shooting results $(R_{y_1,2}) = 0.6395$, This means that 63.95% of shooting results are determined by leg muscle strength and static balance.

**DISCUSSION**

Leg muscle strength shows the results of data on measuring leg muscle strength. The measurement results for leg muscle strength show that the average value is 155.5, standard deviation 45.17, median 169, and variance 1975.753. The lowest score is 66 and the highest score is 215; the range is between these two values. Next, test the correlation coefficient $r_1 = 0.655$ is relevant because, according to the correlation coefficient significance test above, $t_{\text{Count}} = 3.695 = 2.101$. Thus, this research data confirms the assumption that leg muscle strength influences shooting results Higher than $t_{\text{table}}$, meaning that the stronger the leg muscle strength, the better the shooting results. Leg muscle strength determines 42.90% of shooting results, according to the coefficient of determination of leg muscle strength of $(r_{y_1,2}) = 0.4290$. Leg muscle strength in sports is one of the components that must be possessed in several sports, therefore it is related to the results of all performance both individually and in groups carrying out sports activities as the most important component in sports. (Rahmawati et al., 2019). The leg muscle strength is also the ability of a person's muscle or group of muscles to use the maximum force exerted in the shortest possible time according to (Prakoso & Sugiyanto, 2017).

Static balance shows the results of the static balance measurement data, the lowest value, 3, and the highest 65, obtained using static balance measurement data. The average value is 33.45, with a standard deviation of 17.75, a median of 31, and a variance 305.685. Next, test the correlation coefficient $r_1 = 0.675$ is relevant because, according to the correlation coefficient significance test above, $t_{\text{Count}} = 3.795 = 2.101$. Thus, this research data confirms the assumption that static balance influences shooting results, meaning that the better the static balance, the better the shooting results. Static balance determines 45.56% of the shooting results, by the static balance determination coefficient of $(r_{y1,2}) = 0.4556$. With good static balance, the ability to maintain a position when standing, sitting, or starting a movement becomes more coordinated. A good static position is fundamental in maintaining the quality of the movement to be carried out. For individuals who are required to be active, a good balance will increase work productivity (Salzman, 2010).

Shooting in pétanque sports using shooting measurement data was obtained. Using shooting measurement data, the average value was 7.53, with the lowest value being 3 and the highest being 15, as well as a standard deviation of 3.3317, a median of 9, and a variance of 11.549. Next, a significance test of the correlation coefficient above was carried out, it can be seen that $F_{\text{Count}} = 15.304$ Higher than $F_{\text{table}} = 3.59$, which means correlation coefficient $R_{y_1,2} = 0.795$ is meaningful. Thus, the hypothesis that says there is an influence of leg muscle strength and static balance on shooting results is supported by research data, which means that leg muscle strength and static balance together determine the level of shooting results. Coefficient of determination of leg muscle strength and static balance on deep shooting results $(R_{y_1,2}) = 0.6395$. This means that 63.95% of shooting results are determined by leg muscle strength and static balance. The character of the sport of petanque tends to require accuracy, anyone who wants to play petanque no matter what age, position, or gender is allowed to play this sport, because by having good shooting accuracy you will get good results (Souef, 2015).

**CONCLUSION**

Based on the problems raised and supported by the description of the territory, existing research data, as well as data analysis that has been carried out, it can be concluded that: 1). There is a significant influence between frozen muscle strength and shooting results. 2) There is a significant influence between statistical balance on shooting results. 3) There is a significant influence between muscle strength and statistical balance on shooting results.

---

**Tabel 5. Correlation Coefficient Test X1, X2 to Y**

<table>
<thead>
<tr>
<th>Correlation coefficient</th>
<th>$F_{\text{Count}}$</th>
<th>$t_{\text{table}}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.675</td>
<td>3.795</td>
<td>2.101</td>
</tr>
</tbody>
</table>

The correlation coefficient test shows that $r_{y_1,2} = 0.6395$ which means correlation coefficient $R_{y_1,2} = 0.795$ is meaningful. Thus, the hypothesis that says there is an influence of leg muscle strength and static balance on shooting results is supported by research data, which means that leg muscle strength and static balance together determine the level of shooting results.

---

This is and open access article under the CC-BY 4.0 Licence. Copyright © 2023 by journal.
REFERENCE


Kasinyo Dwijawinoto. (1993). Dasar-dasar Ilmu Kepelatihan, Jakarta:


