

## The Correlation of Arm Muscle Strength, Grip Strength, and Body Flexibility to the Results of Long-Distance Shots on Woodball

Farid Aditama , Sugiharto & Donny Wira Yudha Kusuma

Pascasarjana, Universitas Negeri Semarang, indonesia

### Article Info

History Articles  
Received:  
25 September 2019  
Accepted:  
30 October 2019  
Published:  
16 January 2020

#### Keywords:

Arm Muscle Strength,  
Grip Strength, Togok  
Flexibility,  
Long Distance Shots,  
Woodball

### Abstract

This research aims to analyze and examine the correlation between arm muscle strength, grip strength, and body flexibility to the results of long-distance shots on woodball. This research applied a correlational design with variables of arm muscle strength, grip strength, and body flexibility to the results of long-distance shots on woodball. The samples of this research were 25 Central Java woodball athletes using a pull and push instrument dynamometer, handgrip dynamometer, sit and reach dynamometer and long-distance shots test. The results of this research are the arm muscle strength gave an effect to the results of long-distance shots by 13.18%. The grip strength gave an effect to the results of long-distance shots by 9.42%. The body flexibility had an effect to the results of long-distance shots by 7.78%. The arm muscle strength and the grip strength together had an effect to the results of long-distance shots by 24.50%. The arm muscle strength and the flexibility together gave an effect to the results of long-distance shots by 17.14%. The grip strength and the body flexibility together had an effect to the result of long-distance shots by 13.63%. The arm muscle strength, the grip strength, and the togok flexibility together gave an effect to the results of long-distance shots by 27.60%.

#### ✉ Address correspondence:

Pascasarjana Campus A Building Jl Kelud Utara III, Semarang  
50237  
E-mail: (farid\_aditama16@yahoo.com)

p-ISSN 2252-648X

e-ISSN 2502-4477

## INTRODUCTION

Woodball is a new sport in the world that is still developing. Until 2008, it is supported by 29 countries as the members of IWbF (International Woodball Federation) spread over five continents. One of these countries is Indonesia (Sumariyanto A., & Rahayu T. 2018). Woodball is a potential sport in Indonesia because it is relatively easy to play and is cheap so that it can be played by all people (Amin A.K., Sutardji, Rahayu S. 2012). The basic technique in woodball is one of the foundations for someone to be able to play well. The basic techniques are divided into techniques without tools and techniques with tools. Techniques without tools include swinging, setup, and preswing routines without tools. Whereas, the technique with tools include preswing routines with tools (mallet), long-distance shot, medium distance shot, short distance shot, and gating or shooting towards the gate. Shot techniques consist of long-distance, short distance, medium distance, and finishing shot (Kriswantoro, 2016: 49-62).

Long-distance shot is hitting the ball until the ball is at 65 meters or more from the starting area. The measurement of the long-distance shot is because the maximum length of the fairway is 130 meters. It is expected that the first shot can reach half of the fairway distance so that it can make a shot until gating with the least number of shots possible. Long-distance shots do not have to be hit as hard as we can, but we must hit optimally or right on target. Medium distance shots should reach 51 meters to 80 meters from the starting line. Short distance shot is a shot with a distance of 10 meters to 50 meters and bring the ball closer to the gate area. Whereas the finishing shot is the final shot in a fairway with the target of goal or gate (Amin A. K., Doewes, M., & Purnama S. K. (2017).

Long-distance shots require longer swings than other shots. It starts from the back swing movement with clockwise rotation of the pelvis and upper body followed by down swing and follow through pelvic rotation in the reverse direction (Meister et al., 2011). The back full

swing movement requires grip strength to keep the mallet on the correct back swing position. The position of the back full swing requires the body flexibility so that the movement of the back full swing can achieve maximum rotation where the position of the mallet is above the back of the head. It is then continued by down swing movement so that there is an impact between the mallet and the ball. (Putu Citra Permana Dewi, 2015) A long swing requires the body especially the shoulders and hips to rotate because the swing motion in woodball resembles the movement of a pendulum clock. Therefore, the body flexibility is very important in practicing long-distance shots. A good long-distance shot is very much influenced by good physical condition. According Kriswantoro (2016: 9), physical conditions of the basic techniques of woodball are strength, endurance, power, flexibility, balance, and coordination. For this reason, a woodball player must have components of good physical condition in accordance with the criteria of physical conditions in woodball (Komaini, A., Sahri, J., & Tohirin D., 2018).

