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Biomechanics in Woodball

Andri Tria Raharja[1], Sulaiman[2], M. E. Winarno[3], Sri Sumartiningsih[4]

Abstract

This research aims to determine the level of knowledge and implementation of biomechanics in woodball sports. The research approach used is a quantitative descriptive approach. The subjects of this research were referees, athletes and woodball coaches with a total of 33 respondents. The instrument used in this research is a questionnaire containing two indicators, namely the level of knowledge and implementation of biomechanics. Based on the results of the data analysis that has been carried out, it can be concluded that the level of knowledge of woodball players regarding biomechanics is very good regarding several aspects of biomechanics, namely contribution, anatomy, mechanical approaches, determining training programs and contributions to sports performance. The section on the implementation of biomechanics in woodball shows how the role of biomechanics influences the improvement of woodball movements. The answers from woodball players show that woodball players have implemented biomechanics in woodball, both by reducing the risk of injury and improving the quality of the training program. When using applications used in biomechanics, such as the kinovea/darfis application, woodball players are not yet fully able to operate them to analyze woodball movements.

Keywords: *bioemechanis, woodball, level of knowlegde, implementation.*

INTRODUCTION

In 2019, several regions in East Kalimantan participated in the provincial championship. There are 6 regions participating in the championship, namely: Kutai Kartanegara, Samarinda, Balikpapan, East Kutai, Paser and Berau. The number of senior male athletes participating in the men's singles stroke is 45 people. During the Provincial Championships in Tenggarong City, only 1 athlete from Samarinda qualified for the final out of 9 athletes who participated in the men's single-stroke qualification. The following data is obtained from the results of the Provincial Championship in Tenggarong City.

Table 1. Men's Senior Single Stroke Qualification Results East Kalimantan Provincial Championship

No	Name	Region of origin	Number of Field Strokes A	Number of Field Strokes B	Total
1	H.Shahrani	Kutai Kartanegara	50	51	101
2	M. Said	Samarinda	53	53	106

[1] Universitas Negeri Semarang, andri91@students.unnes.ac.id
[2] Universitas Negeri Semarang, sulaiman@mail.unnes.ac.id
[3] Universitas Negeri Malang, m.e.winarno.fik@um.ac.id
[4] Universitas Negeri Semarang, sri.sumartiningsih@mail.unnes.ac.id

3	Anto Sari	Kutai Kartanegara	54	54	108
4	Hamdan	Balikpapan	57	56	113
5	Armansyah	Kutai Kartanegara	58	55	113
6	H.Tohadi	Balikpapan	57	58	115
7	Aswadi	East Kutai	61	54	115
8	H.Suprapto	Balikpapan	55	60	115
9	Nasrun	Kutai Kartanegara	57	59	116
10	Rashid Supriadi	Paser	61	57	118
11	ABG	Kutai Kartanegara	60	58	118
12	Faisal Ghazali	Berau	53	65	118

Based on the qualifying results of the Provincial Championship in Table 1, it shows that athletes from Samarinda City are still relatively unsuccessful in achieving maximum results, this is because the target of the Samarinda City IWbA coach of the 9 athletes who participated in the championship who passed the final was 4. This result is influenced by failure or OB (out of boundary) in making a blow. It is important for athletes in making punches to try to make minimal mistakes or failures in blows, if you look at the average punches made by Samarinda City athletes each fairway is more than five strokes so that if added up the results are not ranked in the top 12 where in the first rank athletes get 101 strokes with an average of four to five strokes each fairway.

Other data showed that the second to twelfth place in the qualifying round of the Provincial Championship in Tenggarong received strokes with an average of five to six strokes per fairway. As for entering the top 12 in qualifying, athletes must hit with the average number of each fairway is four strokes. The number of strokes a fairway in the Provincial Championship when compared to the National Championship in Balikpapan City is still quite far because when viewed from the number of strokes in the National Championship match in Balikpapan for first place in the qualifying round is 94 strokes with an average number of strokes per fairway is three to four strokes. In addition, the second to twelfth place in the National Championship qualifying round in Balikpapan averaged four strokes per fairway.

