

# ANALYSIS OF THE PHYSICAL CONDITIONS OF INDOONESIAN BEACH VOLLEYBALL PLAYERS IN 2022

AHMAD NASRULLOH<sup>1</sup>, BETRIX TEOFA PERKASA WIBAFIED BILLY YACHSIE<sup>2</sup>, AMRY HARTANTO<sup>3</sup>

<sup>1</sup>Sports Science Study Program, Faculty of Sports, Yogyakarta State University, Yogyakarta, Indonesia

<sup>2</sup>Indonesian Traditional Medicine Study Program, Sports and Health Department, Vocational Faculty, Yogyakarta State University, Indonesia

## Correspondence:

Ahmad Nasrulloh, Sports Science Study Program, Faculty of Sports, Yogyakarta State University Yogyakarta State University, Indonesia, [ahmadnasrulloh@uny.ac.id](mailto:ahmadnasrulloh@uny.ac.id)

**Abstract:** This research is preliminary research which aims to determine the results of the dominant physical condition components in beach volleyball athletes. This type of research is quantitative descriptive. The sampling technique used was purpose sampling. A sample of 12 volleyball players was obtained which was divided into two subsamples, namely 6 men and 6 women. The instruments used are the push up test, vertical jump, and bleep test. The data analysis technique uses descriptive analysis expressed in percentage form. with results (1) The arm muscle endurance of men's beach volleyball athletes at Pelatnas in 2021 is in the "Adequate" category at 66.67% (4 athletes), while female athletes are in the "Adequate" category at 66.67% (4 athletes). (2) The cardiorespiratory endurance (VO<sub>2</sub> Max) of the 2021 National Pelatnas men's beach volleyball athletes is in the "Adequate" category at 50.00% (3 athletes), while the female athletes are in the "Adequate" category at 50.00% (3 athlete). (3) The leg muscle strength of male beach volleyball athletes at Pelatnas in 2021 is in the "Good" category at 50.00% (3 athletes), while the female athletes are in the "Poor" category at 33.33% (2 athletes), "Fair" by 33.33% (2 athletes), "Good" by 33.33% (2 athletes). From these dominant components, it can be concluded that Indonesian sand volleyball players have less than optimal results, so it is necessary to vary the training program by the coach.

**Keywords:** arm muscle endurance, cardiorespiratory endurance (VO<sub>2</sub> max), leg muscle power, sand volleyball.

## INTRODUCTION

Volleyball is a sport that is very popular with Indonesian people (Irawan et al., 2023). That is currently ranked second after football, it is no wonder that this game, which mostly uses hands, is played by almost all people in rural communities, urban communities, and even elementary schools to tertiary institutions (Dragosavljević et al., 2020; Young et al., 2023). Sand volleyball is one of many volleyball variations that is practiced, as evidenced by the fact that there are only two players per team and that the game is played on a sandy beach field (Choi et al., 2023).

Excellent physical condition and fundamental volleyball technical abilities are necessary for success in sand volleyball. Body condition and fitness in the world of sports are incredibly closely entwined since an athlete will always want to make the most of his technical talents. If the physical capacity is sufficient and the physical state is closely related to the body's capacity to carry out the work duties being carried out, skilled movement can be performed (Da Costa et al., 2023; Kadhim & Atea, 2023; Martínez et al., 2023; Teixeira et al., 2023). The components of physical condition that affect sand volleyball performance are strength, speed, flexibility, endurance, leg muscle power, and coordination (Sabillah et al., 2022).

Arm muscle endurance and VO<sub>2</sub>Max endurance are a person's ability to use their muscles to contract continuously for a relatively long time with certain loads with different targets. The ability to do work with long intensity and continuously is called stamina. Meanwhile, leg muscle strength in sand volleyball is useful for jumping, smashing and blocking (Khalafi et al., 2022). This is supported by research that (Panda et al., 2022) endurance, strength, power and speed are elements of energy that are really needed in the sand volleyball game, because the sand volleyball game only has 2 players so the intensity of the players jumping is greater.

The importance of the state of physical condition should be realized by coaches and athletes themselves (De Smet et al., 2023; Wu et al., 2023). The coach should always control the athlete's physical condition, so that it can be known early on if the players experience interference which will later affect the performance and performance of these players in competition (Amal et al., 2022). Based on the problems above, it can be said that there is a disbalance between expectations and reality that occurs, this means that achievement is not solely determined by technical

proficiency alone, but from several factors, one of which is through systematic and continuous maximum training. So the purpose of this study was to determine the state of arm muscle endurance, VO2Max endurance, and leg muscle power of Pelatnas beach volleyball athletes in 2021.

