

## THE RELATIONSHIP BETWEEN ARM MUSCLE STRENGTH AND WRIST FLEXIBILITY WITH FOREHAND SHOT ACCURACY IN TABLE TENNIS GAMES FOR STUDENTS AT STATE JUNIOR HIGH SCHOOL 2 PULAU RIMAU BANYUASIN

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### Abstrak

The aim of this study was to determine the relationship between arm muscle strength and wrist flexibility and the accuracy of table tennis forehand smashes. Using the correlational method, the sample consisted of 30 male students who took part in extracurricular activities. The data analysis used is simple correlation analysis for each independent variable with the dependent variable, while for them together it is double correlation. The results of the research between variables X1 and Y obtained  $r_{count} = 0.892 > r_{table} = 0.361$  then  $H_0$  was rejected and  $H_a$  was accepted, variables =  $0.892 > r_{table} = 0.361$  then  $H_0$  is rejected and  $H_a$  is accepted and the value of  $F_{count} = 52.400 > F_{table} = 3.35$  means  $H_0$  is rejected and  $H_a$  is accepted. Because the three variables show a positive direction, it can be concluded that there is a relationship between arm muscle strength and wrist flexibility and the accuracy of forehand strokes in table tennis for students at State Junior High School 2 on Pulau Rimau, Banyuasin.

**Key words:** arm muscle strength, wrist flexibility, forehand accuracy, table tennis.

### INTRODUCTION

Table tennis is a game played using a small ball on a table and played at high speed. (Nopiyanto et al., 2021) argue that: "basically, the game of table tennis begins by bouncing the ball first on the table and hitting the ball at the opponent over the net." A simple game where players hit, aim and place the ball on the opponent's table in the hope that the opponent cannot return it (Junaidi & Mustofa, 2020). Because it is easy to play and does not require a large field or space, table tennis is very popular with everyone in Indonesia (Irawan, 2019). Thus, it is not surprising that table tennis courts can be found in elementary schools, middle schools, junior high schools, and high schools, both in cities and rural areas.

Shots in table tennis are broadly divided into 2 categories, namely serve and smash. The opinion of (Yarmani et al., 2019) states that: "the serves that players must master are the forehand and backhand serves". According to (Suparman et al., 2021) "every player in table tennis must master serve and smash". The basic techniques for playing table tennis are the forehand-backhand bed holding technique and the forehand-backhand ball hitting technique (Purwanto & Suharjana, 2017). Forehand and backhand

strokes are the basic stroke techniques found in table tennis (Anggara, 2020). According to (Tomoliyus, 2017), "a forehand is a front stroke that occurs when the palm of the hand holds the ball facing forward or the back of the hand holds the ball facing backwards, conversely, a backhand is a back stroke that occurs when the palm of the hand holds the ball facing backwards or the back of the hand holds the ball facing forward."

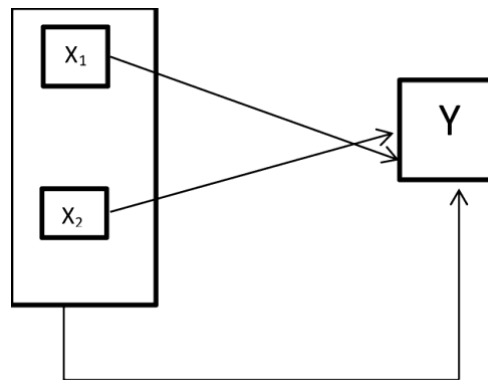
Forehand drive is a technique of hitting with a closed stance and the bet from the bottom obliquely upwards with the angle produced by the tilt of the bet varying depending on many factors, including the direction the ball falls, the speed of the ball coming, the opponent's spin on the ball, and the aim of the hitter (Muherman & Ramona, 2017). This blow is very effective when used in attacks on the opposing team (Pratama & Budiman, 2017). The ability to accurately hit a forehand is the athlete's ability to return a freely moving ball with a forehand for 30 seconds, direct and place it precisely towards the target, namely the corner area of the table that has been marked (Widiantoro, 2017). Because the forehand technique is very young and is used to make shots, such as the forehand smash, this is one of the techniques that is often used in table tennis and must be mastered by athletes or students (Reza et al., 2021). Forehand strokes can be done by looking at the direction the ball is coming from and hitting it according to the target (Ninglan et al., 2020). To master the forehand stroke is supported by several factors, one of which is adequate physical ability (Sariul et al., 2022).

