

## The Effect of Burpees Training Method on the Jump Height Extracurricular Students of SMA Negeri 1 Madang Suku III

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### Abstrak

Penelitian ini bertujuan untuk mengetahui pengaruh metode latihan burpees terhadap peningkatan tinggi lompatan siswa yang mengikuti kegiatan ekstrakurikuler bola voli di SMA Negeri 1 Madang Suku III. Jenis penelitian yang digunakan adalah eksperimen dengan desain One Group Pretest-Posttest. Sampel penelitian berjumlah 12 siswa yang seluruhnya dijadikan responden melalui teknik total sampling. Program latihan burpees dilaksanakan selama satu bulan dengan total 16 pertemuan, yaitu empat kali dalam seminggu. Pengumpulan data dilakukan melalui tes vertical jump yang dilaksanakan sebelum dan sesudah latihan, kemudian dianalisis menggunakan uji Paired Sample t-Test. Hasil penelitian menunjukkan adanya peningkatan rata-rata tinggi lompatan dari 42,33 cm menjadi 45,33 cm, dengan selisih sebesar 3,00 cm dan nilai signifikansi (Sig. 2-tailed) sebesar  $0,000 < 0,05$ . Hal ini menunjukkan bahwa latihan burpees berpengaruh signifikan terhadap peningkatan kemampuan eksplosif otot tungkai. Temuan ini mengindikasikan bahwa burpees dapat menjadi metode latihan yang sederhana, praktis, dan efektif untuk meningkatkan daya ledak otot tungkai serta performa lompatan dalam permainan bola voli di lingkungan sekolah.

**Kata kunci:** Burpees, daya ledak otot tungkai, latihan pliometrik, lompat tinggi, bola voli.

### Abstract

The objective of this study is to determine how burpee methods of practice effect the improvement in jump height of students at SMA Negeri 1 Madang Suku III who play volleyball as an extracurricular activity. An experiment using a one-group pretest-posttest design was the kind of study that was employed. Twelve students made up the research sample, and they were all selected as responders using the total sampling technique. The burpees training program consists of 16 sessions held four times a week for an amount of one month. Vertical jump tests were used to gather data both before and after training, and the Paired Sample t-Test was used for analysis. This demonstrates that performing burpees has a major impact on enhancing leg muscles' capacity for release. According to these results, burpees can be an effective, quick, and simple method to increase leg muscle explosiveness and leap ability when playing volleyball in a classroom.

**Keywords:** Burpees, Leg Muscle Explosiveness, Plyometric Exercises, High Jump, Volleyball.

## 1. INTRODUCTION

One of the most popular games, volleyball demands a great level of physical prowess, particularly in terms of leg muscle explosive force. According to Achmad (2019) The rectangular court used for volleyball is eighteen meters long and nine meters broad. A net is erected in the middle as a border; it is one meter wide, tightly stretched, and 2.24 meters high for ladies and 2.43 meters for males. Each team in volleyball comprises six players plus reserve players. The object of the game is for each player to get the ball into the opponent's area as many times as possible in order to score points (Witarsyah, 2020). It is necessary to learn the fundamentals of volleyball if you want to become a good player. These consist of smashing/spiking, blocking, serving, and passing. Passing is the most crucial of these fundamental strategies to get proficient at. As a result, one of the primary goals of coaching students who play volleyball as an extracurricular activity at school is to help them become better jumpers (Samsudin & Rahman, 2019). According to Keswando et al. (2022), volleyball