This shows that the ability of athletes at the provincial level, especially athletes from East Kalimantan Province, is still not optimal when compared to provinces outside East Kalimantan. It can be seen that the success rate of athletes from East Kalimantan Province only placed one athlete in the final round, and the athlete was an athlete from outside Samarinda City. Here are the results of the men's single stroke qualifying round at the National Championship in Balikpapan City. The qualification results can be seen in Table 2, below:

Table 2. Qualification Results of Men's Single Stroke Competition National Championship in Balikpapan City

No	Name	Region of origin	Total Round 1	Total Round 2	Total
1	Ahris Sumariyanto	Bantam	49	45	94
2	Aries Wanto	Central Java	51	47	98
3	Khoirul Mustakhim	Central Java	48	51	99
4	Ariska	Central Java	44	58	102

No	Name	Region of origin	Total Round 1	Total Round 2	Total
5	Sandi Yulianto	East Java	53	51	104
6	I Made Agus.P.D	Bali	50	54	104
7	I Kadek Agus.S	Bali	56	49	105
8	Dawn M	North Kalimantan	54	51	105
9	Bagas Ardian	Central Java	51	55	106
10	Sudjijanto	Special Region of Yogyakarta	53	54	107
11	Hamdansyah	East Kalimantan	54	54	108
12	Dimas Apriyana.S	West Java	50	58	108

Some research and thoughts on the factors that affect the results of strokes in woodball games conducted by: Kriswantoro & Lumbanraja (2016) in their research stated that the use of heavy balls is more effective than the use of light balls in woodball games. Sumariyanto et al., (2018:243) argue that "... strength is probably the most prominent factor in a swing, as strength is the factor most closely related to the speed of the swing in a collision." Chakim et al., (2021:97) concluded that "woodball athletes are expected to have the right swing starting from body coordination starting from the legs, hips and arms in a comfortable and appropriate position".

Dewi &; Sukadiyanto (2015) stated "in doing a long swing requires the body, especially the shoulders and hips, to rotate because the swing movement in woodball resembles the movement of a pendulum clock". The movement of the swing can change if you look at the level of difficulty of each fairway. Each fairway has its own level of difficulty, some are used for long, near and medium distances. Long-range hitting is hitting the ball until the ball is 65 meters or more from the starting area. Consideration of the size of the long-distance punch because the maximum length of the fairway is 130 meters, it is expected that when the first stroke can reach half of the fairway distance, so that it can punch up to gatting with the least number of strokes possible. Middle-range hitting is hitting the ball until the ball is at a distance of 30 meters or more from the starting area. Short-range punches are hitting the ball until the ball is at a distance of 5 meters from the starting area (starting area) or less than 5 meters. Parking and gatting skills are determined by the player's ability to place the ball at the right distance and angle so that they can gatting the next stroke.

Based on observational data, research and theories about the sport of woodball, the researcher wants to conduct research on analysis that focuses on the technique of hitting movements in the sport of woodball. This is based on the opinion of Costa et al (2012) who state that "efficient and constantly performed techniques will support the achievement of better athletes". One of the sports science disciplines that can be used in analyzing movement is biomechanics. (Ardha et al., 2019: 38) concluded "biomechanics is a scientific discipline that studies the effectiveness of human movement on certain physical activities". The study of biomechanics in sports is very important (Ferreira et al., 2016). The development of biomechanics approach models provides a comprehensive evaluation model to search for efficient motion techniques (Barbosa et al., 2010).

Referring to the theory and observational data made by researchers, this study leads to how the level of knowledge and implementation of biomechanics in woodball?. This research is considered important because it is an effort to increase the effectiveness of movement in woodball.

METHODOLOGY

Based on the problems that will be raised by researchers, namely about "biomechanics in woodball", this type of research approach is a type of quantitative descriptive approach, because the collection of data related to the attitudes and opinions of a group of people, by asking for help to provide important information and such data is analyzed using statistics. The type of data collected in this study is primary data. Primary data is information material obtained from research directly from the place that is the object in the form of unprocessed data obtained from respondents. The subjects of this study were referees, athletes, and woodball coaches in the East Kalimantan region with a total of 33 respondents.