In an effort to improve performance in the sport of table tennis, physical condition is prioritized (Pujianto, 2015). A player is required to be able to carry out movements that have explosive power when executing a blow (Murniati, 2018). Arm muscle strength in table tennis is very necessary in terms of hitting the ball with a forehand drive to produce an ideal shot (Hasibuddin et al., 2022). Shots in table tennis are determined by wrist flexibility (Saripin et al., 2018). Wrist flexibility is very necessary when playing table tennis in all techniques, especially smashes (Kurniawan et al., 2020). The development of a punch depends greatly on the strength of the arm muscles and the flexibility of the wrist. If these muscles do not work well, the blows made will not match expectations (Roetert & Groppe, 2001; Suparman & Hasbillah, 2021). Therefore, to prove this statement, the author was interested in conducting research with the aim of finding out the extent of the relationship between arm muscle

strength and wrist flexibility with the accuracy of making forehand strokes in students' table tennis games at Pulau Rimau State Junior High School 2, Banyuasin.

## METHOD

This type of research is quantitative research. The design used in this research is a correlational method research design.



**Figure 1.** Research Design

Information:

X: Arm Muscle Strength

X2: Wrist Flexibility

Y: Table Tennis Forehand Ability

The sample in this study was 30 male students who took part in extracurricular activities at Pulau Rimau State Junior High School 2, Banyuasin.

**Table 1.** Number and Description of Research Samples

No	Class	Amount	Amount
1	VII a	6	6
2	VII b	8	8
3	VII c	4	4
4	VIII a	7	7
5	VIII b	5	5
Amount			30

The test instrument used in this research is

1. Arm muscle strength test, with a 1 minute push up test (Ismaryati, 2011)

**Table 2.** Men's Push Up Test Norms

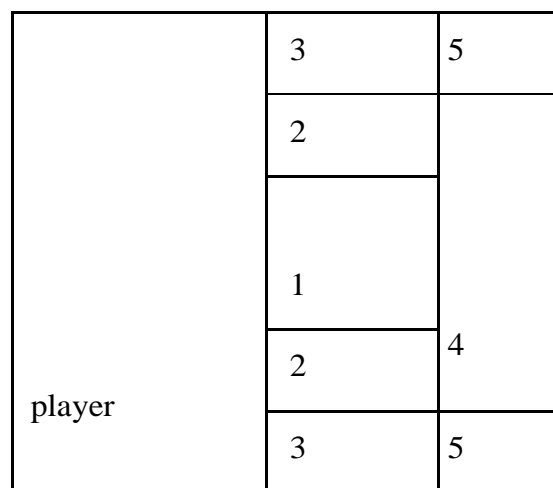
Score	Male Push-up	Criteria
5	>38	Perfect
4	29 – 37	Very well
3	20 – 28	Good
2	12 – 19	Enough
1	4 – 11	Less

2. Arm muscle wrist test with flexion flexibility (Ismaryati, 2011)

**Table 3.** Arm Muscle Wrist Test Norms

Criteria	Male
Perfect	>12.50
Good	12.50 – 11.50
Enough	11.49 – 8.25
Less	8.24 – 6.00

3. Test the accuracy of making a forehand stroke (Nurhasan, 2001)



**Figure 2.** Forehand stroke test plan in table tennis

Description: plot size 1: 60cm x 67 cm, plot size 2,3,5: 30cm x 67cm and plot size 4: 90cm x 67cm

**Table 4.** Forehand Stroke Test Norms

Score criteria	Table Tennis Forehand Shot (10 strokes)
Good	33 - 50
Enough	17 - 32
Less	1 - 16

Data analysis in this research used parametric inferential statistical analysis techniques with the help of the SPSS (Statistical Package for Social Science) Version 23.0 program. Before testing is carried out, it is necessary to carry out prerequisite tests first. The prerequisite test is intended for the data analyzed to meet the requirements for data analysis and hypothesis testing. The prerequisite tests carried out are the normality test using the Kolmogorov Smirnov test, and the linearity test using the test for Linearity. To test the relationship between an independent variable and a dependent variable with Pearson product moment correlation using the SPSS version 23.0 program (Maksum, 2012)

