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Hand Grip Strength, Arm Muscles Power, and Flexibility: Key Contributions to Wrestling Athlete Slam Success

Rafi Alifiansyah[1]✉, Destriana[2], Iyakrus[3]

Departemen of Physical Education dan Health, Universitas Sriwijaya, Indonesia[123]

rafialifiansyah39@gmail.com[1], destriana@fkip.unsri.ac.id[2], Iyakrus@fkip.unsri.ac.id[3]

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Abstract

This quantitative research aimed to examine the relationship between hand grip strength, arm muscle power, and flexibility with the slam results of wrestling athletes at the Sriwijaya State Sports School. Conducted from September 9 to September 27, 2024, the study involved 15 athletes as participants. Data were collected using test and measurement instruments and analyzed using regression and correlation tests with SPSS version 26. The findings revealed significant relationships between the physical attributes and slam results. First, hand grip strength showed a significant correlation with the slam result, with a significance value of 0.023 (<0.05) and a determination coefficient (R) of 0.988, indicating a perfect correlation. Second, arm muscle power demonstrated a significant relationship with the slam result, with a significance value of 0.00 (<0.05) and an R value of 0.981, also showing a perfect correlation. Third, flexibility had a significant impact on the slam result, with a significance value of 0.000 (<0.05) and an R value of 0.720, indicating a strong correlation. Finally, a combined analysis of hand grip strength, arm muscle power, and flexibility revealed a significant relationship with the slam results, with a significance value of 0.00 (<0.05) and an R value of 0.973, demonstrating a perfect correlation. In conclusion, the study highlights that hand grip strength, arm muscle power, and flexibility significantly contribute to the slam results of wrestling athletes at the Sriwijaya State Sports School, with hand grip strength and arm muscle power showing the strongest correlations, emphasizing the importance of these physical attributes in enhancing wrestling performance.

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INTRODUCTION

According to Destriana et al., (2022) Sports are all systematic activities to encourage, foster, and develop physical, spiritual, and social potential. Wrestling as a form of individual martial arts sport, often involves two people facing each other with the aim of pulling, pushing, tripping, and slamming their opponents until one of the wrestlers ends up with both shoulders attached to the mat. There are two main styles in wrestling, namely the free style and the Greco-Roman style, which have different rules (Martiani, 2018). Freestyle allows the wrestler to actively use all of his limbs, both to attack and defend against opponents, with the exception of areas of the body that are considered vital, such as the eyes and genitals.

A wrestler is expected to have a complex physical condition to support the achievement of desired achievements. According to Yudi, (2020), the components of physical condition can be described as follows: strength, endurance, speed, flexibility, balance, coordination, agility, accuracy, and reaction. Physical condition training must be done regularly and has been well programmed, it is useful to improve the physical condition of players correctly and gradually, therefore physical condition is very important for players, because it can improve the quality of individual play (Nugraha & Syafi'i, 2022).

Wrestling sports have physical fitness components, including flexibility, strength, and endurance are important elements in wrestling sports. Suppleness is needed to carry out the slam technique without injury. The basic techniques of wrestling involve slamming, falling, and locking, which every wrestler must master. The slam technique uses the strength of the arm and thigh muscles to defeat the opponent, while the fall technique is used to minimize injuries due to the slam. The lock technique, as the last basic technique, is the key to victory in wrestling, therefore, every wrestler needs to master the three basic techniques, but the grip is very important in the implementation of the slam, the explosive power is concentrated in the hand, if the grip is not strong, the slam is not optimal (Bintara et al., 2021).

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tion of the slam, the explosive power is concentrated in the hand, if the grip is not strong, the slam is not optimal (Bintoro & Nugraheningsih, 2021).The grip of the hand serves to keep the opponent in control by hooking both hands when controlling the opponent. A weak grip will cause the wrestler to lose his opponent when attacking. Meanwhile, flexibility is needed when the wrestler who will slam twists the body and slams quickly. Based on research conducted by (Andesa et al., 2017) that flexibility or flexibility contributes to the speed of slamming.