## METHOD

This research is a quantitative descriptive research with descriptive research methods. A sampling technique was used with certain criteria (purpose sampling), which included: volleyball athletes, height 170-185 and ideal body weight, age 21-25 years, active training, good health condition. Next, based on the criteria, A sample of 12 volleyball players was obtained which was divided into two subsamples, namely 6 men and 6 women. Next, to obtain reference data, a test from the realm of physical fitness was used with the instrument used is arm muscle endurance (push up test), vertical jump leg power, and VO2Max endurance (bleep test) research was carried out in Indonesia. The data analysis technique used is descriptive percentage.

## RESULTS

Below we will explain the results of physical condition tests on volleyball players. The results of the analysis are as follows:

*Table 1. Statistical description of arm muscle endurance in men's and women's beach volleyball players*

No	intervals	Category	Frequency	Percentage	intervals	Category	Frequency	Percentage	
1	53.23 < X	Very good	0	0.00%	33.36 < X	Very good	1	16.67%	
2	43.63 < X ≤ 53.23	Good	1	16.67%	29.12 < X ≤ 33.36	Good	0	0.00%	
3	34.03 < X ≤ 43.63	Enough	4	66.67%	24.88 < X ≤ 29.12	Enough	4	66.67%	
4	24.43 < X ≤ 34.03	Not enough	1	16.67%	20.64 < X ≤ 24.88	Not enough	1	16.67%	
5	X ≤ 24.43	Very Not enough	0	0.00%	X ≤ 20.64	Very Not enough	0	0.00%	
Amount			6	100%	Amount			6	100%

Based on the results above, it shows that the arm muscle endurance of Pelatnas men's beach volleyball athletes in 2021 is in the „Very Insufficient“ category of 0.00% (0 player), „Less“ of 16.67% (1 player), „Enough“ ” by 66.67% (4 player), „Good“ by 16.67% (1 player), and „Very Good“ by 0.00% (0 player). Based on the results above, it shows that the arm muscle endurance of Pelatnas women's beach volleyball athletes in 2021 is in the „Very Insufficient“ category of 0.00% (0 player), „Less“ of 16.67% (1 player), „Enough“ ” by 66.67% (4 player), „Good“ by 0.00% (0 player), and „Very Good“ by 16.67% (1 player).

*Table 2. Descriptive statistics on the VO2Max endurance of men's and women's beach volleyball players*

No	intervals	Category	Frequency	Percentage	intervals	Category	Frequency	Percentage	
1	46.27 < X	Very good	1	16.67%	44.04 < X	Very good	0	0.00%	
2	43.09 < X ≤ 46.27	Good	1	16.67%	41.45 < X ≤ 44.04	Good	2	33.33%	
3	40.09 < X ≤ 43.09	Enough	3	50.00%	38.86 < X ≤ 41.45	Enough	3	50.00%	
4	37.00 < X ≤ 40.09	Not enough	1	16.67%	36.27 < X ≤ 38.86	Not enough	0	0.00%	
5	X ≤ 37.00	Very Not enough	0	0.00%	X ≤ 38.86	Very Not enough	1	16.67%	
Amount			6	100%	Amount			6	100%

Based on the results above, it shows that the VO2Max endurance of Pelatnas men's beach volleyball athletes in 2021 is in the „Very Insufficient“ category of 0.00% (0 player), „Less“ of 16.67% (1 player), „Enough“ of 50.00% (3 player), „Good“ of 16.67% (1 player), and „Very Good“ of 16.67% (1 player). Based on the results above, it shows that the VO2Max endurance of Pelatnas women's beach volleyball athletes in 2021 is in the „Very Insufficient“ category of 16.67% (1 player), „Less“ of 0.00% (0 player), „Enough“ of 50.00% (3 player), „Good“ of 33.33% (1 player), and „Very Good“ of 0.00% (0 player).