## RESULT AND DISCUSSION

### *Result*

#### **1. Arm Muscle Strength**

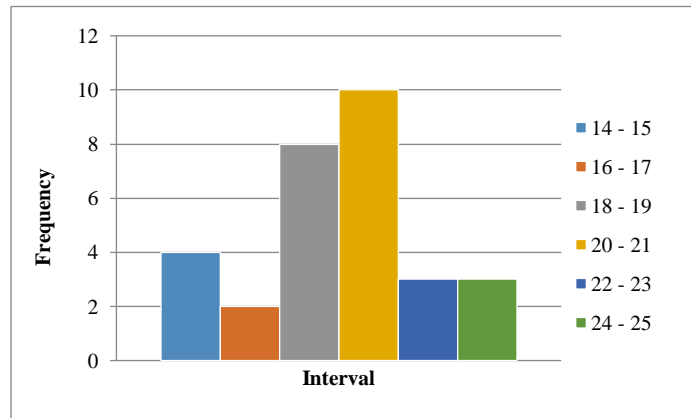
Arm muscle strength was measured using a push up test on 30 samples, the lowest score was 14, and the highest score was 25 with an average (mean) of 19.43, standard deviation (standard deviation) 2.944. For more details, see the frequency distribution below:

**Table 5.** Frequency Distribution of Arm Muscle Strength Variables ( $X_1$ )

Interval	Frequency	Relative Frequency (100%)
14 – 15	4	13,3%
16 – 17	2	6,7%
18 – 19	8	26,7%
20 – 21	10	33,3%
22 – 23	3	10%
24 – 25	3	10%
Amount	30	100%

From the frequency distribution table above, it turns out that 4 people (13.3%) had arm muscle strength results with an interval of 14-15, then 2 people (6.7%) had arm muscle strength results with an interval of 16-17, while 8 people (26.7%) had arm muscle strength results with intervals of 18-19, then 10 people (33.3%) had arm muscle strength results with intervals of 20-21, while 3 people (10%) had arm muscle strength results with interval 22-23,

and 3 people (10%) had arm muscle strength results with an interval of 24-25. For more details, see the histogram below:



**Figure 3.** Histogram of Arm Muscle Strength Variables

## 2. Wrist Flexibility

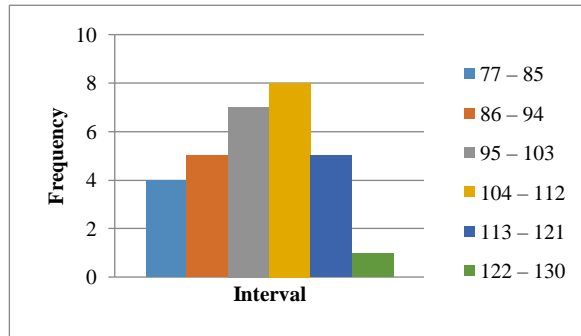
Wrist flexibility was measured using a flexion test on 30 samples, the lowest score was 77 and the highest was 125 with an average of 101.03, a standard deviation of 13.053. For more details, see the frequency distribution below:

**Table 6.** Frequency Distribution of Wrist Flexibility ( $X_2$ )

Interval	Frequency	Relative Frequency (100%)
77 – 85	4	13,3%
86 – 94	5	16,5%
95 – 103	7	23,1%
104 – 112	8	26,4%
113 – 121	5	16,5%
122 – 130	1	3,3%
Jumlah	30	100%

From the frequency distribution table above, it turns out that 4 people (13.3%) had wrist flexibility results with an interval of 77-85, 5 people (16.5%) had an interval of 86-94, 7 people (23.1%) had an interval of 95- 103, 8 people (26.4%) had an interval of 104-112, 5 people (16.5%) had an interval of 113-121, and 1 person (3.3%) had wrist flexibility results

with an interval of 122-130. For more details, see the histogram below:



**Figure 4.** Histogram of Wrist Flexibility Variables

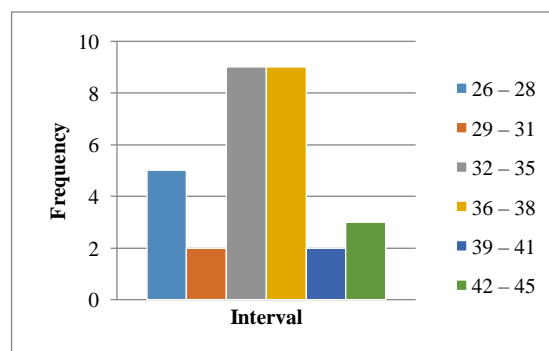
### 3. Table Tennis Forehand Shot Accuracy

