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The effectiveness of weight training in improving grip strength among Pencak Silat athletes

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ABSTRACT

This study examined the effectiveness of weight training in improving grip strength among Pencak Silat athletes. A one-group pretest–posttest experimental design involved 20 regional-level athletes. Grip strength was measured using a hand dynamometer before and after 14 weight-training sessions. Data were analyzed using a paired-samples t-test. Mean grip strength increased from 36.025 ± 10.807 at pretest to 42.025 ± 10.159 at posttest, representing a mean improvement of 6.00 points or 16.66%. The analysis demonstrated a statistically significant difference between measurements, $t(19) = -10.824$, $p < .001$, with a 95% confidence interval of -7.160 to -4.840 . Structured weight training significantly improves grip strength and may support effective takedown performance among Pencak Silat athletes.



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Introduction

Pencak Silat is a traditional Indonesian martial art that has developed not only as a form of cultural heritage but also as a competitive sport with growing national and international recognition. Its development reflects the transformation of traditional martial practices into a structured combat sport characterized by technical, tactical, and physical demands (Nugroho, 2020; Hadiana et al., 2022). The increasing participation and achievements of Pencak Silat athletes in competitive events have further encouraged systematic approaches to athlete development and performance enhancement (Ilahi et al., 2023). Consequently, structured training programs have become essential for preparing athletes to meet the increasingly demanding requirements of competition.

Recent developments in Pencak Silat competition have also increased the physical demands placed on athletes. Changes in competition regulations, including adjustments to the execution and assessment of takedown techniques, require athletes to combine technical accuracy with sufficient muscular strength and explosive power. Takedowns are particularly important because successful execution can provide substantial scoring advantages and influence the outcome of a match (Yondi et al., 2025). In addition to technical proficiency, competitive performance is influenced by physical readiness and psychological factors, including athletes' confidence in executing techniques under competitive pressure (Aguss & Fahrizqi, 2020). Therefore, physical conditioning should be considered an integral component of Pencak Silat performance development rather than merely a complementary aspect of technical training.

Among the physical components involved in takedown performance, grip strength is particularly relevant to techniques requiring athletes to control, hold, pull, and destabilize an opponent. Strong gripping capacity enables athletes to maintain effective contact and generate sufficient force during offensive and defensive actions. Evidence from martial arts research indicates that hand-grip strength can serve as an important physical indicator associated with competitive success because many combat actions depend on the ability to maintain control over an opponent (Iermakov et al., 2016). In Pencak Silat, inadequate grip and upper-limb strength may reduce an athlete's ability to maintain control during pulling-based takedowns, thereby providing the opponent with opportunities to escape or counterattack. Although previous Pencak Silat studies have investigated technical performance and specific training interventions, such as resistance-band and ladder-drill exercises (Cahyani et al., n.d.; Nurhalizah et al., 2023), the specific development of grip strength in relation to the physical demands of pulling-based techniques remains insufficiently investigated.

Weight training represents a potentially effective approach to addressing these physical demands because resistance exercises can systematically increase muscular strength through progressive loading and physiological adaptation. Exercises involving pulling and upper-limb movements can specifically stimulate muscle groups involved in gripping, pulling, and maintaining control over an opponent. Previous studies have demonstrated the application of weight training for developing upper-limb muscular capacity and improving sport-specific physical performance (Bernhardin, 2022; Bagaskara et al., 2024). Similarly, structured resistance training has been reported to contribute to muscular development when training loads are systematically prescribed and progressively increased (Nasrulloh, 2019). More recent evidence has also demonstrated that different loading programs can produce meaningful improvements in finger and grip-related strength, emphasizing the importance of appropriately designed resistance-loading strategies for activities that require high gripping capacity (Gilmore et al., 2024).