**Table 3.** Statistical description of Leg Muscle Power in Men’s and women’s Beach Volleyball player

No	intervals	Category	Frequency	Percentage	intervals	Category	Frequency	Percentage	
1	83.13 < X	Very good	0	0.00%	60.00 < X	Very good	0	0.00%	
2	77.93 < X ≤ 83.13	Good	3	50.00%	56.00 < X ≤ 60.00	Good	2	33.33%	
3	72.73 < X ≤ 77.93	Enough	1	16.67%	52.00 < X ≤ 56.00	Enough	2	33.33%	
4	67.53 < X ≤ 72.73	Not enough	2	33.33%	48.00 < X ≤ 52.00	Not enough	2	33.33%	
5	X ≤ 67.53	Very Not enough	0	0.00%	X ≤ 48.00	Very Not enough	0	0.00%	
Amount			6	100%	Amount			6	100%

Based on the results above, it shows that the leg muscle power of Pelatnas men’s beach volleyball athletes in 2021 is in the category „Very Insufficient“ of 0.00% (0 player), „Less“ of 16.67% (1 player), „Enough“ of 50.00% (3 player), „Good“ of 16.67% (1 player), and „Very Good“ of 16.67% (1 player). Based on the results above, it shows that the leg muscle power of Pelatnas women’s beach volleyball athletes in 2021 is in the „Very Insufficient“ category of 0.00% (0 player), „Less“ of 33.33% (2 player), „Enough“ of 33.33% (2 player), „Good“ of 33.33% (2 player), and „Very Good“ of 0.00% (0 player).

### DISCUSSION

Volleyball athletes really need good physical condition (Cheng & Ebrahimi, 2023) stated that physical condition not only influences technical improvement, but also improves tactics. Improving tactics will not be successful if you do not master the technique well and are supported by good physical condition (Qiao et al., 2023). Physical condition is very determining for a person to optimize the techniques learned, good physical condition is the main requirement for mastering and developing a sports technical skill (Zhao et al., 2023). Physical condition is an important element and is the basis for developing techniques, tactics and strategies in playing volleyball. The dominant physical condition components for sand volleyball players include arm muscle endurance, VO2Max endurance, and leg muscle power.

Muscular endurance is the ability to withstand muscle fatigue during physical activity (Hanish et al., 2023; Yachsie, Suharjana, et al., 2023) Based on research results (Ribeiro et al., 2022) Arm muscle endurance is needed by male or female sand volleyball athletes who aim to combine it with speed where players get hard smashes (Bright et al., 2023). Study (Kang et al., 2023) stated that the average arm muscle endurance of men and women tends to be different. Research backed (Miguel-Ortega et al., 2023) Men’s muscle endurance is on average higher than women’s, so male volleyball athletes are easier to train than women, but not all female volleyball players have the same results. However, there is a gap in the arm muscle endurance component. If a volleyball player only has good arm muscle endurance, not supported by speed, the ball shot will not be accurate (Yudi & Anggara, 2021). Based on the results (Fatih, 2023) On average, male or female volleyball players have arm muscle endurance in the poor category, so it is best to do exercises to strengthen arm muscle endurance, one of which is by using a GYM machine. With the hope of improving the dominant physical condition components of the Indonesian team’s beach volleyball players. So it can be interpreted that arm muscle endurance is needed to maintain a stable arm condition, with the hope that it will not get tired easily when competing (Yachsie, Pranata, et al., 2023). The uses of arm muscle endurance include a stance for receiving passes, as well as for the accuracy of serves or smashes, so the endurance of the arm muscles will greatly influence this, if the muscle endurance is good, the serve will be harder and better. and also smashes (Marpaung & Priyonoadi, 2020).

Fatigue is a factor that causes defeat in sand volleyball games where sandy terrain conditions require players to maintain their stamina, however in this study male and female sand volleyball players had less than optimal results. So there is a gap that causes fatigue during matches and training (Aliberti et al., 2021). Based on research (Rasmin et al., 2023) Low VO2Max conditions are the result of an unhealthy lifestyle, where lack of rest hours, smoking and having fun at night can cause VO2Max conditions to decrease. So it is necessary to hold activities as a form of relaxation, such as outbound activities and other activities. Based on research (Yu et al., 2023) Male and female athletes have an average level of saturation that is higher than non-athletes. And based on research (Griban et al., 2023) The smoking lifestyle is not only experienced by men but women also follow it, be it vaping or smoking tobacco. This means that coaches must understand that it is not only training activities that are maximized, but recreational activities also need to be carried out, with the hope of reducing the impact of unhealthy lifestyles on athletes. Based on research (Carpes et al., 2023). Endurance is a person’s body’s ability to resist fatigue that arises when carrying out

activities for a long time (Carpes et al., 2023). The culture of smoking and lack of regular rest can affect cardiopulmonary endurance, if interpreted as the ability of the lungs, heart and blood vessels to send sufficient amounts of oxygen to the cells to meet the needs of physical activity for a long time (Stojanović et al., 2022). So if there is an obstacle in the body's system, the body will not respond well, but the body will show a reaction to rest.