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is a sport that is developing very rapidly. Volleyball requires simple equipment. Volleyball can be played by all levels of society, from children to adults, men and women, both urban and rural (Ismail & Tunggul, 2020). Volleyball is a team sport, so players must work together and support each other to form a cohesive team (Kardiyanto & Sunardi, 2020, p. 5). The techniques used in playing volleyball are basic service techniques, basic passing techniques, basic hitting techniques, basic techniques. Irwanto (2023). Additionally, explosive leg muscular strength refers to the muscle's capacity to quickly apply force in order to give the body or item the best momentum throughout a full, explosive action in order to accomplish the intended outcome (Azzannul, 2019 in Wahyuni & Donie, 2020). Explosive power is an essential component of physical fitness. It refers to the ability of a muscle or group of muscles to generate maximum force in the shortest possible time (Andryani, 2014, as cited in Frayogha & Afrizal, 2019). According to Saroni et al. (2022), developing good jumping ability requires a planned, methodical, and ongoing training approach rather than happening overnight. A well-designed and organized training regimen can greatly enhance jump performance, particularly by increasing leg muscle strength and contraction speed. High jump is a power-demanding motor task. Jumpers extend the take-off leg joints. According to Abdillahtulkhaer (2019) The height at which a person can leap while floating in midair is known as their jump height. Plyometric exercises, which emphasize rapid movements with quick and powerful muscle contractions, are one type of exercise that has been demonstrated to be successful in enhancing muscle explosiveness. Block jump height may be impacted by pyometric rim jump training (Bakar et al., 2021). According to Wicaksono and Putri (2020), plyometric workouts are designed to increase the neuromuscular system's efficiency and the muscles' capacity to generate explosive force. This workout is ideal for sports like volleyball that call for a lot of strength and speed. The burpee exercise is a simple plyometric exercise modification that can be used in the classroom. Pitri et al. (2024) suggest that burpees do not require any tools. Plyometric training is an exercise method designed to develop speed and power by utilizing one's own body weight as resistance (Purnami & Purnomo, 2019). Plyometric training is a popular form of exercise used to enhance athletic performance. It involves a rapid stretching of the muscle-tendon unit immediately followed by a quick shortening contraction (Komarudin, 2021). For passing, shooting, and dribbling, the explosive force of the arm and leg muscles is utilized. (Donie, 2020). Increasing smashes is impacted by explosive leg muscle power training, according to Hariadi and Mardela (2020). According to Ambarwati et al. (2019), explosive power is the capacity to apply the greatest amount of force possible. A vertical jump test is used to measure the explosive power of the leg muscles (Putra & Mardela, 2019).

According to Bayu Segara (2020), burpees and jumping movements are dynamic exercises that emphasize general muscle tone, including the arms, and aim to build muscle strength and improve shooting precision. Burpees are toolless exercises that progressively incorporate squat, push-up, and jump movements, claim Pitri et al. (2024). An excellent cardiovascular training to improve leg muscle strength, flexibility, coordination, and flexibility is this one. While the triceps, deltoid, and biceps muscles work to strengthen the arm muscles' endurance during a push-up, the leg muscles contract to increase strength during a squat-down position. Burpees training is a type of high-intensity anaerobic physical condition workout that is part of the High Intensity Interval Training (HIIT) approach, in accordance with (Sudrazat & Rustiawan, 2020). Almost every muscle in the body is used in this workout, which can improve cardiovascular endurance and the body's capacity to generate explosive energy

According to Adhi et al. (2019), the muscles of the lower limbs can be divided into groin muscles, upper leg muscles, lower leg muscles, and foot muscles. Therefore, burpees are cardiorespiratory workouts that work every part of the body without the need of assistance and can enhance general endurance and coordination (Saroni et al., 2022). Burpee is defined by Fawaid and Puriana (2024) as a repetitive exercise that involves push-up motions followed by airborne leaps, like squat jumps. In order to develop the legs' explosive power, this workout focuses on strengthening the leg muscles and the initial speed of jumping. Major muscular groups like the rectus femoris, vastus medialis, gluteus maximus, and gastrocnemius are included in burpee workouts, according to (Wicaksono & Putri, 2020). These muscles are crucial for developing leg muscles and boosting jump

explosiveness. The description leads one to the conclusion that doing burpees has several advantages for the growth of physical skills, particularly the leg muscles' explosiveness, which is essential for volleyball.

Based on preliminary observations of volleyball extracurricular activities at the school, which revealed that the majority of pupils had the ability to leap vertically, which was still relatively low, the research location at SMA Negeri 1 Madang Suku III was chosen. This situation is reflected in the students' difficulties in performing smashes and blocks effectively during both training sessions and competitions. Furthermore, the physical training program previously implemented was still general in nature and had not specifically targeted the development of leg muscle explosive power. Considering the students' considerable potential and the school's adequate sports facilities, SMA Negeri 1 Madang Suku III was deemed an appropriate site for conducting research to examine the effectiveness of the burpees training method in enhancing students' jumping ability. Based on this rationale, the study was carried out to investigate the effect of the burpees training method on increasing the jump height of volleyball extracurricular students at SMA Negeri 1 Madang Suku III, as an effort to develop a training program that is effective, simple, and practical to implement in a school setting.