The current state of research on Pencak Silat, however, has predominantly focused on technical execution, kicking performance, speed, tactical aspects, and general physical conditioning. Studies have examined resistance-band exercises for improving kicking performance (Ilahi et al., 2023), ladder drills for developing front-kick performance (Nurhalizah et al., 2023), and imagery training for improving throwing techniques (Rosad, 2015). These findings demonstrate increasing scientific attention to training interventions in Pencak Silat; nevertheless, limited empirical evidence is available regarding the effectiveness of systematic weight training specifically for improving grip strength. This represents an important research gap because recent competitive demands require athletes to execute pulling and takedown actions while maintaining strong and stable control of their opponents. Furthermore, evidence concerning grip-strength adaptations has largely emerged from other sports and martial arts contexts (Gilmore et al., 2024; Iermakov et al., 2016), leaving uncertainty regarding whether similar adaptations can be achieved among competitive Pencak Silat athletes.

Accordingly, this study aims to examine the effect of a structured weight-training program on the grip strength of Pencak Silat athletes. The novelty of this study lies in its specific examination of grip-strength development through weight training within the context of contemporary Pencak Silat performance demands, particularly those associated with gripping, pulling, and takedown actions. Unlike previous studies that have primarily emphasized kicking speed, general physical conditioning, or technical training, the present study focuses on a strength component that is directly relevant to maintaining opponent control during pulling-based techniques. By providing empirical evidence regarding changes in grip strength following a structured weight-training intervention, this study is expected to extend the existing literature on physical conditioning in Pencak Silat and provide practical evidence for coaches in designing more targeted strength-training programs for competitive athletes.

Method

This study employed an experimental research method using a One-Group Pretest–Posttest Design. In this design, participants were initially assessed through a pretest, followed by a weight training intervention, and subsequently evaluated through a posttest. The difference between pretest and posttest scores was used to determine the effectiveness of the intervention. The study population consisted of 20 athletes from the Empat Banding Budi Pencak Silat School in Padang City. Participants were selected using purposive sampling, with the inclusion criterion that athletes had previously participated in regional-level competitions. The research followed a pretest-posttest experimental model. At the beginning of the study, participants underwent grip strength measurements using a hand dynamometer. Subsequently, they completed a weight training program consisting of 14 training sessions specifically designed to improve grip strength. Upon completion of the training program, grip strength was reassessed using the same instrument. Comparisons between pretest and posttest scores were then conducted to evaluate improvements resulting from the intervention. Data were analyzed

quantitatively using a paired-samples t-test to determine the effectiveness of the weight training program. Statistical analyses were performed using SPSS and Microsoft Excel.

Results and Discussions

This study aimed to examine the effect of weight training on the grip strength of Pencak Silat athletes from the Empat Banding Budi School in Padang City. The statistical analyses conducted using SPSS and Microsoft Excel produced the following results.

Table 1. Pretest and Posttest Results

Statistics	Pretest	Posttest
N (Valid)	20	20
N (Missing)	0	0
Mean	36.025	42.025
Median	32.200	37.400
Mode	21.7 ^a	33.9 ^a
Std. Deviation	10.8071	10.1594
Minimum	21.7	27.9
Maximum	59.4	61.4
Sum	720.5	840.5

Based on hand dynamometer measurements, the pretest results showed a highest score of 59.4 and a lowest score of 21.7, with a mean of 36.03 and a standard deviation of 10.81. Following the intervention, the posttest results indicated a highest score of 61.4 and a lowest score of 27.9, with a mean of 42.03 and a standard deviation of 10.16. Table without vertical lines