The instrument used in this study was in the form of a questionnaire containing two indicators, namely the level of knowledge and implementation of biomechanics. The following is the instrumen grid that will be filled by respondents:

Table 3. Research Instrument Grille

Indicators	Statement Item	No. Item
Knowledge Level	I've known about biomechanics in sports before.	1
	I know that biomechanics can contribute to investigating elite-level sports performance	2
	I understand that biomechanics has to do with human anatomy.	3
	I understand that biomechanics is related to the approach of mechanics.	4
	I know that the use of biomechanics by coaches/athletes can support the training aspect in determining exercise programs.	5
	I know the principles of biomechanics in sports	6
	I know that biomechanics can contribute to achievement coaching.	7
Biomechanics Implementation	I once used biomechanics to reduce the risk of injury during training sessions	8
	I once used biomechanical analysis to get data on motion.	9
	I once used the kinovea/derfis app for motion analysis.	10
	The use of Biomechanics can improve the quality of training programs for athletes	11
	I once used biomechanics analysis to be able to complete training programs faster.	12
	I once used biomechanical analysis to increase productivity in training.	13
	I have used biomechanical analysis to improve the effectiveness of exercises in training programs.	14
	I once used biomechanical analysis to make it easier to develop training programs in doing exercises.	15
	I've used biomechanical analysis to make decisions when in a match.	16
	I've seen the use of biomechanical analysis around me in sports.	17
	I feel that the use of biomechanical analysis in sports is impractical.	18

The data collection technique carried out by researchers quantitatively by giving questionnaires to respondents and analyzing the scores on the question sheets that have

been filled out. The alternative answers on this questionnaire use the Guttman scale with the choices "Yes" and "No". Answer scores with a choice of "Yes" are converted to "1" and "No" to (0). Questionnaire data is first tested for validity and reliability to see the level of validity and reliability of the instrument. Testing the validity of the instrument is carried out statistically using pearson product moment by comparing each dependent variable. Higher correlation indicates a strong degree of concurrent validity (Hall and Docherty, 2017). Reliability is a test to see the extent to which a given instrument has stable and consistent results. This test is important because it refers to the consistency of all instruments (Pasianus and Kana, 2021). There are several reliability test techniques, namely test-retest reliability, equivalent-form reliability, split-half reliability, Kuder-Richardson formulas (K20 & K21) and Alfa Cronbach (Ahmad et al, 2020).

RESULTS

Based on the researcher's question about "how is biomechanics on woodball?". So the results of this study are analyzed through several stages. The first stage is testing the level of validity and reliability; the second stage of knowledge level testing; and the third stage of implementation level testing.

1. Test Instrument Validity and Reliability

The validity test results obtained in the form of count will be compared with the r value of the table. The results of the validity test for the questionnaire obtained show that all questions are "valid" because the results are calculated r values > r tables. These results show that the level of knowledge questionnaire and the implementation of biomechanics are able to measure the level of knowledge and implementation of respondents well. The following are the results of the validity test of the questionnaire.

Table 4. Results of Instrument Validity

Items	Total Pearson Correlation (r count)	r table	Information
Pernyataan_1	0.650	0,344	Valid
Pernyataan_2	0.752	0,344	Valid
Pernyataan_3	0.838	0,344	Valid
Pernyataan_4	0.699	0,344	Valid
Pernyataan_5	0.727	0,344	Valid
Pernyataan_6	0.765	0,344	Valid
Pernyataan_7	0.821	0,344	Valid
Pernyataan_8	0.705	0,344	Valid
Pernyataan_9	0.632	0,344	Valid
Pernyataan_10	0.620	0,344	Valid
Pernyataan_11	0.706	0,344	Valid
Pernyataan_12	0.680	0,344	Valid
Pernyataan_13	0.722	0,344	Valid
Pernyataan_14	0.743	0,344	Valid
Pernyataan_15	0.670	0,344	Valid

Pernyataan_16	0.748	0,344	Valid
Pernyataan_17	0.653	0,344	Valid
Pernyataan_18	0.420	0,344	Valid

Based on the results of the validity test of the level of knowledge and implementation questionnaire with 33 respondents showed that 18 statements were categorized as "valid" because they had a r count > r table (r > 0.344). The study shows that the level of knowledge questionnaire and implementation of biomechanics is able to measure the level of knowledge and implementation of respondents well (Kusuma, Noviasari and Marthasari, 2016). The next step is to conduct a reliability test to determine the level of reliability of the instrument used. The releability test used in this study was to use Cronbach's Alpha coefficient. The state of an instrument can be seen from Cronbach's alpha value, for < values 0.5 has "low" reliability, 0.5-0.7 has "medium" reliability, 0.7-0.9 "high" reliability, and > 0.9 has "excellent" reliability (Taherdoost, 2018).