## **2. METHOD**

This kind of study uses a quantitative descriptive technique and is conducted on the volleyball court of SMA Negeri 1 Madang Suku III. According to Risnita (2024), quantitative research techniques are based on positivism and are employed to study particular populations or samples. In order to test preconceived hypotheses, sampling processes are typically carried out at random, data are gathered using research tools, and data analysis is quantitative or statistical in nature. In line with the previous view, Afif et al. (2023) state that quantitative data analysis methods are computational and statistical approaches that emphasize numerical, mathematical, and statistical examination of datasets. Therefore, in quantitative research, the data used must be measurable or capable of being converted into numerical form. According to Ramdhan (2021). Descriptive research is research with a method to describe research results. All 12 male students who played volleyball as an extracurricular activity made up the research population, and they were all used as research samples (total sampling). The One Group Pretest–Posttest Design, which is an experiment with a single group receiving treatment without a comparison group, is used in this study Pradana et al. (2022)

The t-test formula, also known as the t-test and independent sample t-test, is used. Because the t-formula is used, the t-formula itself has undergone various modifications, and its use is adjusted to the specifics of the data to be identified. That have taken place. Warm-ups (10 minutes), core burpees (40 minutes), and cool-downs (10 minutes) make up each training session, which lasts approximately 60 minutes. A vertical jump test was used to gauge the leg muscles' explosive strength both before and after exercise. The first step in data analysis is the analysis prerequisite test, which verifies that the data is normally distributed by performing a normality test using the Kolmogorov–Smirnov test. The analysis proceeded with a hypothesis test utilizing the Paired Sample t-Test to ascertain the impact of the burpees training method on the rise in the jump height of SMA Negeri 1 Madang Suku III extracurricular volleyball students once the data was deemed normal.

## **3. RESULT AND DISCUSSION**

### ***Result***

The purpose of this study is to ascertain how the burpees training method affects the growth in jump height of SMA Negeri 1 Madang Suku III extracurricular volleyball students. The research data was gathered using vertical jump tests that were administered both before (pretest) and after (posttest) a month of training (16 meetings, four times a week).

Table 1. Data Pretest  
Jump height before training

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid 40	2	16.7	16.7	16.7
41	2	16.7	16.7	33.3
42	2	16.7	16.7	50.0
43	3	25.0	25.0	75.0
44	2	16.7	16.7	91.7
45	1	8.3	8.3	100.0
Total	12	100.0	100.0	

The findings of the pretest of jump height before exercise demonstrate that participants have a rather narrow range of ability, with the highest value being 45 cm and the lowest being 40 cm, as can be seen from the frequency distribution table above. Two individuals (16.7%) achieved a leap height of 40 cm, two individuals (16.7%) advanced to 41 cm, and two individuals (16.7%) achieved a jump height of 42 cm. Additionally, two people (16.7%) reached 44 cm, one participant (8.3%) reached 45 cm, and three participants (25.0%) reached 43 cm. The data shows that the most common jump height (mode), attained by 3 participants (25%), is 43 cm.

This indicates that prior to the workout, the majority of participants could leap between 42 and 43 centimeters. Overall comparisons indicate that the participants' starting jump skills are still fairly equal and have not demonstrated any discernible individual variances.

Table 2. Data Post Test  
Jump height after training

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid 43	1	8.3	8.3	8.3
44	3	25.0	25.0	33.3
45	3	25.0	25.0	58.3
46	2	16.7	16.7	75.0
47	2	16.7	16.7	91.7
48	1	8.3	8.3	100.0
Total	12	100.0	100.0	

Based on the frequency distribution table presented above, the posttest results of the high jump after the training program indicate an improvement compared to the pretest outcomes. The highest jump recorded was 48 cm, while the lowest was 43 cm. One participant (8.3%) achieved a height of 43 cm, three participants (25.0%) reached 44 cm, and another three participants (25.0%) recorded 45 cm. In addition, two participants (16.7%) attained 46 cm, two others (16.7%) achieved 47 cm, and one participant (8.3%) reached the maximum height of 48 cm.

Three respondents (25%) achieved the most dominant scores (modes), namely 44 cm and 45 cm. This shows that after the training program, most participants were able to increase their jump height to a range of 44-45 cm. Compared to the pretest results, the frequency distribution shifted toward higher values. Before the training, most participants were in the 42-43 cm range, whereas after the training, the majority had improved to the 44-45 cm range.