According to a study conducted by Basri et al., (2023) entitled "The Contribution Of Arm Muscle Strength Levels To Throws In Judo Pangkep Athletes", it shows There is an effect of the strength of the slam arm muscles on the ability to slam in Pangkep judo athletes. 47.2%. This shows that the strength of the arm muscles on the ability to slam in pangkep judo athletes. While the remaining 52.8% is influenced by other factors such as mastery of basic techniques in judo.

From the consequences of perception on the field, through the perception that is made, it tends to be seen that there are several problems, for example, the ability to slam which actually still has room to be developed, it can be seen when the athlete actually does the slam, where several times the athlete has difficulty lifting his opponent. In addition, often when doing a slam, the athlete is still not strong or inaccurate in handling the opponent which causes the slam to fail. Meanwhile, athletes with low flexibility have difficulty adjusting body movements when performing slams that require flexibility. This phenomenon shows that these physical factors are closely related to the success of the slamming technique

Based on the observations made, it was found that there were still wrestling ath-letes at the Sriwijaya State Sports School who were less than optimal or not good at performing slam techniques, when slamming athletes looked less energetic when slamming, it was seen that the slam movement still looked less flexible when slam-ming, and when pulling the opponent, it was seen that the athlete had a less strong hand grip.

Based on the above presentation, this study was conducted to find out the rela-tionship between hand grip, arm muscle power and flexibility so that coaches provide more specific training to improve slam technique, therefore this study is entitled "The Relationship of Hand Grip Strength, Arm Muscle Power and Flexibility to the Results of Male Wrestling Athletes at Sriwijaya State Sports School".

METHOD

This study uses a quantitative approach with a correlational design to analyze the relationship between hand grip strength, arm muscle power, body flexibility, and slam results in wrestlers at Sriwijaya State Sports School. In this study, the researcher used purposive sampling by conducting a BMI test on the population. The criteria for determining the sample in this study is to use the BMI (Body Mass Index) standard, which is a calculation based on a person's height and weight. Through this body mass index, it can be measured whether a person's weight is ideal enough, too thin, to overweight. The research subjects consisted of 10 male wrestlers and 5 female wrestlers who were actively training in the

school. This research was carried out at the Sriwijaya State Sports School Palembang from September 9 to September 27, 2024.

In this study, instruments were used to measure physical factors related to the suc-cess of slamming in wrestling athletes at the Sriwijaya State Sports School, including to measure hand grip strength, arm muscle power, body flexibility, and assessment of slam results. The grip strength of the hand is measured using a hand grip dynamome-ter, which allows the measurement of grip strength in kilograms. Each athlete was asked to hold the device with maximum force for five seconds, and the best score from the two experiments was used. Arm muscle power was measured using Two Hand Medicine Ball Put according to Nurhasan, (2000:144) quoted in (Rismayadi et al., 2023). The weight of the medicine ball weighs 6 pounds or 3 kg according to what is expressed by . The test procedure is carried out by sitting with both legs stretched out in front of you and looking straight, while holding the medicine ball with both hands in front of the chest. Then Teste pushed the ball until his hand was straight forward as hard as he could. This test was carried out 2 times and the farthest distance from the fall of the medicine ball was taken. Flexibillity was measured using the sit and reach test ac-cording to the sit and reach (cm) norm, namely for the male category from 10 cm to approximately 41 cm while for women from 15 cm to approximately 46 cm (Topan & Subagio, 2021). Slamming skills are measured using a validated arm slamming test (Al Wafi et al., 2022). The slam technique procedure is carried out by: 1. The two testees/wrestlers stand facing each other, ready to do the slam 2. After there was a cue, yes, one of the testees/wrestlers did the arm slam technique. 3. From the moment the Yes stopwatch is triggered until one of the wrestlers is able to knock down his opponent. 4. The time given to the testee/wrestler to do a slam for 30 seconds and given 2 opportunities to perform. 5. Then it is recorded how many times the testee knocked down his opponent for 30 seconds. The assessment categories for the three tests can be seen as shown in tables 1, 2, and 3.