The position of the legs in a volleyball game forms a stance with a half-squat process. This is done so that the process of bouncing the ball on the arm can be directed properly. Apart from that, each player must move to pick up the ball, so players who lack good leg power will certainly have unbalanced movements (Shamsuddin et al., 2022). Leg muscle power is the ability of a muscle or group of leg muscles to overcome resistance with fast movements, for example jumping, throwing, hitting and running (González-Badillo et al., 2022). On the other hand, if the explosive power of the leg muscles is still weak, it will affect the player's performance on the field, especially when carrying out attacks and defense (Huang et al., 2023). So this leg power has a big influence on jumping, based on opinion (Schärer et al., 2023) The explosive power of male and female volleyball players has a large gap where men jump higher than women (Roso-Moliner et al., 2023), but As for opinions (Pawlik & Mroczek, 2023) that women's jumps are no less high than men's. This means that leg power can vary depending on body height and the training performed. From the results above, it can be interpreted that male and female sand volleyball players have less than optimal results, so it is necessary to carry out training programs specifically to increase leg power, for example by providing training. Therefore, the explosive power of the leg muscles continues to be trained and improved through training programs that are prepared based on planned and systematic training programs. The weakness in this research is that it cannot control other factors that can influence the test, namely psychological or mental factors.

## CONCLUSION

Playing volleyball in a match takes a relatively long time, it can last for hours, and there can even be extra rounds. This requires the ability of volleyball players to do physical work for a relatively long time. These dominant components will provide maximum results. So it can be concluded that it is necessary to carry out special treatment to provide a significant impact, such as exercise to increase arm muscle endurance, relaxation and special treatment to change lifestyle so that VO2Max is maintained as well as, weight training for leg power with each appropriate exercise program.

## REFERENCES

- Aliberti, S., Calandro, A., Esposito, G., Altavilla, G., & Raiola, G. (2021). Three workouts compared: interval training, intermittent training and steady state training for the improvement of VO2 max and BMI. *Sportske Nauke i Zdravlje*, 11(2), 197–204. <https://doi.org/10.7251/SSH2102197A>
- Amal, A. I., Sutapa, P., & Ramadhan, T. K. (2022). The relevance of physical conditions to team performance: A case study of PORPROV women's volleyball athletes in Banyumas regency. *Journal of Sports Science and Nutrition*, 3(1), 95–102.
- Bright, T. E., Handford, M. J., Mundy, P., Lake, J., Theis, N., & Hughes, J. D. (2023). Building for the future: A systematic review of the effects of eccentric resistance training on measures of physical performance in youth athletes. *Sports Medicine*, 1–36.
- Carpes, L. O., Domingues, L. B., Fuchs, S. C., & Ferrari, R. (2023). Rate of Responders for Post-Exercise Hypotension after Beach Tennis, Aerobic, Resistance and Combined Exercise Sessions in Adults with Hypertension. *Sports*, 11(3), 58.
- Cheng, C., & Ebrahimi, O. V. (2023). A meta-analytic review of gamified interventions in mental health enhancement. *Computers in Human Behavior*, 141, 107621.
- Choi, W., Lee, W., Lee, C., Haugen, M., & Welty Peachey, J. (2023). How do fan engagement and sport participation influence adaptation to campus and life satisfaction? A Comparison between American domestic and Asian international students. *Journal of Leisure Research*, 1–25.
- Da Costa, Y. P., Fortes, L., Santos, R., Souza, E., Hayes, L., Soares-Silva, E., & Batista, G. R. (2023). Mental fatigue measured in real-world sport settings: A case study of world class beach volleyball players. *Journal of Physical Education and Sport*, 23(5), 1237–1243. <https://doi.org/10.7752/jpes.2023.05152>
- De Smet, S., O'Donoghue, K., Lormans, M., Monbaliu, D., & Pengel, L. (2023). Does exercise training improve physical fitness and health in adult liver transplant recipients? A systematic review and meta-analysis. *Transplantation*, 107(1), e11–e26.
- Dragosavljević, S., Mitrović, N., & Stević, D. (2020). The Effects of Plyometric Training on Motor Skills of Top Volleyball Players / Efekti pliometrijskog treninga na motoričke sposobnosti vrhunskih odbojkaša. *Спортске Науке И Здрање - Анеурон*, 18(2), 124–138. <https://doi.org/10.7251/ssh1902124d>
- Fatih, E. (2023). Investigation of the Effect of Push-Up Exercises with and without Suspension on Some Motor Skills Applied to Young Volleyball Athletes. *Journal of Education and Recreation Patterns*, 4(2).
- González-Badillo, J. J., Sánchez-Medina, L., Ribas-Serna, J., & Rodríguez-Rosell, D. (2022). Toward a New Paradigm in Resistance Training by Means of Velocity Monitoring: A Critical and Challenging Narrative. *Sports Medicine-Open*, 8(1), 1–24.
- Griban, G. P., Lyakhova, N., Oleniev, D., Kanishcheva, O., Duhina, L., Ostrianko, T., & Skoruy, O. (2023). Dynamics of tobacco smoking prevalence among students and directions of its prevention. *Wiadomości Lekarskie*, 76 (8), 1776–1782.
- Hanish, S., Muhammed, M., Kelly, S., & DeFroda, S. (2023). Postoperative Rehabilitation for Arthroscopic Management of Femoroacetabular