**Normality Test**

The normality test is carried out to find out whether the data on the results of the pretest and posttest of the high jump of students is distributed normally or not. To ascertain whether the data is normally distributed or drawn from a normal population, the Normality Test is helpful (Fahmeyzan, Soraya, & Etmy, 2018). The normality test is a statistical method used to determine whether data meet the assumption of a normal distribution (Ahadi & Zain, 2023). The test uses the Kolmogorov–

Smirnov test with the help of the IBM SPSS Statistics 26 program. The test results can be seen in the following table:

Table 3. Tests of Normality

	Kolmogorov-Smirnova		
	Statistic	df	Itself.
Jump height before training	.160	12	.200*
Jump height after training	.171	12	.200*

\*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Based on the results of the Kolmogorov–Smirnov test, it is known that the significance value for jump height before exercise is 0.200 and jump height after exercise is also 0.200. The value is greater than 0.05, so it can be it is concluded that the data is normally distributed.

**T-Test**

The t-test is a statistical test used to determine the extent to which an independent variable individually influences a dependent variable. This statistical testing procedure is conducted using a significance level of 0.05 ( $\alpha = 5\%$ ) (Krisanti, 2019). The independent sample t-test is a type of statistical test that aims to compare the means of two unpaired or unrelated groups. Palupi, Yulianna & Winarsih (2021).

Table 4. Paired Samples Statistics

		Mean	N	Hours of deviation	Std. Error Mean
Pair 1	Jump height after training	45.33	12	1.497	.432
	Jump height before training	42.33	12	1.614	.466

Based on the table above, the average jump height before training was 42.33 cm with a standard deviation of 1.614 and a standard error mean of 0.466, while the average jump height after training increased to 45.33 cm with a standard deviation of 1.497 and a standard error mean of 0.432. The number of participants analyzed was 12 people.

Table 5. Paired Samples Correlations

		N	Correlation	Itself.
Pair 1	High jump after training & High jump before training	12	.890	.000

The correlation analysis between the jump height before and after the exercise showed a value of  $r = 0.890$  with  $\text{sig.} = 0.000$ , which means that there is a very strong positive correlation between the pretest and posttest results, so that the data between measurements are closely related and worthy of further analysis with the Paired t-test.

Pair	Jump height after training - High jump before training	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
					Lower	Upper			
1		3.000	.739	.213	2.531	3.469	14.071	11	.000

The results of the paired sample t-test revealed that the mean difference in jump height before and after the training program was 3.00 cm, with a standard deviation of 0.739 and a standard error of 0.213. The 95% confidence interval for the mean difference ranged from 2.531 cm to 3.469 cm. The t-value was 14.071 with 11 degrees of freedom ( $df = 11$ ), and the significance value (Sig. 2-tailed) was 0.000, which is less than 0.05. This indicates a statistically significant difference in jump height before and after the training.

Based on the paired sample t-test results, the null hypothesis ( $H_0$ ) is rejected and the alternative hypothesis ( $H_1$ ) is accepted because the significance value (0.000) is lower than 0.05. Therefore, it can be concluded that there is a significant difference in jump height before and after the exercise program, indicating that the exercise program has a significant effect on improving jump height.

### Discussion

Burpees exercise improves students' leg muscles' explosive power, as proven by a 3 cm improvement in average jump height. Increased muscle contraction strength, improved neuromuscular coordination, and the capacity of muscles to store and release elastic energy are examples of physiological changes brought about by exercise.

After completing the training program, this enables pupils to jump with more force. These findings align with the findings of Imam Saroni et al. (2022) study, which found that intense and frequent leg muscle-focused explosive exercises can improve jumping ability. acquired by performing intense, repeated explosive activities that target the leg muscles. Additionally, Sudrazat and Rustiawan (2020) highlighted that high-intensity burpees. Exercises that improve anaerobic endurance and lower body muscle strength include interval training (HIIT).

This study also supports the findings of Fawaid and Puriana (2024), who clarify that the repetitive motions used in burpee exercises improve leg muscular strength and coordination, which directly contributes to power growth. Furthermore, Pitriani et al. (2023) noted that because burpees work multiple muscular groups at once, they can enhance the body's agility and balance. The results of the paired sample t-test revealed that the mean difference in jump height before and after the training program was 3.00 cm, with a standard deviation of 0.739 and a standard error of 0.213. The 95% confidence interval for the mean difference ranged from 2.531 cm to 3.469 cm. The t-value was 14.071 with 11 degrees of freedom ( $df = 11$ ), and the significance value (Sig. 2-tailed) was 0.000, which is less than 0.05. This indicates a statistically significant difference in jump height before and after the training.

Based on the paired sample t-test results, the null hypothesis ( $H_0$ ) is rejected and the alternative hypothesis ( $H_1$ ) is accepted because the significance value (0.000) is lower than 0.05. Therefore, there is a significant difference in jump height before and after the exercise program.