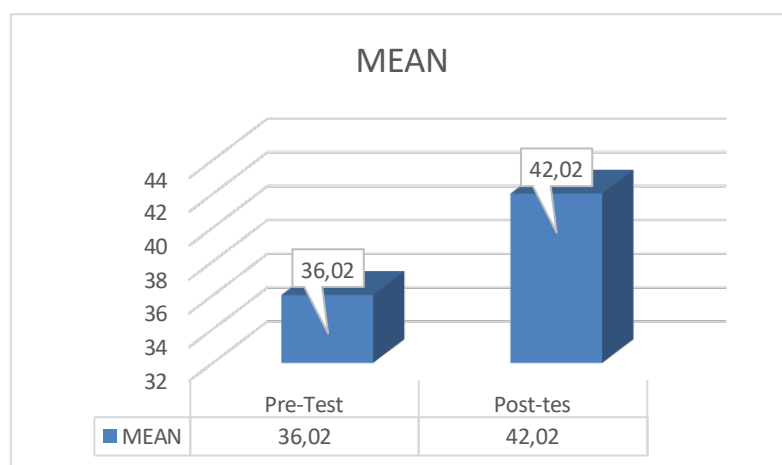


Figure 1. Graph of pretest and posttest results

Subsequently, a normality test was conducted using the Kolmogorov-Smirnov test to determine whether the data were normally distributed. Assessing data normality is an essential prerequisite before conducting hypothesis testing. The results of the normality test are presented in Table 2.

Table 2. Normality Test Results

Parameters	Statistics	Pretest	Posttest
N		20	20
Normal Parameters ^{a, b}	Mean	36.025	42.025
	Std. Deviation	10.8071	10.1594
Most Extreme Differences	Absolute	0.171	0.208
	Positive	0.171	0.208
	Negative	-0.105	-0.109
Test Statistic		0.171	0.208
Asymp. Sig. (2-tailed)		0.128 ^c	0.024 ^c

Based on the results of the Kolmogorov-Smirnov test, the significance value for the pre-test was 0.128 (> 0.05), while the post-test yielded a significance value of 0.240 (> 0.05). Since both significance values exceeded the 0.05

threshold, it can be concluded that the hand dynamometer data from both the pre-test and post-test were normally distributed.

Following the fulfillment of the prerequisite assumptions, hypothesis testing was conducted to determine whether the proposed hypothesis should be accepted or rejected. A Paired Samples t-Test was employed to analyze the differences between the pre-test and post-test measurements, as the grip strength data were normally distributed. This statistical procedure was used to evaluate the effect of the weight training program on athletes' grip strength. The hypothesis tested in this study was as follows:

Table 3. Paired Samples t-Test Results

Pair	Comparison	Mean Difference	Std. Deviation	Std. Error Mean	95% CI Lower	95% CI Upper	t	df	Sig. (2-tailed)
Pair 1	Pretest – Posttest	-6.0000	2.4790	0.5543	-7.1602	-4.8398	-10.824	19	.000

Based on the results presented in Table 3, the significance value (Sig. 2-tailed) was 0.000, which was lower than the predetermined significance level of 0.05 ($p < 0.05$). Therefore, it can be concluded that there was a statistically significant difference between the pre-test and post-test grip strength scores following the weight training intervention.

The t-test analysis yielded a critical t-value (t-table) of 1.729, obtained from the t-distribution table with 19 degrees of freedom ($df = 19$) at a significance level of 0.05. The decision criteria for hypothesis testing were as follows: the alternative hypothesis (H_a) would be accepted if the calculated t-value (t-count) exceeded the critical t-value (t-table), whereas the null hypothesis (H_0) would be rejected if the calculated t-value was lower than the critical value. Since the calculated t-value (10.824) was greater than the critical t-value (1.729), a significant difference was found between the pre-test and post-test results. Consequently, the hypothesis stating that weight training has a significant effect on grip strength was accepted.

To determine the percentage increase following the intervention, the difference between the post-test and pre-test means was calculated as follows:

$$\text{Mean Difference} = \text{Mean Post-test} - \text{Mean Pre-test}$$

$$= 42.02 - 36.02$$

$$= 6.00$$

$$\text{Percentage Increase} = (\text{Mean Difference} / \text{Mean Pre-test}) \times 100\%$$

$$= (6.00 / 36.02) \times 100\%$$

$$= 16.66\%$$

Based on these calculations, it can be concluded that the weight training program resulted in a 16.66% improvement in the athletes' grip strength.