Measuring the accuracy of table tennis forehand strokes was carried out using a stroke accuracy test on 30 samples, the lowest score was 26 and the highest was 45 with an average (mean) of 34.70, standard deviation (standard deviation) 4.991. For more details, see the frequency distribution below:

**Table 7.** Frequency Distribution of Table Tennis Forehand Shot Accuracy (Y)

Interval	Frequency	Relative Frequency (100%)
26 – 28	5	16,7%
29 – 31	2	6,7%
32 – 35	9	30%
36 – 38	9	30%
39 – 41	2	6,7%
42 – 45	3	10%
Amount	30	100%

From the frequency distribution table above, it turns out that 5 people (16.7%) had accurate forehand results with an interval of 26-28, 2 people (6.7%) an interval of 29-31, 9 people (30%) an interval of 32-35, 9 people (30%) interval 36-38, 2 people (6.7%) interval 39-41, and 3 people (10%) with interval 42-45. For more details, see the histogram below:



**Figure 5.** Histogram of Forehand Shot Accuracy Variables

## **DISCUSSION**

The results of the analysis of the relationship between the two independent variables and the dependent variable in hypothesis testing need to be studied further by providing an interpretation of the relationship between the analysis results achieved and the theories underlying this research. This explanation is needed so that we can know the suitability of the theories put forward with the research results obtained.

### **1. There is a significant relationship between arm muscle strength and the accuracy of a forehand shot in table tennis.**

It is known how important strength is for almost all sports (Harsono, 2015). Therefore, strength training must always be included in the physical condition training program for players (Bompa & Buzzichelli, 2022). In making precise strokes in table tennis, strength is needed in making the strokes so that the strokes made are better and optimal (Sahabuddin et al., 2022). Therefore, arm muscle strength greatly influences forehand shots in table tennis (Suparman et al., 2021).

The results obtained are in accordance with the underlying theories, basically the results of this research support the existing theory. This can be explained by the fact that if an athlete has good arm muscle strength, they will be able to make accurate forehand strokes in table tennis well (Rahmat & Komaludin, 2022; Saputra, 2014; Susanti et al., 2020).

### **2. There is a significant relationship between wrist flexibility and the accuracy of a forehand shot in table tennis**

In playing table tennis, there are many factors that must be considered. One factor is physical condition, including flexibility (Bompa, T.O. & Haff Gregory, 2019). Because this flexibility really supports the skill of making accurate forehand strokes in table tennis (Mahendra et al., 2012). The results obtained are in accordance with the underlying theories, basically the results of this research support existing theories (Sutari & Syahara, 2019; Wilda, 2021). Players who have good wrist flexibility will be able to make good forehand shots in table tennis (Sandi et al., 2022; Syafiq, 2022).

### **3. There is a significant relationship between arm muscle strength and wrist flexibility and the accuracy of the forehand shot in table tennis**



In this case, arm muscle strength and wrist flexibility have an influence on the accuracy of making a forehand shot in table tennis (Wilastra, 2022). Arm muscle strength contributes to the ability to hit in table tennis, as well as wrist flexibility also contributes to a person or athlete's ability to make accurate shots in table tennis (Falupi, 2018; Mahendra, 2014; Susilawati, 2022).

## CONCLUSION

1. From the results of the research and discussion previously presented, several conclusions can be drawn. Here are some conclusions that can be drawn:
2. There is a positive and significant relationship between arm muscle strength and accuracy in making forehand strokes in table tennis for students at SMP Negeri 2 Pulau Rimau, Banyuasin.
3. There is a positive and significant relationship between wrist flexibility and accuracy in making forehand strokes in table tennis for students at SMP Negeri 2 Pulau Rimau, Banyuasin.
4. There is a positive and significant relationship between arm muscle strength and wrist flexibility and the accuracy of making forehand strokes in table tennis for students at SMP Negeri 2 Pulau Rimau, Banyuasin.