Table 1. Dynamometer Handgrip Test Assessment Norms

Boy		Category	Girl	
Right	Left		Right	Left
>55.50	>54.50 USD	Very good	>42.50	>37.00 PM
46.50-55.00	44.50-54.00	Good	32.50-41.00	27.00-36.50
36.50-46.00	33.50-44.00	Keep	24.50-32.00	19.00-26.50
27.50-36.00	24.50-33.00	Less	18.50-24.00	14.00-18.50
< 27.00	<24.00	Less	<18.00	<13.50

Source : Center for Physical Freshness and Recreation of the Ministry of Education and Culture, 1996 in (Ardiansyah, 2020)

Table 2. Assessment Norms of the Two Hand Madicine Ball Test

Boy	Criterion	Girl
5.38-6.22	Very good	3.52-4.03
4.53-5.37	Good	2.95-3.52
3.68-4.52	Enough	2.38-2.94
2.63-3.67	Less	1.81-2.37
< 2.62	Less	<1.80

Source : (Yudho et al., 2022)

Table 3. Sit and Reach Test Assessment Norms

Boy	Criterion	Girl
>41	Excellent	>46
30-40	Good	35-45
21-30	Enough	26-34
11-20	Less	16-25
<10	Less	<15

Source : National Level Laboratory Training 2010 (Irawan, 2014)

Table 4. Wrestling Slam Test Assessment Norms

Boy	Category	Girl
>13	Very good	> 10
9-12	Good	7-9
5-8	Keep	4-6
2-4	Less	1-3
<1	Less	0

Source : (Al Wafi et al., 2022)

This study uses simple and multiple correlation test regression analysis techniques. Regression testing is one of the ways used to convey or show the existence of a rela-tionship (presence or absence) between the variables being studied. Correlation Test is one of the ways used to convey or show the existence of a relationship (presence or absence) between the variables to be tested. The Multiple Correlation Test is used to determine whether there is a relationship to more than one bound variable. Using the SPSS 26 aid in the calculation processor.

RESULT AND DISCUSSION

1. Results

This research was carried out at the Sriwijaya State Sports School, which is located in Palembang The process of collecting data on physical tests for wrestling sports was carried out on wrestling athletes at the Sriwijaya State Sports School. The data in this study are in accordance with the elements of testing that are suitable for wrestling sports. The components include hand grip strength, arm muscle power, flexibility, and slam. The instruments used are handgrip dynamometer, two hand medicine ball, sit and reach and arm slams that are directly in contact with people. From this study, wrestling athletes at the Sriwijaya State Sports School amounted to 15 people, divid-ed into 5 women and 10 men.

The results of the analysis obtained data on hand grip, arm muscle power, flexibility and slamming results are presented in the following table:

Tabel 5. Distribution of hand grip frequency, arm muscle power, flexibility and slam results

Variable	n	%	Mean
Hand Grip			
Very good	0	0	
Good	0	0	27.85
Medium	6	40	
Weak	5	33,3	
Very Weak	4	26,7	
Arm Muscles Power			
Very good	3	20	4.35
Good	9	60	
Medium	3	20	
Weak	0	0	
Very Weak	0	0	
Flexibility			
Very good	4	26,7	
Good	6	40	33.73
Medium	2	13,3	
Weak	3	20	
Very Weak	0		
Slam			
Very good	**0**	0	
Good	4	26,7	7.07
Medium	11	73,3	
Weak	0	0	
Very Weak	0	0	

Based on the above data distribution table, it shows that the grip strength of the hand is included in the medium category with a percentage of 40% with an average arm muscle strength of 27.85. Meanwhile, arm muscle power is known to be included in the good category with a percentage of 60% with an average of 4.35. Then for flexibility, it was included in the good category with a percentage of 40% and an average of 33.73. Meanwhile, the ability to bounce is defined in the medium category with a percentage of 73.3% with an average of 7.07.