The findings of this study indicate that weight training has a significant effect on grip strength, which plays an important role in the successful execution of takedown techniques in Pencak Silat. Improved grip strength may contribute to athletes' overall performance by enhancing their ability to control opponents during competition. In addition to the weight training intervention examined in this study, athletes generally participate in various training programs aimed at improving technical skills, physical fitness, and stamina required for competitive performance (Lubis et al., 2024; Subekti et al., 2021, 2025; Welis, Effendi, Ilham, et al., 2024). This finding is consistent with Rosad, who stated that training volume and intensity can significantly influence the development of specific physical capacities, including endurance and stamina.

The effectiveness of a training program is determined not only by the type of exercise performed but also by its suitability to the athlete's characteristics, such as age, sex, and training experience. In many cases, training programs tend to focus on particular aspects of performance, such as physical fitness or the strength of specific muscle groups. Therefore, training loads should be carefully prescribed and balanced to ensure optimal physiological adaptations and performance outcomes (Ilahi et al., 2023; Lubis et al., 2022; Mardius et al., 2026; Welis, Effendi, Mario, et al., 2024).

Targeted training programs provide specific stimuli to particular muscle groups and energy systems. In the context of this study, weight training was designed to stimulate the muscles involved in gripping and pulling movements. However, the success of such programs also depends on adequate nutritional support and proper

recovery strategies, which facilitate adaptation to training loads and maximize performance improvements (Lubis et al., 2021; Parihar et al., 2025). Through the implementation of well-structured training programs, Pencak Silat athletes are expected to achieve higher levels of performance and better meet the competitive demands established by coaches and sporting organizations.

Furthermore, recent revisions to Pencak Silat competition regulations have increased the strategic importance of takedown techniques in determining match outcomes. Under the updated scoring system, the successful execution of valid takedowns can provide substantial scoring advantages, making grip strength an increasingly important physical attribute for athletes (Effendi et al., 2025; Irawan et al., 2021; Nugroho et al., 2024; Wijaya et al., 2021).

This study was motivated by the need to understand how specific training interventions influence grip strength and, consequently, the effectiveness of takedown techniques that contribute directly to scoring opportunities. It was hypothesized that improvements in grip strength would enhance an athlete's ability to perform controlled and effective takedowns, thereby increasing the likelihood of obtaining points and achieving competitive success. Previous research has similarly emphasized that strong gripping actions constitute an important tactical component in Pencak Silat competition and may serve as a decisive factor in scoring situations (Dharmadi et al., 2026; Kahfi et al., 2025; Karim, 2025; Mansyukri et al., 2025).

The findings suggest that athletes should place greater emphasis on strengthening the muscles involved in gripping and pulling actions. Enhanced upper-limb strength, combined with effective takedown execution, may improve the likelihood of successfully unbalancing opponents and securing points during competition (Amrullah et al., 2022; Ariyadi et al., 2025; Putrie & Sumartiningsih, 2025; Sinulingga et al., 2023). Consequently, this study contributes to the growing body of knowledge regarding evidence-based training strategies in Pencak Silat and provides practical implications for coaches and athletes seeking to optimize performance through targeted strength training interventions.

Conclusions

Weight training has been shown to have a positive effect on grip strength, which is an essential component in the successful execution of scoring takedown techniques under the current Pencak Silat competition regulations. The findings of this study demonstrated that the implementation of a weight training program resulted in a significant improvement in athletes' grip strength, with an increase of 16.66% following the intervention. These results suggest that weight training can be effectively incorporated into Pencak Silat training programs as a method for enhancing grip strength and supporting competitive performance. Improved grip strength may increase athletes' ability to execute effective takedowns, thereby contributing to greater scoring opportunities during competition. For future research, it is recommended to involve larger sample sizes and include additional variables related to physical, technical, or physiological performance. Such investigations may provide a more comprehensive understanding of the factors influencing grip strength and competitive success in Pencak Silat. Furthermore, future studies may explore different training methods and intervention durations to generate new insights and expand the existing body of knowledge in this field.