Arm muscle strength is really needed in practicing long-distance shots. Muscle strength is the ability of muscles to perform one contraction maximally against resistance or load (Gazali, N. 2016). (Rahmadani, A. 2018) Muscles are a connective network whose main task is to move body parts both consciously and unconsciously (Rasyid, HA, Setyakarnawijaya, Y., & Marani, I., N. 2017). In addition, arm muscle strength and grip strength also greatly influences the performance of long-distance shots in woodball.

The strength of the hand grip is the result of strong flexion of all joints, fingers, and wrists with the maximum strength that a person is able to move in normal biokinetic conditions (Wagh, Birajdar, & Nagavekar, 2017). Hand grip muscle strength is a method commonly used to estimate the muscle strength of upper extremities because the muscle strength of the hand grips needs the combination of hand muscles and forearm muscles (Daharis, 2017). Grip strength is a group of muscles that can contract to be able to hold and receive maximum load (Saputra F., E.,

& Riyadi, 2016). So, the strength of the arm muscle has a role in the performance of long-distance shots that is as a force to swing. In practicing the swing, it requires the body flexibility so that the long-distance shots can be optimal.

Flexibility is one of physical condition aspects that is very important in achieving goal. (Irfan, 2005) Related to the body flexibility, it basically relies on the extent of the motion of the joints of the body. The flexibility is determined by the size of the joints of the body in motion and is influenced by the elasticity of the muscles, tendons, and ligaments. Thus, a person is said to have a good to good flexibility if the person has a very wide body motion in the joints and elasticity of the abdominal muscles and good back muscles (Putra, A., N., & Gazali, V. 2017). So, flexibility is a person's ability to make movements that can be made by a group of spinal joints with optimal stretching (Ahmad J. 2015). The body flexibility is very influential in practicing long-distance shots movements, back swing, and follow through (Purba, P., H. 2017). From the observations and experiences that have been stated above, it can be said that the arm muscle strength, the grip strength, and the body flexibility need to be further investigated so that the shots produced is more efficient. From the description above, the researcher wants to examine more deeply about "The Correlation of Arm Muscles Strength, Grip Strength, and Body Flexibility to the Results of Long-distance Shots on Woodball".

## METHODS

This research is a quantitative study using correlational method. The design applied is triple correlational method. The population in this study were 50 Central Java woodball athletes who had been participating in the district, provincial and national level championships. The samples were selected using an acceptable sampling method and 25 subjects were considered as the minimum acceptable

sample. Purposive sampling is a sampling technique with certain considerations.

Variables in this research are as follows: 1) Independent variables consists of: a) arm muscle strength (X1), b) grip strength (X2), c) body flexibility (X3). 2) Dependent variables in this study is the result of long-distance shots on woodball which is symbolized by (Y). Data collection techniques used in this study were instrument administration techniques. The instruments used in this study were tests to measure arm muscle strength (pull and push dynamometer), tests to measure grip strength (handgrip dynamometer), tests to measure the flexibility of body (sit and reach dynamometer) and practicing long-distance shots.

The data analysis technique applied in this study is t-test. It is used to test the rejection or acceptance of the null hypothesis with the conditions that the sample is homogeneous and normally distributed. Data normality test is used to determine whether a random variable is normally distributed or not. Hypothesis testing can be based on two things: the level of significance or probability and the level of internal confidence.

## RESULTS AND DISCUSSION

On the research results of the muscle strength, the arm muscle strength has a significant influence towards the results of long-distance shots. The grip strength gives a significant effect on the results of long-distance shots. The body flexibility has a significant effect on the results of long-distance shots. The arm muscle strength and the grip strength together give a significant influence on the results of long-distance shots. The arm muscle strength and the body flexibility together have a significant influence on the results of long-distance shots. The grip strength and the body flexibility together give a significant influence on the results of long-distance shots. The arm muscle strength, the grip strength, and the body flexibility together have an influence on the results of long-distance shots.