Reliability test results for questionnaires distributed to respondents showed "excellent" results in 33 respondents. The following table of reliable test analysis results using Cronbach's alpha:

Table 5. Results of Reliability Statistics

Cronbach's Alpha	N of Items
.936	18

The results of the analysis obtained Cronbach's alpha value of 0.936 or > 0.9 and said the reliability level was "very good". It can be said that this questionnaire has an "excellent" reliability value, meaning that it is stable in collecting data.

2. Results of Analysis of Biomechanics Knowledge Level in Woodball

The use of biomechanics in sports is a strategic step to achieve athlete performance. But the conditions in the field between knowledge of biomechanics and implementation in the field are inversely proportional. Researchers tried to collect data on the knowledge and implementation of biomechanics in woodball sports players in East Kalimantan, with the aim of whether woodball sports players have carried out biomechanical analysis on their movement techniques. Instrument used in the form of a google form (link: https://forms.gle/5by2X27gC9Dug9TRA) for woodball sports players in 2022. The results show a level of knowledge consisting of seven question items, as follows:

Table 6. Level of Biomechanics Knowledge in Woodball

No	Statement Item	Answer Percentage (%)	
		Yes	No
1	I've known about biomechanics in sports before.	52,6	47,4
2	I know that biomechanics can contribute to investigating elite-level sports performance	63,2	36,8
3	I understand that biomechanics has to do with human anatomy.	71,1	28,9
4	I understand that biomechanics is related to the approach of mechanics.	60,5	39,5
5	I know that the use of biomechanics by coaches/athletes can support the training aspect in determining exercise programs.	65,8	34,2

No	Statement Item	Answer Percentage (%)	
		Yes	No
6	I know the principles of biomechanics in sports	56,8	43,2
7	I know that biomechanics can contribute to achievement coaching.	68,4	31,6
Average		63	37

Based on the results of the questionnaire that has been filled out by respondents in Table 6, it can be seen that the level of knowledge of respondents to biomechanics is very good where 63% of the level of knowledge of woodball actors understands biomechanics. This is evidenced by how woodball players know about biomechanics both in relation to contributions, anatomy, mechanical approaches, determining exercise programs to contributions to sports achievements. These results show that respondents who are woodball players, understand the importance of biomechanics in sports so it is very important that biomechanics can be applied in coaching athletes so that in the future achievements continue to increase both at national and international levels.

3. Results of Biomechanics Implementation Analysis in Woodball

In addition to the level of knowledge, researchers also gave questionnaires to woodball sports players related to how to implement biomechanics in woodball sports activities. Data related to the level of implementation of biomechanics in woodball sports consisting of 11 question items, obtained the following data:

Table 7. Implementation of Biomechanics in Woodball

No	Statement Item	Answer Percentage (%)	
		Yes	No
1	I once used biomechanics to reduce the risk of injury during training sessions	63,2	36,8
2	I once used biomechanical analysis to get data on motion.	31,6	68,4
3	I once used the kinovea/derfis app for motion analysis.	18,4	81,6
4	The use of Biomechanics can improve the quality of training programs for athletes	68,4	31,6
5	I once used biomechanics analysis to be able to complete training programs faster.	36,8	63,2
6	I once used biomechanical analysis to increase productivity in training.	44,7	56,3
7	I have used biomechanical analysis to improve the effectiveness of exercises in training programs.	44,7	55,3
8	I once used biomechanical analysis to make it easier to develop training programs in doing exercises.	43,2	56,8
9	I've used biomechanical analysis to make decisions when in a match.	42,1	57,9
10	I've seen the use of biomechanical analysis around me in sports.	42,1	57,9
11	I feel that the use of biomechanical analysis in sports is impractical.	26,3	73,7
Average		42	58