This study conducted a regression test and a correlation test using the SPSS version 26 statistical device. The relationship between variables is considered critical if the sig < 0.05, while if the sig > 0.05, then there is no relationship between the X variable and the Y variable.

Table 6. Results of the regression test of arm muscle strength, arm muscle power, and flexibility on wrestling slam results

ANOVA[a]

Model	Sum of squares	df	Mean square	f	Sig.
Regression	14.216	3	4.739	4.099	.035[b]
Residual	12.718	11	1.156		
total	26.933	14			

The results from table 6 show that the significance value of 0.035 when compared to the coefficient of α (0.05) then the significance value is less than 0.05 so it can be concluded that there is a significant relationship between hand grip, arm muscle power, and flexibility on the slam results of wrestlers.

From the data, a correlation test was carried out and the results were obtained as shown in table 7.

Table 7. Results of the correlation test of hand grip strength, arm muscle power, and flexibility to the results of slamming

Correlations

		X_1	X_2	X_3	Y
X_1	Pearson Correlation	1	.815**	.210	.486
	Sig. (2-tailed)		.000	.453	.066
	N	15	15	15	15
X_2	Pearson Correlation	.815**	1	.046	.220
	Sig. (2-tailed)	.000		.870	.431
	N	15	15	15	15
X_3	Pearson Correlation	.210	.046	1	.593*
	Sig. (2-tailed)	.453	.870		.020
	N	15	15	15	15
Y	Pearson Correlation	.486	.220	.593*	1
	Sig. (2-tailed)	.066	.431	.020	
	N	15	15	15	15

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Based on the table above, Pearson's correlation test shows that hand grip, arm muscle power, flexibility and wrestling slam results have a significant relationship and are perfectly correlated.

2. Discussion

The results of the research that have been conducted show the relationship be-tween hand grip, arm muscle power and flexibility to the results of wrestling slam-ming. Between the grip of the hand and the result of the slam, a significant relation-ship was obtained that was perfectly correlated. In studies related to the relationship between hand grip and wrestling results, until now, no research has been found that specifically identifies a direct relationship between the two factors. Although several studies have examined hand grip strength in the context of other sports, such as weightlifting or rock climbing, which shows the importance of grip strength for im-proving athlete performance, specific applications in wrestling have not been fully explored. Although there have been no findings on the relationship between hand grip and slam results in wrestling, the tanga grip still has an important role in wrestling as stated by (Syahputra, 2015) that the hand grip functions to keep the opponent in control by linking both hands when controlling the opponent. A weak grip will cause the wrestler to lose his opponent when attacking. Opinion (Nadapdap & Mahfud, 2022) states

that when doing a forward shoulder slam precisely and directionally, to support the opponent's weight when Slam depends on the strength of the limbs while another physical condition is the endurance of the strength of the arm muscles as a tool to grip the opponent when on top and pull the opponent's arm for-ward when slamming and try to make the opponent easily shake or shake because thus the state of the body Opponents are unstable and easy to take down. Another opinion from (Sahrul Jahrir & Yusuf, 2022) Lumbar slamming can be influenced by several elements including speed, strength and accuracy, the ability of lumbar slam referred to in this study is one of the slam techniques that uses the waist as the basis for slam techniques in wrestling. Based on some of these opinions, it can be conclud-ed that even though an athlete has a good physical condition in various aspects, but if he does not have good hand grip strength, the athlete will have difficulty doing the slam technique because before doing the slam he will lose his opponent because he cannot grasp the opponent's collar properly so that it is released, so it can be said that the strength of the hand grip affects the result of the slam wrestlers.