References

- Aguss, R. M., & Fahrizqi, E. B. (2020). Analisis tingkat kepercayaan diri saat bertanding atlet Pencak Silat Perguruan Satria Sejati. *Multilateral: Jurnal Pendidikan Jasmani dan Olahraga*, 19(2), 164. <https://doi.org/10.20527/multilateral.v19i2.9117>
- Amrullah, R., Sari, S., Fallo, I. S., Lauh, W. D. A., & Purnomo, E. (2022). Swiss ball-based core stability exercise for student-athletes of Pencak Silat in Pontianak: Experimental study. *International Journal of Human Movement and Sports Sciences*, 10(4), 704–707. <https://doi.org/10.13189/saj.2022.100410>
- Ariyadi, A., Satria, A. L., Nugraha, H., Wicaksono, G., & Muti, G. (2025). Contribution of body reaction time speed to the speed of the crescent kick of the Melati Sakti School, Pekalongan City. *Journal of Physical Education and Active Pedagogy*, 1(1), 12–18.
- Bagaskara, Z. A., Hidayah, N., & Rismayadi, A. (2024). Efektivitas latihan pull down dan alternate squat terhadap peningkatan kecepatan renang gaya dada. *Jurnal Kepelatihan Olahraga*, 16(1), 1–6. <https://doi.org/10.17509/jko-upi.v16i1.66589>
- Bernhardin, D. (2022). Weight training pada otot lengan di olahraga panahan. *Jurnal Master Penjas & Olahraga*, 3(1), 168–177. <https://doi.org/10.37742/jmpo.v3i1.50>
- Cahyani, V. R., Arifan, I., Putra, J., & Haryanto, J. (n.d.). Pengaruh latihan resistance band dan ladder speed drill terhadap peningkatan kecepatan tendangan sabit pada atlet Pencak Silat Persaudaraan Setia Hati Terate Padang Sarai. [Journal information unavailable], (2), 1979–1991.