**Table 1.**

Variables	N	$\bar{X}$	Std.dev	Min	Max	Criteria
Arm Muscle Strength (X1)	25	61,11	8,52	11	48	Good
Grip Strength (X2)	25	1,39	0,94	22,2	50,7	Very Good
Body Flexibility (X3)	25	44,50	4,97	4	25	Good
Long-distance Shot Results (Y)	25	28,83	5,54	70	117	Very Good

Based on the table 1, the arm muscle strength has a significant influence on the results of long-distance shots. The grip strength gives a significant effect on the results of long-distance shots. The body flexibility has a significant effect on the results of long-distance shots. The arm muscle strength and the grip strength together show a significant influence on the results of long-distance shots. The arm muscle strength and the body flexibility together have a significant influence on the results of long-distance shots. The grip strength and the body flexibility together show a significant influence on the results of long-distance shots. The arm muscle strength, the grip strength, and the body flexibility together give an influence on the results of long-distance shots.

The results of the research are as follows:

1) The arm muscle strength gives an influence on the results of long-distance shots by 13.18%. It is categorized as low and there is a positive correlation between arm muscle strength and the results of long-distance shots. 2) The grip strength gives an influence on the results of long-distance shots by 9.42%. It is categorized as low and there is a positive correlation between the grip strength and the results of long-distance shots. 3) The body flexibility gives an influence on the results of long-distance shots by 7.78%. It is categorized as low and there is a positive correlation between the body flexibility and the results of long-distance shots. 4) The arm muscle strength and the grip strength together show an influence on the results of long-distance shots by 24.50%. It is categorized as moderate and there is a positive correlation between the arm muscle strength, the grip strength and the results of long-distance shots. 5) The arm muscle strength and the body flexibility together give an effect on the

results of long-distance shots by 17.14%. It is categorized as moderate and there is a positive correlation between the arm muscle strength, the body flexibility, and the results of long-distance shots. 6) The grip strength and the body flexibility together influence the results of a long-distance shots by 13.63%. It is categorized as low and there is a positive correlation between the grip strength, the body flexibility and the result of a long-distance shots. 7) The arm muscle strength, the grip strength and the body flexibility jointly influence the results of long-distance shots by 27.6%. It is categorized as moderate and there is a positive correlation between the arm muscle strength, the grip strength, the body flexibility, and the results long-distance shots.

## DISCUSSION

Based on the analysis of the relationship of arm muscle strength, grip strength and the body flexibility to the results of long distance shots in woodball, it is obtained the following results: 1) The correlation of the arm muscle strength to the results of long distance shots. Based on the results, the arm muscle strength has a very important role in the implementation of upper body movements. The arm muscle strength is produced from the contraction of the muscles in the arm in order to move it when swinging. The results show that the arm muscle strength contributes 10.37%. It can be concluded that the arm muscle strength of the athletes need to be improved by practicing repetitive and structured training. 2) The correlation of the grip strength to the results of long distance shots. Based on results of grip strength, the speed of the shots is determined by the strength of the shots