The results of data obtained regarding the level of implementation of biomechanics in woodball sports show that the implementation of biomechanics in sports in woodball sports players is mostly used in handling injury risk, while the implementation related to movement analysis for the preparation of exercise programs has not been carried out evenly by sports players woodball. This can be seen on tabel 7, where the implementation of biomechanics above 50% states never, in addition to performance improvement based on numerical / numerical analysis data has not been fully carried out by woodball sports players. One of the uses of biomechanics applications that have been used in several countries such as darfish/kinovea is still at a low percentage of 18.4% implementation in woodball sports, especially in East Kalimantan Province.

CONCLUSIONS AND RECOMMENDATIONS

Based on the results of data analysis that has been carried out, it can be concluded that the level of knowledge of woodball sports players about biomechanics can be said to be "good" because the percentage results show that 63% stated "Yes" which is related to several aspects of biomechanics, namely contribution, anatomy, mechanical approach, determination of exercise programs to contributions to sports achievements. If you see these results, woodball players in East Kalimantan Province, understand about biomechanics related to biomechanics with anatomy, mechanics, principles of biomechanics and how important biomechanics is in woodball. Utami & Kriswantoro (2019) explained that woodball training programs need to be improved to achieve maximum results in playing as well as technical training, including: 1) grip, 2) foot position, 3) posture, 4) ball placement position, 5) pulling the mallet back, 6) downswing, 7) impact, 8) and follow-through. The basic motion of the woodball game is the swinging motion. The swinging motion is basically a very simple pendular or bow movement. The swinging motion is used on all strokes from the tee area (the beginning of starting the stroke), to the punch made in the gate area (goal).

The basic aspects of woodball swings are still the same, but the length and speed of a regular swing differ depending on the stroke used. Swing or swing in woodball is one of the most dominant techniques, therefore athletes who will swing or swing when making a punch need good concentration and coordination (Yazid et al., 2016). The most important concept in performing swing techniques in woodball is that the ball is hit into the path of movement. Woodball balls are in a stationary state, so the main goal is to develop consistent swings. One technique in developing a consistent swing is to imagine the swing to be on an inclined wheel. The ideal swing will follow a circular line that continuously rotates along an inclined plane. The variability between individuals during the backswing phase is higher by showing the difference in swing times between players. This study concluded that there is a high relationship between speed and weight transfer during a golf swing to produce extra energy on the ball (Gryc et al., 2015). The research entitled "woodball shooting technique analysis in biomechanic perspective". The conclusion in the study showed that shooting accuracy is influenced by the elbow and grip position (Muhammad et al., 2019). The index obtained from the peak of pre-impact pelvic rotational speed, pelvic rotational speed on impact, and post-impact upper body rotational speed peak showed strong predictive performance to distinguish professional golfers from amateurs (Zhou et al., 2022).

In the implementation of biomechanics in woodball sports shows about how the role of biomechanics affects the improvement of woodball movement. The answer from the woodball perpetrator shows that the woodball perpetrator has applied biomechanics in woodball both by reducing the risk of injury, and improving the quality of the exercise program. In the use of applications used in biomechanics such as the kinevea/derfis application has not been fully able to operate woodball actors to analyze woodball movements. Various studies that have been conducted on the use of biomechanics show

good results for increased movement in sports. The study entitled "motion analysis of long-distance drive in woodball athletes". The method in this study uses quantitative descriptive by using observation with Video Recording. This study used data analysis techniques using Kinovea application software Version 0.8.15. The results of this study showed that it was quite effective and efficient based on the video analysis used (Irawan et al., 2021). Other studies such as "the required number of trials for biomechanical analysis of a golf swing". The statement of the results of the study concluded that 8 experiments were sufficient for biomechanical analysis of golf swings (Severin et al., 2021). Gould et al., (2018) examined the relationship between golf movement screen (GMS), factor x, which is the separation between upper body and pelvic rotation, and biomechanical movements of the pelvis , chest, and spine during backswing and impact of golf strokes in golfers with low handicaps. Upon impact, torso inclination, thoracic rotation, and leg bending position have a small to moderate significant relationship with movement.

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