## REFERENCES

- Anggara, F. (2020). *Keterampilan Pukulan Forehand Dan Backhand Tenis Meja Melalui Modifikasi Alat*. *Jurnal Muara Olahraga*, 3(1), 25–35. <https://doi.org/10.52060/jmo.v3i1.441>
- Bompa, T.O., & Haff Gregory. (2019). *Periodization: Theory and Methodology of Training, 6th Edition*. In *Medicine & Science in Sports & Exercise* (Vol. 51, Issue 4). <https://doi.org/10.1249/01.mss.0000554581.71065.23>
- Bompa, T. O., & Buzzichelli, C. A. (2022). *Periodization of Strength Training for Sports*. In *Fourth Edition*. | *Champaign : Human Kinetics*.
- Falupi, H. (2018). *Hubungan Antara Kekuatan Otot Lengan, Kelentukan Pergelangan Tangan dan Kelincahan Dengan Ketepatan Pukulan Forehand Drive Permainan Tenis Meja Pada Atlet Putra Klub Niplas Kabupaten Tulungagung*. Universitas PGRI Kediri.
- Harsono. (2015). *Periodisasi Program Pelatihan*. In P. Latifah (Ed.), Bandung: PT Remaja Rosdakarya. PT. Remaja Rosdakarya.
- Hasibuddin, M., Hasan, M. S., & Jamaluddin. (2022). *Kontribusi Kekuatan Otot Lengan Dan Kecepatan Reaksi Tangan Terhadap Kemampuan Pukulan Forehand Drive Dalam*

- Permainan Tenis Meja Pada Atlet BKMF Tenis Meja Universitas Negeri Makassar. GOJOCCA (Global Journal of Sport Education, Coaching and Health), 2(1).*
- Irawan, E. (2019). Pengaruh Kelincahan, Kecepatan Gerak Dan Kelentukan Terhadap Ketepatan Pukulan Forehand Drive Pada Permainan Tenis Meja Siswa SMA Negeri 3 Maros. Jurnal Pendidikan Olahraga, 9(2), 19–29. <https://doi.org/10.37630/jpo.v9i2.324>*
- Ismaryati. (2011). Tes dan Pengukuran Olahraga. Universitas Sebelas Maret.*
- Junaidi, A., & Mustofa, H. (2020). Pengembangan Variasi Pembelajaran Tenis Meja Menggunakan Ejection Machine. Altius: Jurnal Ilmu Olahraga Dan Kesehatan, 9(2), 52–60. <https://doi.org/10.36706/altius.v9i2.12652>*
- Kurniawan, R., Haryanto, J., & Purnomo, E. (2020). Hubungan Fleksibilitas Pergelangan Tangan Dengan Ketepatan Pukulan Fourhand Tenis Meja Mahasiswa PKO FIK UNIMED. Sport Science: Jurnal Sains Olahraga Dan Pendidikan Jasmani, 20(2). <https://doi.org/10.24036/jss.v20i2.59>*
- Mahendra, I. R. (2014). Faktor Kondisi Fisik Dominan Penentu Prestasi Bermain Tenis Meja ( Analisis Faktor Fleksibilitas Pergelangan Tangan, Fleksibilitas Pinggul, Waktu Reaksi, Koordinasi Mata Tangan, Kelincahan , Dan Power Otot Lengan Pada Mahasiswa Pembinaan Prestasi Tenis. UNS.*
- Mahendra, I. R., Nugroho, P., & Junaidi, S. (2012). Kelentukan Pergelangan Tangan Dan Koordinasi Mata Tangan Dalam Pukulan Forehand Tenis Meja. JSSF (Journal of Sport Science and Fitness), 1(1), 12–15. <https://doi.org/10.15294/jssf.v1i1.206>*
- Maksum, A. (2012). Metode Penelitian dalam olahraga. Unesa University Press.*
- Muherman, S., & Ramona, S. (2017). Pengaruh Open Skill Terhadap Ketepatan Pukulan Forehand Drive Dalam Ekstrakurikuler Tenis Meja. Altius : Jurnal Ilmu Olahraga Dan Kesehatan, 6(1). <https://doi.org/10.36706/altius.v6i1.8231>*
- Murniati, S. (2018). Korelasional Antara Kecepatan Reaksi, Daya Ledak Otot Lengan Dan Koordinasi Mata-Tangan Dengan Keterampilan Smash Mahasiswa Fkip Jpok Unlam Banjarbaru. Multilateral Jurnal Pendidikan Jasmani Dan Olahraga, 17(1). <https://doi.org/10.20527/multilateral.v17i1.5012>*
- Ninglan, T., Soegiyanto, & Sulaiman. (2020). Effect of Arm Muscles and Long Arm Power Exercises on the Results of Accuracy in Forehand Smash Blows in Table Tennis Games at Silaberanti Club , Palembang. Journal of Physical Education and Sports, 9(1), 88–94. <https://journal.unnes.ac.id/sju/index.php/jpes/article/view/32158/13814>*
- Nopiyanto, Y. E., Raibowo, S., Prabowo, A., Gunawantara, D., & Ibrahim, I. (2021). Analisis Tingkat Kelincahan Atlet Tenis Meja PTM MBC Raflesia. Jurnal Patriot, 3(3), 284–291. <https://doi.org/10.24036/patriot.v3i3.798>*
- Nurhasan. (2001). Tes dan Pengukuran Pendidikan Jasmani Prinsip-prinsip dan Penerapannya. DEPDIKNAS.*
- Pratama, S. A., & Budiman, B. (2017). Hubungan Koordinasi Mata Tangan, Kekuatan*