that hits the ball. The harder and stronger the shots, the more stable the ball will go. Based on these results, it shows that the grip strength contributes 0.02%. All activities need strength, although strength is not the dominant factor in doing long distance shots. 3) The correlation of the body flexibility to the results of long distance shots. Based on the results of the research, it is obtained that the body flexibility gives an influence by  $0.059 = 5.9\%$  to the results of long distance shots. Togok flexibility is used as a counterweight when practicing the long distance shots. The good body flexibility helps to keep the body from shacking and maintain the body balance in practicing long distance shots. When doing a shot, body must be able to be moved to the maximum so that the resulting shots are stronger and more accurate. Therefore, body flexibility needs to be more concerned by a coach and athlete in order to add to the training program to increase the flexibility so that they are able to achieve maximum shots and get achievement. 4) The correlation of the arm muscle strength and the grip strength to the results of long distance shots. Based on the results of the research, it shows that the arm muscle strength and the grip strength have a very important role in the implementation of upper body movement. The arm muscle strength is produced from the contraction of the muscles in the arm in order to move it when swinging. The results showed that the arm muscle strength and the grip strength give an effect by 11%. So, it can be concluded that the arm muscle strength of the athletes need to be improved by practicing repetitive and structured training. 5) The correlation of the arm muscle strength and the body flexibility to the results of long distance shots. Based on the results of the research, it is obtained that the arm muscle strength and the body flexibility give an influence by 11.30% to the results of long distance shots. The togok flexibility is used as a especially when practicing long distance shots. 6) The correlation between the grip strength and the togok flexibility to the result of long distance shots. Based on results of the grip strength, the speed of the shots is determined by the strength of the shots that hits

the ball. The harder and stronger the shots, the more stable the ball will go. The strength of the grip is produced by the contraction from the muscles of the fingers to maintain the stability of the swing. The less movement of the wrist, the more stable the ball will go to the track of the field. Based on these results, it shows that the grip strength and the body flexibility give an effect by 0.9%. All activities require strength, although strength is not the dominant factor in practicing long distance shots. 7) The correlation of the arm muscle strength, the grip strength, and the body flexibility to the results of long distance shots. Based on the results of the research, it is obtained: 1) the arm muscle strength gives an effect by 10.37%. 2) the grip strength gives an effect by 0.02%. 3) the body flexibility gives an effect by 0.86%. 4) the arm muscle strength and the grip strength give an effect by 11%. 5) the arm muscle strength and the body flexibility give an effect by 11.3%. 6) the grip strength and togok flexibility give an effect by 0.9%. 7) overall, they have an effect by 11.5%, which means they have a low effect. So, it can be concluded that the three independent variables are not yet dominant and have little role in practicing long distance shots in woodball so that it needs to be considered and studied in order to support the ability to make a desired movement such as shooting. When practicing long distance shots, all components of the physical body will play an active role especially arm muscle strength, grip strength, and body flexibility. The arm muscle strength, the grip strength and the togok flexibility are used when performing swing stages namely backswing, downswing, impact, and follow through. The grip strength is used to strengthen the grip when mallet contact with the ball does not occur when practicing backswing, downswing, impact, and follow through. When pushing the ball, there will be an impact with the ball. The arm muscles must also be able to be maximally mobilized to turn the swing into an appropriate shots and the back muscles as a support for the upper body to withstand the weight of the stick to shape a good body position to remains stable so that the shots will be great.

## CONCLUSION

Based on the results of data analysis and the discussion, the following are the conclusions: 1) There is a significant correlation between the arm muscle strength and the results of long distance shots on woodball. 2) There is a significant correlation between the grip strength and the results of long distance shots on woodball. 3) There is a significant correlation between the body flexibility and the results of long distance shots on woodball. 4) There is a significant correlation between the arm muscle strength and the grip strength to the results of long distance shots on woodball. 5) There is a significant correlation between the arm muscle strength and the body flexibility to the results of long distance shots on woodball. 6) There is a significant correlation between the grip strength and the togok flexibility to the results of long distance shots on woodball. 7) There is a significant correlation between the arm muscle strength, the grip strength, and the body flexibility to the results of long distance shots on woodball.

hendaknya merupakan jawaban atas pertanyaan penelitian, dan diungkapkan bukan dalam kalimat statistik. Ditulis sepanjang satu paragraf dalam bentuk esai, tidak dalam bentuk *numerical*.