### 4. CONCLUSION

Based on the findings, it can be concluded that the burpees training method has a significant effect on improving the jump height of extracurricular volleyball students at SMA Negeri 1 Madang Suku III. Before the training program, the students' average jump height was 42.33 cm,

ranging from 40–45 cm. After completing the one-month training program with 16 sessions, the average jump height increased to 45.33 cm, with a range of 43–48 cm.

The Paired Sample T-Test results showed a significance value (Sig. 2-tailed) of 0.000, which is lower than 0.05. This indicates that the null hypothesis ( $H_0$ ) was rejected and the alternative hypothesis ( $H_1$ ) was accepted, meaning there was a statistically significant difference in jump height before and after the training program.

The average increase of 3.00 cm confirms that burpees training is effective in enhancing the explosive power of the leg muscles. Therefore, burpees can be considered a simple, practical, and effective exercise method to improve jump height and support the physical development of students in school volleyball extracurricular programs.

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## 6. REFERENCES

Abdillahtulkhaer, M. (2019). *Pengaruh pemberian latihan pliometrik jump to box terhadap perubahan tinggi lompatan pada pemain Persatuan Sepak Bola Indonesia Sulawesi (PERSIS) Bina Bola Makassar* [Undergraduate thesis, Universitas Hasanuddin].

Achmad, I. Z. (2019). Hubungan antara power tungkai, koordinasi mata-tangan, dan rasa percaya diri dengan hasil keterampilan open spike bola voli. *Judika (Jurnal Pendidikan Unsika)*, 4(1).

Adhi, B. P., Sugiharto, S., & Soenyoto, T. (2019). Pengaruh metode latihan dan kekuatan otot tungkai terhadap power otot tungkai. *Journal of Physical Education and Sports*, 6(1), 7–13.

Afif, Z., Azhari, D. S., Kustati, M., & Sepriyanti, N. (2023). Penelitian ilmiah (kuantitatif) beserta paradigma, pendekatan, asumsi dasar, karakteristik, metode analisis data, dan outputnya. *INNOVATIVE: Journal of Social Science Research*, 3(3), 682–693.

Ahadi, G. D., & Zain, N. N. L. E. (2023). Pemeriksaan uji kenormalan dengan Kolmogorov–Smirnov, Anderson–Darling, dan Shapiro–Wilk. *Eigen Mathematics Journal*, 11–19.

Ambarwati, D. R., Widiastuti, W., & Pradityana, K. (2019). Pengaruh daya ledak otot lengan, kelentukan panggul, dan koordinasi terhadap keterampilan tolak peluru gaya O'Brien. *Jurnal Keolahragaan*, 5(2), 207–215. <https://doi.org/10.21831/jk.v5i2.14918>

Bakar, A., Candra, A. R. D., Romadhoni, W. N., & Ulinuha, R. A. N. (2021). Pengaruh latihan plyometric rim jump terhadap tinggi lompatan blok permainan bola voli. *Journal of Sport Coaching and Physical Education*, 6(2), 113–120.

Edi Irwanto, E. (2023). *Bola voli: Sejarah, teknik dasar, strategi, peraturan, dan perwasitan*.

Fahmeyzan, D., Soraya, S., & Etmu, D. (2018). Uji normalitas data omzet bulanan pelaku ekonomi mikro desa Senggigi menggunakan skewness dan kurtosis. *Jurnal Varian*, 2(1), 31–36.

Fawaid, A. Y., & Puriana, R. H. (2024). The effect of burpee pass and box jump training on limb muscle power of SSB UNTAG ROSITA U-16 Surabaya players. *Jurnal Adiraga*, 10(1), 57–68. <https://doi.org/10.36456/adiraga.v10i01.8799>