- Lengan dan Motivasi Berprestasi dengan Ketepatan Forehand dalam Tenis Meja. Jurnal Penelitian Dan Pengkajian Ilmu Pendidikan: E-Saintika*, 1(1), 11. <https://doi.org/10.36312/e-saintika.v1i1.2>
- Pujianto, A. (2015). *Profil Kondisi Fisik Dan Keterampilan Teknik Dasar Atlet Tenis Meja Usia Dini Di Kota Semarang. Journal of Physical Education Health and Sport*, 2(1), 38–42. <https://doi.org/10.15294/jpehs.v2i1.3941>
- Purwanto, D. D., & Suharjana, S. (2017). *Pengembangan Model Pembelajaran Pengenalan Teknik Dasar Tenis Meja untuk Siswa SD Kelas Atas. Jurnal Keolahragaan*, 5(2), 133. <https://doi.org/10.21831/jk.v5i2.6419>
- Rahmat, R., & Komaludin, D. (2022). *Pengaruh Kekuatan Otot Lengan Dan Kelentukan Pinggang Terhadap Forehand Smash Dalam Permainan Tenis Meja. Performa Olahraga*, 7(1). <https://doi.org/10.21137/jse.2023.8.1.9>
- Reza, F., Ruslan, Abdul, G., & Siswanto. (2021). *Survei Tingkat Keterampilan Pukulan Forehand pada Peserta Ekstrakurikuler Tenis Meja di SMK TI Muhammadiyah Cikampek. Jurnal Ilmiah Wahana Pendidikan* <https://Jurnal.Unibrah.Ac.Id/Index.Php/JIWP>, 7(1), 391–402. <https://doi.org/10.5281/zenodo.5614375>
- Roetert, P., & Groppe, J. L. (2001). *World-class tennis technique. Human Kinetics Publishers*. [https://books.google.co.uk/books/about/World\\_class\\_Tennis\\_Technique.html?id=dd0OcvZtgEEC&redir\\_esc=y](https://books.google.co.uk/books/about/World_class_Tennis_Technique.html?id=dd0OcvZtgEEC&redir_esc=y)
- Sahabuddin, S., Syahrudin, S., & Fadillah, A. (2022). *Analisis Kekuatan Genggaman, Kelentukan Bahu Dan Daya Tahan Otot Lengan Terhadap Pukulan Forehand Dalam Permainan Tenismeja. Riyadhoh: Jurnal Pendidikan Olahraga*, 5(1), 58. <https://doi.org/10.31602/rjpo.v5i1.6881>
- Sandi, E. E., Syampurma, H., Firdaus, K., & Syahputra, R. (2022). *Hubungan Kelentukan Pergelangan Tangan Terhadap Akurasi Forehand fast serve Atlet Tenis Meja PTM Gempas. Jurnal Pendidikan Olahraga*, 5(6), 54–60.
- Saputra, R. W. (2014). *Hubungan Kecepatan Reaksi dan Kekuatan Otot Lengan dengan Kemampuan Pukulan Forehand Smash pada Anggota Klub Tenis Meja Smp Negeri 145 Jakarta. Universitas Negeri Jakarta*.
- Saripin, S., Agust, K., & Rafni, R. (2018). *Hubungan Antara Fleksibilitas Dengan Pergelangan Tangan Bagian Belakang Terhadap Pembelajaran Tenis Meja Dalam Program Pendidikan Jasmani Kesehatan Mahasiswa Dan Rekreasi. Journal Of Sport Education (JOPE)*, 1(1), 17. <https://doi.org/10.31258/jope.1.1.17-21>
- Sariul, S., Marsuna, M., & Jud, J. (2022). *Analisis Kemampuan Smash Forehand Tenis Meja Pada Siswa Sma Negeri 4 Kendari. Jurnal Eduscience*, 9(1), 195–203. <https://doi.org/10.36987/jes.v9i1.2583>

