The Relationship Between Wrist Flexibility and Arm Muscle Strength With the Accuracy and Speed of Smash for Badminton Athletes Universitas Pendidikan Indonesia (UPI)

Ardianto Rifki Purnama[1✉], Kardjono[2], Yopi Kusdinar[3], Mulyana[4]

Sports Coaching Education, Faculty of Sport and Health Education, University of Education Indonesia, Indonesia[1234]

Abstract

This study aims to analyze the relationship between wrist flexibility and arm muscle strength with smash accuracy and speed in badminton athletes of Universitas Pendidikan Indonesia (UPI). In this study using descriptive methods with correlational techniques and the sample in this study amounted to 12 UPI Badminton UKM athletes.. Descriptive statistics show the average wrist flexibility of 99.16, arm muscle strength of 5.01, smash accuracy of 4.25, and smash speed of 103.83. The normality test results showed that the data were normally distributed ($p > 0.05$). Pearson correlation analysis showed a significant positive relationship between wrist flexibility and smash accuracy ($r = 0.640$, $p = 0.025$) and smash speed ($r = 0.662$, $p = 0.019$). Similarly, arm muscle strength was significantly associated with accuracy ($r = 0.587$, $p = 0.045$) and smash speed ($r = 0.720$, $p = 0.008$). However, the regression analysis results showed that these two variables together did not have a significant effect on smash accuracy ($p = 0.081$) but were significant on smash speed ($p = 0.030$). The results of this study underscore the importance of wrist flexibility and arm muscle strength in supporting smash performance, both in terms of accuracy and speed. Training that focuses on improving flexibility and arm muscle strength is recommended to help athletes improve the quality of their smashes, while still considering aspects of technique and coordination.

How to Cite

Purnama, A. R., Kardjono., Kusdinar, Y., & Mulyana. (2024). The Relationship Between Wrist Flexibility and Arm Muscle Strength With the Accuracy and Speed of Smash for Badminton Athletes Universitas Pendidikan Indonesia (UPI). *Journal of Physical Education, Health and Sport*, 11 (2), 75-78.

✉ Correspondence Author:
E-mail: ardiantorifkipurnama@gmail.com

INTRODUCTION

Badminton is a popular sport that demands skill, strategy and physical strength (Elfandi et al., 2024). Smash is a basic strategy in badminton that can kill the opponent›s game quickly and on target (Azhar, 2022). Therefore, it is important for badminton players to understand the elements that affect smash performance. In addition, wrist flexibility is an important physical element for smash quality (Sulaiman et al., 2024). Players with wrists that have high flexibility can make precise finishing touches to various angles of the shot to sharpen the smash and make it more difficult for the opponent to return the shuttlecock. So that it can support the ability of the arm muscles can also contribute to providing a fast push on the shuttlecock (Tantra, Aditya & Pramono, 2016). This is in line with previous research revealing that smash efficiency is ultimately influenced by hitting speed, which can be improved with ideal arm muscle strength.

Research conducted (Abiwan, 2024) shows that players with good wrist flexibility are able to produce sharper and more accurate shots, thus increasing effectiveness in the game. The ability of muscle strength is closely interconnected with the speed of the stroke and therefore this can be one of the success factors of smash to show that arm muscle strength is closely related to stroke speed, which is a key element in producing a deadly smash. However, research examining the relationship of these two factors, wrist flexibility and arm muscle strength, to smash accuracy and speed is limited, particularly at the university level.

The UPI Badminton Student Activity Unit (UKM) is a forum for students to develop their abilities in the field of badminton. UPI Badminton UKM athletes are required to have optimal performance in various aspects of the game, including smash techniques. However, based on preliminary observations, observations and field data, the results of the match still do not produce the specified achievement targets, as evidenced by the UPI badminton UKM team at the championship event between Indonesian students at UNY 2022 getting 1 silver and 1 bronze, UII 2023 did not get a medal, UNS 2024 got 1 bronze medal, Bumsil Open 2024 got 1 bronze medal. From these data, it shows that the achievements of the UPI badminton UKM team are not good enough and structured training is needed, specifically in terms of smash ability (Adi, S., Arbanisa, W., & Winoto, 2023). So, researchers need to conduct research to determine the relationship between wrist flexibility and arm muscle strength with the accuracy and speed of smash in UPI Badminton UKM athletes.