- Frayogha, J., & Afrizal, A. (2019). Pengaruh latihan daya ledak otot tungkai terhadap akurasi shooting pemain futsal. *Jurnal Patriot*, 1(3), 919–931.
- Fujimori, T., Tobe, N., & Sado, N. (2024). Joint kinetic demand for performance in high jump. *Sports Biomechanics*, 1–15.
- Georgievich Polevoy, G., & Sablin Borisovich, A. (2023). The influence of burpee on the volume of attention of schoolchildren. *Bangladesh Journal of Medical Science*, 22(2), 392–397. <https://doi.org/10.3329/bjms.v22i2.65001>
- Hariadi, R., & Mardela, R. (2020). Pengaruh latihan daya ledak otot tungkai terhadap kemampuan smash. *Jurnal Patriot*, 2(3), 898–906.
- Ismail, M., & Tunggul, E. (2020). Pengaruh latihan bench step terhadap kemampuan smash semi dalam permainan bola voli. *Tadulako Journal Sport Sciences and Physical Education*, 8(1), 131–136.
- Kardiyanto, D. W., & Sunardi, S. (2020). *Kepelatihan bola voli*. Zifatama Jawa.
- Keswando, Y., Sistiasih, V. S., & Marsudiyanto, T. (2022). Survei keterampilan teknik dasar atlet bola voli. *Jurnal Porkes*, 5(1), 168–177.
- Komarudin, K. (2021). Latihan plyometric dalam sepak bola untuk anak usia muda. *Sepakbola*, 1(2), 67–77.
- Krisanti, M. A. (2019). Analisis penyebab dan solusi rekonsiliasi finished goods menggunakan hipotesis statistik dengan metode independent sample t-test. *Jurnal Tekno*, 16(2), 35–48.
- Palupi, R., Yulianna, D. A., & Winarsih, S. S. (2021). Analisa perbandingan rumus Haversine dan Euclidean menggunakan independent sample t-test. *Journal Informatic Technology and Communication*, 5(1), 40–47.
- Pitri, P., Donie, D., Setiawan, Y., & Putra, Y. A. (2024). The effect of burpees training on limb muscle explosive power and arm muscle endurance of volleyball players. *Jurnal Gladiator*, 4(2), 106–122. <https://doi.org/10.24036/gldor84601>
- Pradana, G. W., Ma'ruf, M. F., & Eprilianto, D. F. (2022). Penerapan student t-test untuk menilai efektivitas pengembangan buku ajar. *Jurnal Dimensi Pendidikan dan Pembelajaran*, 10(2), 182–190.
- Prasetyo, W. E., & Umar, U. (2020). Studi kondisi fisik bola voli. *Jurnal Patriot*, 2(2), 590–603.
- Purnami, A. F. H., & Purnomo, M. (2019). Pengaruh latihan plyometric terhadap kemampuan kecepatan, power, dan kelincahan. *Jurnal Prestasi Olahraga*, 2(2).
- Putra, R. Y., & Mardela, R. (2019). Daya ledak otot tungkai dan otot lengan berhubungan dengan kemampuan smash bola voli. *Jurnal Patriot*, 1(3), 1101–1113.
- Putri, A. E., Donie, D., Fardi, A., & Yenes, R. (2020). Metode circuit training dalam peningkatan daya ledak otot tungkai dan lengan. *Jurnal Patriot*, 2(3), 680–691.
- Ramdhan, M. (2021). *Metode penelitian*. Cipta Media Nusantara.
- Risnita, R. (2024). Pendekatan penelitian kuantitatif dan kualitatif serta tahapan penelitian. *Jurnal Genta Mulia*, 15(1), 82–92.

Samsudin, S., & Rahman, H. A. (2019). Pengaruh metode pembelajaran drill, bermain, dan kelincahan terhadap kemampuan passing bola voli. *Jurnal Keolahragaan*, 4(2), 207–219.

Saroni, I., Putro, D. E., & Dermawan, B. (2022). Effect of burpee and banded barbell squat on jump height in volleyball players. *Jurnal Adiraga*.

Segara, B. (2020). Pengaruh latihan crocodile push-up dan burpee terhadap kekuatan otot lengan dan hasil shooting handball mahasiswa. *Jurnal Pendidikan Olahraga*, 6(1).

Sudrazat, A., & Rustiawan, H. (2020). Exercise burpees and run 150 meter track 45° to increase VO<sub>2</sub>max. *Journal Wahana Pendidikan*, 7(2), 123. <https://doi.org/10.25157/wa.v7i2.3310>

Wahyuni, S., & Donie, D. (2020). VO<sub>2</sub>max, daya ledak otot tungkai, kelincahan, dan kelentukan atlet taekwondo. *Jurnal Patriot*, 2(2), 640–653.

Wicaksono, T., & Putri, W. S. K. (2020). The effect of burpee and box jump training on limb muscle explosiveness and swimming speed. *JOSSAE: Journal of Sport Science and Education*, 5(1), 39–47. <https://doi.org/10.26740/jossae.v5n1.p39-47>

Witarsyah, W. (2020). Manfaat latihan variasi jarak servis terhadap ketepatan servis atas peserta ekstrakurikuler bola voli. *Jurnal Patriot*, 2(4).