- Suparman, S., & Hasbillah, M. (2021). *Kontribusi Kekuatan Otot Tungkai, Kecepatan Reaksi Tangan dan Kelentukan Pergelangan Tangan terhadap Kemampuan Ketepatan Pukulan Forehand Drive Permainan Tenis Meja PTM YPUP Makassar. Jendela Olahraga, 6(1), 165–174. <https://doi.org/10.26877/jo.v6i1.6999>*
- Suparman, S., Syafruddin, M. A., & Jahrir, A. S. (2021). *Kontribusi Kekuatan Otot Lengan Dan Koordinasi Mata Tangan Terhadap Kemampuan Ketepatan Servis Permainan Tenis Meja. Sportif Journal, 1(2), 57–65. <https://doi.org/10.36312/sfj.v1i2.8>*
- Susanti, J., Putra, M. A., & Armade, M. (2020). *Hubungan Koordinasi Mata-Tangan dan Kekuatan Otot Lengan dengan Kemampuan Forehand Drive pada Siswa Ekstrakurikuler Tenis Meja SMA Muhammadiyah Rambah. Journal Of Sport Education and Training, 1(2), 53–59.*
- Susilawati, S. (2022). *Hubungan Kelentukan Pergelangan Tangan Dan Power Otot Lengan Dengan Ketepatan Pukulan Drive Dalam Permainan Tenis Meja. UNSIL.*
- Sutari, F., & Syahara, S. (2019). *Hubungan Kelentukan Pergelangan Tangan Dan Koordinasi Mata Tangan Terhadap Kemampuan Service Backhand Dalam Permainan .... Jurnal Patriot, 1(1). <https://doi.org/10.24036/patriot.v1i1.480>*
- Syafiq, A. R. (2022). *Hubungan Kecepatan Reaksi dan Kelentukan Pergelangan Tangan Terhadap Ketepatan Forehand Drive Tenis MEJA. Universitas Negeri Jakarta.*
- Tomoliyus. (2017). *Sukses Melatih Keterampilan Dasar Tenis Meja. CV. SARNU UNTUNG.*
- Widiantoro, A. (2017). *Pengaruh Latihan Multiball Terhadap Kemampuan Ketepatan Pukulan Forehand Dan Backhand Pada Peserta Ekstrakurikuler Tenis Meja Tahun 2016/2017 Di SMA Negeri 1 Gamping. Pendidikan Jasmani Kesehatan Dan Rekreasi, 6(11). <https://journal.student.uny.ac.id/index.php/pjkr/article/view/8701>*
- Wilastra, D. (2022). *Hubungan Kelentukan Pergelangan Tangan Dan Kekuatan Otot Lengan Terhadap Hasil Smash Forehand Dalam Permainan Tenis Meja Pada Ekstrakurikuler Tenis Meja Di Sma Negeri 1 Tembilahan. JOI (Jurnal Olahraga Indragiri), 6(1), 114–122. <https://doi.org/10.61672/joi.v6i1.2319>*
- Wilda, D. (2021). *Hubungan Kelentukan Pergelangan Tangan Dengan Kemampuan Smash Backhand Dalam Permainan Tenis Meja Pada Unit Kegiatan Mahasiswa (Ukm) Penjas Stkip Bina Bangsa Getsempena Banda Aceh Tahun 2019 [Universitas Bina Bangsa]. <https://repository.bbg.ac.id/handle/963>*
- Yarmani, Y., Sugihartono, T., & Defliyanto, D. (2019). *Penerapan Media Dinding dalam Meningkatkan Service Forehand Backhand pada Pembelajaran Tenis Meja. Kinestetik, 3(1), 1–9. <https://doi.org/10.33369/jk.v3i1.8760>*