- Impingement Syndrome: a Contemporary Review. *Current Reviews in Musculoskeletal Medicine*, 1–11.
- Huang, R., Zhang, M., Huang, L., Chen, Z., Mo, Y., & Gao, Y. (2023). Effects of lower-extremity explosive strength on youth judo athletes adopting different types of power-based resistance training. *Frontiers in Physiology*, 14, 413.
- Irawan, F. A., Permana, D. F. W., & Hadi, S. R. (2023). Kinematics Analysis of Volleyball Open Spike in the Elite Athletes. *ISPHE 2022: Proceedings of the 6th International Seminar on Public Health and Education, ISPHE 2022, 29 June 2022, Semarang, Central Java, Indonesia*, 195.
- Kadhim, H. S., & Atea, A. S. (2023). The Effect of Balance Exercises on Some Strength Abilities of The Legs for High-Spiking Players in Volleyball. *The Egyptian Journal of Hospital Medicine*, 90(2), 2808–2813.
- Kang, B., Crilly, N., Ning, W., & Kristensson, P. O. (2023). Prototyping to elicit user requirements for product development: Using head-mounted augmented reality when designing interactive devices. *Design Studies*, 84, 101147.
- Khalafi, M., Sakhaei, M. H., Rosenkranz, S. K., & Symonds, M. E. (2022). Impact of concurrent training versus aerobic or resistance training on cardiorespiratory fitness and muscular strength in middle-aged to older adults: A systematic review and meta-analysis. *Physiology & Behavior*, 113888.
- Marpaung, H. I., & Priyonoadi, B. (2020). *The Correlation between Leg-arm Muscle Power and Volleyball Players' Open Smash Ability*.
- Martínez, E. L., García, G. M. G., & Molina-Martín, J. J. (2023). Quantification of the competition load of the sets in high-level volleyball in the year 2021. *Journal of Physical Education and Sport*, 23(1), 134–142.
- Miguel-Ortega, Á., Calleja-González, J., & Mielgo-Ayuso, J. (2023). Comparison of Sports Performance and Kinanthropometric Profiles of Elite Female Basketball and Volleyball Players over the Course of a Competitive Season. *Applied Sciences*, 13(14), 8267.
- Panda, M., Rizvi, M. R., Sharma, A., Sethi, P., Ahmad, I., & Kumari, S. (2022). Effect of electromyostimulation and plyometrics training on sports-specific parameters in badminton players. *Sports Medicine and Health Science*, 4(4), 280–286.
- Pawlik, D., & Mroczek, D. (2023). Influence of jump height on the game efficiency in elite volleyball players. *Scientific Reports*, 13(1), 8931.
- Qiao, J., Wang, S., Yu, C., Yang, X., & Fernandez, C. (2023). A chaotic firefly-Particle filtering method of dynamic migration modeling for the state-of-charge and state-of-health co-estimation of a lithium-ion battery performance. *Energy*, 263, 126164.
- Rasmin, M., Faiza, H. N., Suryoadji, K. A., Zain, N. H., Utami, S. S., Taufik, F. F., Friska, D., Sudarsono, N. C., & Syahrudin, E. (2023). Relationship Between Nutritional Status, Physical Activity, Type of Work and Smoking Activity with Fitness Level Measured by 6-Minute Walking Test on Non-staff Employees of Universitas Indonesia, Depok. *Respiratory Science*, 3(2), 103–115.
- Ribeiro, J., Silva Dias, T., Dias, C., & Fonseca, A. M. (2022). Mental imagery use: the perspective of national team coaches in the U-19 beach volleyball world championship. *Sports Coaching Review*, 1–21.
- Roso-Moliner, A., Lozano, D., Nobari, H., Bishop, C., Carton-Llorente, A., & Mainer-Pardos, E. (2023). Horizontal jump asymmetries are associated with reduced range of motion and vertical jump performance in female soccer players. *BMC Sports Science, Medicine and Rehabilitation*, 15(1), 80.