## REFERENCES

- Ahmad Jamalong. (2015). Hubungan Antara Power Otot Tungkai Dan Kelentukan Tegok Dengan Kemampuan Servis Bawah Dalam Permainan Sepaktakraw Pada Atlet Sepaktakraw Klub Tunas Muda Kabupaten Mempawah. *Jurnal Pendidikan Olahraga*.
- Amin, A. K., Doewes, M., & Purnama, S. K. (2017). Pengembangan Prototipe Alat Bantu Latihan Mengayun ( Swing Trainer ) Pada Atlet Woodball, 7, 1–8.
- Amin A.K., Sutardji., Rahayu S., (2012) Kekuatan Genggaman Dan Kekuatan Otot Lengan Dalam Pukulan Jarak Jauh Woodball. (2012). *JSSF (Journal of Sport Science and Fitness)*.
- Daharis, D. (2017). Hubungan Kekuatan Otot Lengan Dan Kelentukan Dengan Keterampilan Gerakan Senam Round Off. *Journal Sport Area*.
- Gazali, N. (2016). Kontribusi Kekuatan Otot Lengan Terhadap Kemampuan Servis Atas Atlet Bolavoli. *Journal Of Physical Education, Health And Sport*.
- Komaini, A., Sahri, J., & Tohidin, D. (2018). Pengembangan Instrumen Tes Kelentukan Statis Berbasis Teknologi Sensor. *Jurnal Sositologi*.  
<https://doi.org/10.5614/Sostek.Itbj.2018.17.3.1>
- Kriswantoro. 2016. *Teknik Dasar Bermain Woodball*. Semarang. Fastindo
- Irfan, M. (2005). *Hubungan Kekuatan Otot Tungkai Dan Kelentukan Togok Dengan Kemampuan Menendang Bola Pada Mahasiswa Putra Semester Iii A Pklo Fik Unnes Tahun 2005*.
- Meister, D. W., Ladd, A. L., Butler, E. E., Zhao, B., Rogers, A. P., Ray, C. J., & Rose, J. (2011). Rotational Biomechanics Of The Elite Golf Swing: Benchmarks For Amateurs. *Journal Of Applied Biomechanics*.  
<https://doi.org/10.1123/Jab.27.3.242>
- Purba, P. H. (2017). Hubungan Kelentukan Dan Kelincahan Terhadap Kecepatan Tendangan Mawashi Gery Chudan Pada Karateka Perguruan Wadokai Dojo Unimed. *Jurnal Prestasi*.  
<https://doi.org/10.24114/Jp.V1i1.6492>.
- Putra, A. N., & Gazali, V. (2017). Kontribusi Kelentukan Pinggang Dan Kelincahan Terhadap Kemampuan Dribbling Atlet Sepakbola Psts Tabing Padang. *Multilateral Jurnal Pendidikan Jasmani Dan Olahraga*.  
<https://doi.org/10.20527/Multilateral.V16i2.4247>.
- Putu Citra Permana Dewi, 2015. (2015). Jurnal Keolahragaan. *Jurnal Keolahragaan*.
- Rahmadani, A. (2018). Hubungan Kekuatan Otot Lengan Dengan Keterampilan Lay Up Shoot Bola Basket. *Journal Sport Area*.  
[https://doi.org/10.25299/Sportarea.2017.Vol2\(2\).884](https://doi.org/10.25299/Sportarea.2017.Vol2(2).884).
- Rasyid, H. Al, Setyakarnawijaya, Y., & Marani, I. N. (2017). Hubungan Kekuatan Otot Tungkai Dan Kekuatan Otot Lengan Dengan Hasil Renang Gaya Bebas 50 Meter Pada Atlet Millennium Aquatic Swimming Club. *Jurnal Ilmiah Sport Coaching And Education*.  
<https://doi.org/10.21009/Jsce.01106>
- Saputra, F. E., & Riyadi, M. A. (2016). Perancangan Pengukur Kekuatan Genggaman Tangan Dengan Load Cell Berbasis Arduino Uno.

- Perancangan Pengukur Kekuatan Genggaman Tangan Dengan Load Cell Berbasis Arduino Uno.*  
Sumariyanto, A., & Rahayu, T. (2018). The Development of a Woodball Swing Tool Model for UNNES Woodball Students ( Student Activity Units ), 7(44), 242–245.
- Wagh, P. D., Birajdar, G., & Nagavekar, M. (2017). Comparison Of Handgrip Muscle Strength In Sportsmen And Sedentary Group, 16(7), 62–65.