- Dharmadi, M. A., Spyawati, N. L. P., Dartini, N. P. D. S., Ariani, L. P. T., & Sudarmada, I. N. (2026). The effect of the 8-week traditional Balinese game of Mepantigan on the static balance of junior Pencak Silat athletes. *Ido Movement for Culture*, 26(1), 65–71. <https://doi.org/10.14589/ido.26.1.8>
- Effendi, R., Welis, W., Ihsan, N., Alnedral, & Effendi, H. (2025). Agility training in adolescent Pencak Silat athletes: A randomized controlled experimental study. *Retos*, 63, 156–164. <https://doi.org/10.47197/retos.v63.108123>
- Febrianti, M. A., Safari, I., & Fauzi, R. A. (2022). Perkembangan multiple intelligences siswa SD dengan modifikasi bola dan lapangan pada pembelajaran tenis meja. *Jurnal Sport (Sport, Physical Education, Organization, Recreation, and Training)*, 6(2), 101–110. <https://doi.org/10.37058/sport.v6i2.6376>
- Gilmore, N. K., Klimek, P., Abrahamsson, E., & Baar, K. (2024). Effects of different loading programs on finger strength in rock climbers. *Sports Medicine - Open*, 10(1), 1–11. <https://doi.org/10.1186/s40798-024-00793-7>
- Hadiana, O., Subarjah, H., Ma'mun, A., Mulyana, M., Budi, D. R., & Rahadian, A. (2022). Pencak Silat Tapak Suci: Overview in a historical perspective of Muhammadiyah autonomic organizations in Indonesia. *JUARA: Jurnal Olahraga*, 7(2), 408–416. <https://doi.org/10.33222/juara.v7i2.1915>
- Ilahi, B. R., Okilanda, A., Raibowo, S., Yarmani, Sugihartono, T., Syafrial, Nopiyanto, Y. E., Hiasa, F., Ihsan, N., & Putra, J. (2023). The effect of resistance bands rubber spring exercise on the front kick speed of adolescent Pencak Silat women. *International Journal of Human Movement and Sports Sciences*, 11(2), 418–423. <https://doi.org/10.13189/saj.2023.110219>
- Iermakov, S. S., Podrigalo, L. V., & Jagiełło, W. (2016). Hand-grip strength as an indicator for predicting the success in martial arts athletes. *Archives of Budo*, 12, 179–186.
- Irawan, R., Mahmudiono, T., & Martiana, T. (2021). Interleukin-6 as immune system and inflammation biomarker on the response of basic Pencak Silat exercise in Perguruan Pencak Silat Perisai Diri, Bojonegoro. *Open Access Macedonian Journal of Medical Sciences*, 9(T6), 179–183. <https://doi.org/10.3889/oamjms.2021.7303>
- Kahfi, I., Putra, A. N., Bafirman, B., & Chaeroni, A. (2025). The effect of ladder drill and zig-zag run exercises and motivation on crescent kick performance in young athletes: A health and fitness perspective. *Contagion: Scientific Periodical Journal of Public Health and Coastal Health*, 7(3), 335–347.
- Karim, A. (2025). Analysis of physical conditions on the speed of Pencak Silat sickle kick in Makassar City athletes. *Journal Physical Health Recreation (JPHR)*, 6(1), 212–220.
- Lubis, J., Fitrianto, E. J., Haqiyah, A., Setiakarnawijaya, Y., Robianto, A., Sukriadi, S., Irawan, R. N., & Sumartiningsih, S. (2021). Does aerobic interval training induce a decrease in body weight in Pencak Silat elite athletes? *Journal of Physical Education and Sport*, 21, 2372–2380. <https://doi.org/10.7752/jpes.2021.s4318>
- Lubis, J., Haqiyah, A., Robianto, A., Ihsani, S. I., Wardoyo, H., Ginanjar, S., Irawan, A. A., Sumartiningsih, S., Setiawan, I., Lubis, R. A., Sanjaya, K. H., & Kusumandari, D. E. (2024). The effect of six-week plyometric, functional, and interval trainings on body composition, power, and kicking speed in male Pencak Silat university athletes. *International Journal of Disabilities Sports and Health Sciences*, 7, 46–53. <https://doi.org/10.33438/ijds.1371605>
- Lubis, J., Thongdaeng, N., Haqiyah, A., Sukur, A., Abidin, D., Irawan, A. A., Sumartiningsih, S., & Hanief, Y. N. (2022). The effect of five-week aerobic interval training on the body composition of Pencak Silat elite athletes. *International Journal of Kinesiology and Sports Science*, 10(2), 16–24. <https://doi.org/10.7575/aiac.ijkss.v.10n.2p.16>
- Mansyukri, E. R., Haryanto, J., Irawadi, H., & Putra, J. (2025). Kontribusi kekuatan otot tungkai dan keseimbangan terhadap kemampuan tendangan sabit atlet Pencak Silat Satria Muda Indonesia Kabupaten Padang Pariaman. *Jurnal Gladiator*, 5(9), 1883–1897.
- Mardius, A., Kumar, A., Rijaluddin, K., Candra, J., & Ockta, Y. (2026). Improving physical fitness of Pencak Silat athletes through circuit body weight training. *Sportske Nauke i Zdravlje*, 16(5), 81–86. <https://doi.org/10.7251/SSH26V081M>
- Nasrulloh, A. (2019). Program latihan body building dapat meningkatkan massa otot mahasiswa IKORA FIK UNY. *Jurnal Chemical Information and Modeling*, 2, 1–16.
- Nugroho, A. (2020). Analisis penilaian prestasi teknik dalam pertandingan Pencak Silat. *Jorpres (Jurnal Olahraga Prestasi)*, 16(2), 66–71. <https://doi.org/10.21831/jorpres.v16i2.31655>
- Nugroho, H., Gontara, S. Y., Angga, P. D., & Jariono, G. (2024). Pencak Silat as a comprehensive method of mental, physical, and spiritual growth: A systematic review. *Physical Education Theory and Methodology*, 24(6), 1015–1025. <https://doi.org/10.17309/tmf.2024.6.20>
- Nurhalizah, S., et al. (2023). The effect of ladder drill on female's front straight kick in Pencak Silat. *Medikora*, 22(1), 33–42.
- Padoyan, N. L., Arifan, I., Mardesia, P., & Putra, J. (n.d.). The effect on arm muscle explosive power: A case study on Patbanbu Pencak Silat athletes in North Padang District, Padang City. [Journal information]