- Sabillah, M. I., Tomoliyus, Nasrulloh, A., & Yuniana, R. (2022). The effect of plyometric exercise and leg muscle strength on the power limb of wrestling athletes. *Journal of Physical Education and Sport*, 22(6), 1403–1411. <https://doi.org/10.7752/jpes.2022.06176>
- Schärer, C., Reinhart, L., & Hübner, K. (2023). Age-Related Differences between Maximum Flight Height of Basic Skills on Floor, Beam and Vault and Physical Condition of Youth Female Artistic Gymnasts. *Sports*, 11(5), 100.
- Shamsuddin, D. S. N. A., Fekeri, A. F. M., Muchtar, A., Khan, F., Chin, K. B., Huah, L. B., Rosli, M. I., & Takriff, M. S. (2022). Computational Fluid Dynamics Modelling Approaches of Gas Explosion in the Chemical Process Industry: A review. *Process Safety and Environmental Protection*.
- Stojanović, N., Stojanović, D., Zdražnik, M., Bešić, Đ., & Stojanović, T. (2022). The Effects of Short-Term Preseason Skill-Based Conditioning on Physiological Characteristics in Elite Female Volleyball Players. *SportLogia*, 18(1).
- Teixeira, M., Júnior, A., & Sesinando, A. (2023). Sport Events as a Catalyst for Economic, Socio-Cultural, Tourism, and Environmental Sustainability in Portugal. *Sport Management in the Ibero-American World: Product and Service Innovations*, 258–273.
- Wu, S. W., Wan, D. T., Jiang, C., Liu, X., Liu, K., & Liu, G. R. (2023). A finite strain model for multi-material, multi-component biomechanical analysis with total Lagrangian smoothed finite element method. *International Journal of Mechanical Sciences*, 243, 108017.
- Yachsie, B. T. P. W. B., Pranata, D., Hita, I. P. A. D., Kozina, Z., & Suhasto, S. (2023). How Does Circuit Plank Exercise Affect Arm Muscle Strength and Archery Accuracy? *International Journal of Human Movement and Sports Sciences*, 11(5), 1114–1120. <https://doi.org/10.13189/saj.2023.110520>
- Yachsie, B. T. P. W. B., Suharjana, Graha, A. S., & Hartanto, A. (2023). Circuit Game Development: Implications On Balance, Concentration, Muscle Endurance, And Arrow Accuracy. *Physical Education Theory and Methodology*, 23(1), 92–97. <https://doi.org/10.17309/tmfv.2023.1.13>
- Young, W. K., Briner, W., & Dines, D. M. (2023). Epidemiology of common injuries in the volleyball athlete. *Current Reviews in Musculoskeletal Medicine*, 16(6), 229–234.
- Yu, Q., Kong, Z., Zou, L., Chapman, R., Shi, Q., & Nie, J. (2023). Comparative efficacy of various hypoxic training paradigms on maximal oxygen consumption: A systematic review and network meta-analysis. *Journal of Exercise Science & Fitness*.
- Yudi, A. A., & Anggara, D. (2021). Plyometrics exercise effects volleyball athlete smash ability. *1st International Conference on Sport Sciences, Health and Tourism (ICSSHT 2019)*, 35, 24–30.
- Zhao, K., Zhang, M., Shen, W., Liu, X., Ji, J., Dai, B., & Zhang, R. (2023). Automatic body condition scoring for dairy cows based on efficient net and convex hull features of point clouds. *Computers and Electronics in Agriculture*, 205, 107588.

Primljen: 11. jul 2023. / Received: July 11, 2023

Prihvaćen: 07. oktobar 2023. / Accepted: October 07, 2023



This work is licensed under a [Creative Commons Attribution-NonCommercial 4.0 International License](https://creativecommons.org/licenses/by-nc/4.0/).