Based on the results of the study, it was found that there was a significant relation-ship that correlated perfectly between arm muscle power and wrestling slamming results. This research is in line with research (Erawan, 2010) which states that arm power has a positive relationship with freestyle wrestling achievement, this explains that if arm power is increased, then the freestyle wrestling achievement will be more positive;(Fitriana & Komara, 2019) Power is a very dominant aspect in wrestling, especially the number of short-distance matches. To be able to wrestle in the mini-mum amount of time necessary, strong arm power is needed. If the power of the wrestler's arm increases, the travel time achieved by the wrestler is minimal, so the wrestler can finish his wrestling quickly. This is supported by the opinion (Sabilah, 2023) which states that the power of the arm muscles functions to attract and push the opponent to eliminate stability in defense, then the resulting arm muscle power functions to lift the opponent's body. Thus, it is suspected that there is a positive rela-tionship between arm power and wrestling slamming results.

The results of this study after a regression test between the independent variable, namely .flexibility to the bound variable, namely the slam result, obtained results that stated that there was a significant strong correlation between flexibility and wrestling slam results. This research is in line with the research (Maya Sari Br Sembiring et al., 2018) with the results of the study stating that there is a positive influence between waist flexion on arm slamming skills in North Sumatra PPLP Athletes. Meanwhile, in a study (Januareva, 2023) with the results of the study, there was a significant rela-tionship between flexibility and slamming results in Pontianak wrestling club athletes as evidenced by the r calculation ≥ r table or 0.676>0.732. research (Catur Wijayanti & Asmi, 2019) stated that waist flexion provides a significant relationship with the ability to slam kayang in wrestling with a simple correlation coefficient (rxy) 0.559 > r tab 0.482 at the significance level $\alpha = 0.05$ with a t-hit of 2.697 > a t-tab of 2.120. The conclusion is the same as previous research that flexibility has a relationship with wrestling slamming results.

The results of this study after a regression test between the independent variables, namely hand grip, arm muscle power, and flexibility to the bound variable, namely the slam result showed that in this study there was a relationship between hand grip, arm muscle power and flexibility to the slam result.

The results of the hypothesis test in the form of comparing the significant values used, namely 95%, it turned out that the significant value obtained was less than α 0.05, so it was concluded that Ho was rejected, meaning that there was a significant contribution of hand grip, arm muscle power, and flexibility to the results of the slam of wrestling athletes at the Sriwijaya State Sports School. Furthermore, the correlation coefficient obtained for the relationship between hand grip, arm muscle power and flexibility to the wrestling slam result is = 0.973, this value is in the interval of 0.90 – 1.00, so the correlation coefficient shows a very perfect relationship.

This is understood because wrestling sports require coordination between hand grip, arm muscle power and flexibility (Jahrir & Yusuf, 2021). The grip of the hand provides initial control and mastery of the opponent, which allows the wrestler to direct the next move. Power arm muscles are used to pull, push, or lift opponents with speed and force, overcome opponent resistance, and throw opponents with control. Juhanis, (2019) in his research stated that the better the strength of a person's arm muscles, the better the results of the slam performed Body flexibility allows wrestlers to adapt to the opponent's dynamic movements and maintain good body balance throughout the slam movement. Asmi's opinion, (2016) states that the higher the level of flexibility of a wrestler, the higher the slam he achieves. These three components support each other and increase the success of the slam, both in terms of technique, speed, and control.

Based on this, it can be concluded that in the implementation of the wrestling slam technique, you must pay attention to the ability of the hand grip, the power of the arm muscles and flexibility if you want to get good slam results. Seeing the im-portance of the physical condition component that greatly affects the performance of athletes whether in training or facing matches for a wrestler, excellent physical condition can be achieved with proper and optimal coaching.

CONCLUSION

The results of this study found a strong relationship between arm muscle strength, hand grip, and flexibility to slam results in wrestling sports. Based on these findings, it is suggested that arm muscle power exercises need to be done to improve the results of slamming, such as with push-ups and plank exercises. In addition, the strength of the hand grip also affects the result of the slam, so practice is needed to strengthen the hand grip, for example by practicing grip and grip of the ball. Body flexibility also has a significant relationship with slam results, therefore flexibility exercises, such as stretching and yoga, need to be implemented to improve flexibility. With the right training, it is hoped that it can improve the results of slamming in wrestling. This study has limitations with a relatively small sample size and only involves post-secondary age participants, so further research needs to consider this.

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