METHOD

In this study using descriptive methods. Therefore descriptive research can be explained as research that tries to describe phenomena, events or events that occur at this time (Sugiyono, 2020). Then because this study aims to find and establish the relationship between one variable and another, this study uses descriptive methods with correlational techniques. With the correlation technique, the author can state that in this study the data obtained are collected, compiled, explained and analyzed (Sugiyono, 2020). This is intended to obtain a clear picture of the relationship between wrist flexibility and arm muscle strength with smash accuracy and speed.

The population in this study were all badminton athletes who are members of the UPI Badminton UKM totaling 32 athletes, with samples taken using purposive sampling based on certain criteria, such as athletes who are registered as members of the University of Education Indonesia badminton student activity unit (UKM), have experience competing, athletes who have participated in regional and national inter-student competitions, male. Based on these criteria, the sample in this study amounted to 12 athletes. The variables studied consisted of two independent variables, namely wrist flexibility as measured by a goniometer (Ruswandi, 2016), and arm muscle strength as measured using the soft ball throw test (Nurhasan & Cholil, 2007) While the dependent variable tested was smash accuracy (Junanda et al., 2016), which was measured by the French stalter badminton test and smash speed measured using a speed measuring device in the form of a bushnell speed gun (Priyatama, 2016).

The research procedure begins with measuring the wrist flexibility and arm muscle strength of athletes, followed by testing the accuracy and speed of smashes performed by athletes. The data collected was then analyzed using the Pearson correlation test to determine the relationship between the independent and dependent variables, and simple linear regression to see how much influence each independent variable has on the dependent variable.

Based on the results of the analysis, it can be concluded that wrist flexibility and arm muscle strength have a significant relationship with smash accuracy and speed in UPI UKM badminton athletes. These findings can be used

as a basis for providing advice to coaches and athletes in improving aspects of flexibility and arm muscle strength in order to improve their smash performance.

RESULTS AND DISCUSSION

Tabel 1. Statistik Deskriptif

	Flex-ibility	Arm Strength	Accu-racy	Speed
Mean	99.16	5.01	4.25	103.83
Std. De-viation	5.40	.69	.29	6.86
Minimum	89.00	4.01	3.80	88.00
Maximum	106.00	5.88	4.80	117.00

Based on **Tabel 1** of the data obtained in conducting the test. obtained an average value of flexibility of 99.16, standard deviation 5.40, minimum 89.00, and maximum value 106.00, while the average value of arm strength is 5.01, standard deviation 069, minimum 4.01, and maximum value 5.88, and the average value of accuracy is 4. 25, standard deviation 0.29, minimum 3.80, and maximum value 4.80, and the average speed value of 103.83, standard deviation 6.86, minimum 88.00 and maximum 117.00.

The significance value for flexibility is 0.531, arm strength is 0.196, accuracy is 0.333, speed is 0.168 > 0.05, then Ho is rejected.

Based on Pearson correlation analysis, it was found that wrist flexibility has a significant positive relationship with smash accuracy (r = 0.640, p = 0.025). These results indicate that the higher the wrist flexibility, the better the smash accuracy produced by badminton athletes. In addition, wrist flexibility also has a significant positive relationship with smash speed (r=0.662, p=0.019). This indicates that an increase in wrist flexibility can contribute to an increase in smash speed. With N=12 athletes, these two relationships demonstrate the importance of wrist flexibility in supporting smash technique performance in badminton.