- unavailable].
- Parihar, S., Khan, T., Akhtar, B., & Kaur, H. (2025). Developing a standard skill assessment for male Pencak Silat fighters in the tanding category. *Balneo and PRM Research Journal*, 16(2). <https://doi.org/10.12680/balneo.2025.807>
- Putrie, S. F., & Sumartiningsih, S. (2025). The effect of sabit kick training program with high intensity interval training (HIIT) on speed and agility. *Journal of Physical Education and Sports*, 14(4), 57–67.
- Rosad, A. (2015). Pengaruh program latihan imagery terhadap peningkatan teknik bantingan cabang olahraga Pencak Silat pada latihan ekstrakurikuler Pencak Silat di MAN 2 Semarang. *Journal of Sport Sciences and Fitness*, 4(1), 7–10.
- Sari, C. P., Putra, J., Studi, P., Kepelatihan, P., & Keolahragaan, F. I. (n.d.). Evaluasi program pembinaan prestasi atlet Pencak Silat Perguruan Tapak Suci Putera Muhammadiyah Padang Panjang. [Journal information unavailable], 1388–1402.
- Sinulingga, A., Pasaribu, A. M. N., Bangun, S. Y., Ningrum, D. T. M., & Mahyudi, Y. V. (2023). Plyometric exercise and speed on the power of sabit kick in Pencak Silat. *International Journal of Human Movement and Sports Sciences*, 11(3), 591–597. <https://doi.org/10.13189/saj.2023.110311>
- Subekti, N., Hidayatullah, M. F., Syaifullah, R., Setiyadi, N. A., & Fatoni, M. (2025). Pencak Silat combat: Dominant technique in national student competition based on gender and weight. *International Journal of Innovation and Learning*, 37(1), 1–15. <https://doi.org/10.1504/IJIL.2025.142977>
- Subekti, N., Syaifullah, R., Fatoni, M., Syaukani, A. A., Warthadi, A. N., & Arni-Rayhan, A. R. (2021). Pencak Silat combat match: Time motion analysis in elite athletes championship. *Journal of Human Sport and Exercise*, 16(Proc4), S1597–S1608. <https://doi.org/10.14198/jhse.2021.16.Proc4.05>
- Welis, W., Effendi, R., Ilham, Mario, D. T., Bafirman, & Ihsan, N. (2024). Protein-based soy flour supplementation to support the effects of weight training on muscle hypertrophy. *Retos*, 51, 923–929. <https://doi.org/10.47197/RETOS.V51.99162>
- Welis, W., Effendi, R., Mario, D. T., Ilham, & Ihsan, N. (2024). Consuming soy flour after weight training: An alternative to increase leg muscle strength. *Retos*, 57, 197–204. <https://doi.org/10.47197/retos.v57.103147>
- Wijaya, M. R. A., Saputro, D. P., & Aissya, A. N. (2021). Profile sabit kick speed profile and general speed of Pencak Silat club achievement. *JUARA*, 7(1), 25–38.
- Yondi, E. P., Astuti, Y., & Sasmita, W. (2025). Analisis teknik jatuhan cabang olahraga Pencak Silat kelas B putra dalam SEA Games Kamboja 2023. [Journal title unavailable], 8(3), 420–427.