The results of Pearson correlation analysis show that arm muscle strength has a significant positive relationship with smash accuracy (r = 0.587, p = 0.045). This relationship indicates that the stronger the arm muscles of an athlete, the better the level of smash accuracy that can be produced. In addition, arm muscle strength also showed a highly significant positive relationship with smash speed (r=0.720, p=0.008). This indicates that increasing arm muscle strength makes a substantial contribution to the speed of smash shots

of badminton athletes. With N=12 athletes as the sample, this finding confirms the important role of arm muscle strength as one of the supporting factors for smash technique performance, both in terms of accuracy and speed.

The p value = 0.081 (> 0.05), so the overall regression model is not statistically significant. This means that wrist flexibility and arm strength together do not show a significant relationship to smash accuracy.

The regression model is significant with a p value = 0.030 (<0.05), which means that flexibility and arm strength together have a significant relationship with smash speed.

Based on the results of this study, it can be concluded that:
1. wrist flexibility has a significant positive relationship with accuracy (r = 0.640, p = 0.025) and smash speed (r = 0.662, p = 0.019) in badminton athletes upi.
2. arm muscle strength also has a significant positive relationship with accuracy (r = 0.587, p = 0.045) and smash speed (r = 0.720, p = 0.008).
3. regression analysis shows that together, wrist flexibility and arm muscle strength have a significant effect on smash speed (p = 0.030), but not significant on smash accuracy (p = 0.081).

This study shows that wrist flexibility has a significant positive relationship with smash accuracy and speed in UPI badminton athletes. Good flexibility allows athletes to position the hand and arm with more precision, which can improve smash accuracy (Akkase, 2024). These results are in line with previous research showing that wrist flexibility can affect the quality of hitting techniques in badminton, including smash accuracy and speed. With sufficient flexibility, athletes can utilize the full range of motion, resulting in more effective shots (Simanjuntak et al., 2023).

On the other hand, arm muscle strength also plays an important role in smash performance, especially in terms of speed. The results showed that arm muscle strength has a significant relationship with smash speed, which indicates that the stronger an athlete's arm muscles are, the faster smash shots can be produced. Arm muscle strength allows athletes to exert greater thrust on the shuttlecock, which directly increases smash speed. (Setyawan, 2016). This is in accordance with previous research that emphasizes the importance of arm muscle strength in producing strong and fast smashes (Mahulkar, 2016).

However, although flexibility and arm

muscle strength showed a significant relationship to smash accuracy and speed, the regression analysis results showed that they did not have a statistically significant effect on smash speed. This could be due to other factors that were not taken into account in this study, such as smash technique, eye-hand coordination, or even psychological factors that affect athletes'

performance during competition (Muliana, 2019). Therefore, further research needs to be done by including other variables to better understand the factors that play a role in increasing smash speed.

From the results of this study, it can be suggested that badminton athletes' training programs integrate exercises to improve wrist flexibility and arm muscle strength. Stretching and wrist mobility exercises can improve flexibility, while strength training such as weight lifting and arm muscle endurance training can strengthen the muscles that play a role in smash technique. However, an effective training program should also consider aspects of smash technique and coordination to maximize the results of improving flexibility and arm muscle strength.(Wahyudi, 2020).

CONCLUSION

These results suggest that wrist flexibility and arm muscle strength are important factors in improving smash performance in badminton athletes. Therefore, a training program that focuses on developing flexibility and arm muscle strength, accompanied by improved technique and coordination, can help improve smash quality to the maximum.

REFERENCES

Abiwan, A. R. (2024). The relationship between shoulder and wrist muscle flexibility and hand muscle strength with the smash accuracy in Badminton. 2(1), 17–25.

Adi, S., Arbanisa, W., & Winoto, A. (2023). Program Latihan Beban Pada Olahraga Bulutangkis: Sebuah Tinjauan Pustaka. Citius : Jurnal Pendidikan Jasmani, Olahraga, Dan Kesehatan, 3(2), 146–154. https://doi.org/10.32665/citius.v3i2.2317

Akkase, A. (2024). Hubungan Kelentukan Pergelangan Tangan Dengan Kemampuan Pukulan Dropshot Pemain Bulutangkis The Relationship between Wrist Flexibility and the Ability to Hit Dropshot Badminton Players. November, 275–280.

Azhar, S. (2022). Penjasorkes Keterampilan Olahraga dengan Permainan. CV Jejak (Jejak Publisher).

Elfandi, M., Gustian, U., & Rubiyatno. (2024). Analisis Kemampuan Teknik Dasar Bulutangkis pada Atlet PB Junior Tangkas Usia 10-12 Tahun di Kota Pontianak Analysis of Basic Badminton Technique Ability in PB Junior Tangkas Athletes Aged 10-12 Years in Pontianak. 3(2), 91–104.

Junanda, H. A., Rusdiana, A., & Rahayu, N. I. (2016). Kecepatandan Akurasi Shuttlecock pada Jump Smash dengan Loncatan Vertikal dan Parabol Depan dalam Bulutangkis. Jurnal Terapan Ilmu Keolahragaan, 1(1), 17. https://doi.org/10.17509/jtikor.v1i1.1548

Mahulkar, S. S. (2016). Relationship of strength and flexibility with skill performance in badminton players. Internatioanl Journal of Physical Education, Sports and Health, 3(5), 38–40.

Muliana, A. (2019). Pengaruh Koordinasi Mata-Tangan, Kekuatan Otot Lengan dan Kelentukan Pergelangan Tangan Terhdap Kemampuan Pukulan Servis Panjang Dalam Permainan Bukutangkis pada Club PB. Matrix Makassar. 1–23.

Nurhasan, H., & Cholil, D. (2007). Tes dan pengukuran keolahragaan. Universitas Pendidikan Indonesia.

Priyatama, A. R. (2016). Perbandingan Hasil Tendangan Passing Terhadap Kecepatan dan Ketepatan Berdasarkan Jarak Passing Short, Medium dan Long Dalam Permainan Futsal.

Ruswandi, I. (2016). Hubungan Power Otot Lengan dan Fleksibilitas Pergelangan Tangan Terhadap Ketepatan Melakukan Spike Pada Permainan Bola Voli.

Setyawan, I. (2016). Hubungan Antara Kekuatan Otot Lengan dan Power Otot Tungkkai Dengan Ketepatan Smash Dalam Permainan Bulutangkis Mataram Raya Sleman Tahun 216. Revista Brasileira de Ergonomia, 3(2), 80–91.

Simanjuntak, J. J., Lian, B., & Akhbar, M. T. (2023). The Effect of Wrist Flexibility Exercise Using a Bottle on the Ability of Smash Badminton at the Extracurricular of SMK Negeri 2 Palembang. Journal of Social Work and Science Education, 4(3), 584–590. https://doi.org/10.52690/jswse.v4i3.594

Sugiyono. (2020). Metodologi Penelitian Kuantitatif, Kualitatif dan R & D.

Sulaiman, M. A., Pradany, N. S., & Maulana, H. (2024). Studi Artrokinematik : Pengaruh Kelentukan Sendi Pergelangan Tangan Sebagai Kemampuan smash Atlet Bulu Tangkis : Literature Review Arthrokinematic Study : The Effect of Wrist Joint Flexibility on Badminton Athletes ' Smashing Ability : Literature Review. 01, 24–31.

Tantra, Aditya, F., & Pramono, M. (2016). Kontribusi Konsentrasi Dan Kelentukan Pergelangan Tangan Terhadap Ketepatan Short Serve Pada Pemain Bulutangkis Sman 2 Tanggul Jember. Jurnal Kesehatan Olahraga, 06(2), 110–116.

Wahyudi, M. (2020). Kontribusi Kelenturan Pergelangan Tangan dan Kekuatan Otot Lengan Terhadap Smash Badminton pada Ekstrakurikuler di SMA Negeri 1 Teluk Kuantan (p. 50).