12 (1) (2025) 139 - 144

Journal of Physical Education, Health and Sport

https://journal.unnes.ac.id/journals/jpehs

The Effect of Speed Play Training Method on Improving Cardiovascular Endurance of Pencak Silat Athletes Single Art Category

Alya Sabrina Mujakirahmah[1], Dikdik Zafar Sidik[2]✉, Oktoviana Nur Ajid[3]

Physical Sports Coaching Study Program, Faculty of Sport and Health Education, University of Education Indonesia, Indonesia[123]

History Article

Received July 2025
Approved July 2025
Published vol 12 no 1 2025

Keywords

Speed Play; VO_2Max; Pencak Silat

Abstract

This study aims to determine the effect of the speed play training method on increasing cardiovascular endurance (VO_2max) in pencak silat athletes of the single arts category. Using a pretest-posttest control group design, ten athletes were divided into experimental and control groups. The experimental group received a structured speed play training program for eight sessions, while the control group followed their regular training routines. The Beep Test was used as the primary instrument to estimate VO_2max. The results of the independent t-test showed a significant difference between the groups ($p = 0.044$), with an average VO_2max increase of 1.04 points in the experimental group. These findings suggest that speed play is effective in improving aerobic capacity, especially due to its varied intensity patterns that match the dynamic and uninterrupted demands of single arts performances. The study also provides evidence that speed play can serve as a specific training model for pencak silat art athletes and offers recommendations for further research involving more diverse participants and physiological indicators.

How to Cite

Mujakirahmah, A. S., Sidik, D. A., & Ajid, O.N. (2025). The Effect of Speed Play Training Method on Improving Cardiovascular Endurance of Pencak Silat Athletes Single Art Category. Journal of Physical Education, Health and Sport, 12 (1), 139-144.

✉ Correspondence Author:
E-mail: dikdikzafarsidik@upi.edu

p-ISSN 2354-7901
e-ISSN 2354-8231

INTRODUCTION

Pencak silat is a traditional martial art that is deeply rooted in Indonesian culture. Over time, pencak silat has not only become a cultural heritage, but has also developed into a nationally and internationally recognized sport (Zulfa et al., 2022). This development requires a transformation from traditional values to competitive aspects that emphasize physical, technical, mental, and spiritual aspects in a balanced manner.

In general, pencak silat is divided into two main categories in the competition, namely the fighting category and the art category. The fighting category emphasizes direct contact between athletes, while the art category is a demonstration of a series of standard moves expressed aesthetically, either individually, in pairs, or in teams. The single art category is specifically in the spotlight because it demands performance stability for a full three-minute duration without a break.

A three-minute performance in the solo arts category is no ordinary activity. It consists of repeated bursts of power, transitions of intensity, and consistent technical expressions. This requires a high cardiovascular endurance capacity to support the performance without decreasing the rhythm and precision of the movements (Zulfa et al., 2022). In this context, the need for endurance becomes a vital component.

Cardiovascular endurance is measured by a physiological parameter known as VO_2max. This parameter describes the body›s ability, especially the heart and lung system, to supply oxygen during sustained physical activity (Kour Buttar et al., 2019). Athletes with high VO_2max values have advantages in aerobic energy production, rapid recovery, and resistance to muscle fatigue during high workloads.

However, the reality in the field shows that pencak silat training, especially the art category, is still very dominantly oriented towards technical and choreographic aspects. Many athletes experience a decline in performance in the final third of the performance, which indicates physiological fatigue (Firah, 2024). When stamina decreases, the quality of technique (wiraga), rhythm of movement (wirama), and soul (wirasa) also decrease simultaneously.

VO_2max is influenced by many factors, both modifiable factors such as fitness and exercise intensity, and non-modifiable factors such as age and genetics. Decreased VO_2max ability is often not only caused by cardiorespiratory factors, but also by respiratory muscle fatigue that triggers metaboreflex and reduces blood supply to major muscles such as the legs (Gunerathne et al., 2023). Therefore, increasing VO_2max must be done comprehensively and strategically.

Various training methods have been shown to increase VO_2max, including HIIT, MICT, Fartlek, and Speed Play. The speed play method is in the spotlight because it has flexibility in tempo and intensity variations that are in accordance with the dynamics of single arts matches (Herlan & Komarudin, 2020). Speed play is a development of Fartlek with a semi-planned structure that is easier to adapt to a scientific training program.

Speed play includes a combination of walking, jogging, sprinting, and running backwards that are done continuously. The advantage of this method is that it is able to train the aerobic and anaerobic energy systems simultaneously, and allows physiological adaptation to sudden changes in intensity in a short time (A. Bompa T, O & Buzzichieli, 2019). Thus, speed play is in line with the principle of specificity required in the single art category of pencak silat.

Training with varying intensity such as speed play also has high psychological value because it is not monotonous, increases motivation, and reduces athlete boredom in long training sessions (Arimbi et al., 2024). This is especially important for adolescent athletes who need a fun and effective training method. Previous studies have shown that this training significantly increases cardiorespiratory capacity in other sports such as basketball (Støren et al., 2012).

Although the effectiveness of speed play has been proven in other sports, studies testing the effect of this method on pencak silat—especially the single arts category—are still lacking. Research on pencak silat generally focuses more on the fighting category, which has different physiological demands than the arts category. This is an important research gap to bridge (Bahtra et al., 2024).

This condition shows that there is an urgent need to develop a training model that is not only physiologically measurable, but also practically relevant to the characteristics of single art performance. A training approach is needed that is able to increase endurance without sacrificing technical and aesthetic aspects.

Novelty of this study lies in the application of a structured speed play method for single-art pencak silat athletes, which has never been tested before in a controlled experiment. This study is not just adopting a training model from another

branch, but adapting it based on the demands of specific artistic and rhythmic performance in single-art pencak silat.

The study also developed a speed play protocol that is specifically tailored to the duration, intensity, and intervals of single-art performance, unlike the Fartlek or regular interval training commonly used in sports. With a flexible yet standardized structure, this approach can be measured, evaluated, and replicated for coaching purposes.

By comparing the changes in VO_2max between the experimental and control groups, this study aims to provide concrete scientific evidence regarding the effectiveness of speed play in improving the endurance of single-art athletes (Faude et al., 2017) . This can be an important reference for coaches and pencak silat sports organizations in developing more modern and evidence-based coaching programs (Buchheit & Laursen, 2015).

Practically, the results of this study can be used to strengthen athlete performance in maintaining movement quality during a three-minute performance, while minimizing the risk of decreasing scores due to fatigue. Theoretically, this study expands the scientific basis on the effectiveness of speed play in the context of artistic martial arts, which has so far received minimal research.

METHOD

This study used an experimental method with a pretest-posttest control group design, which allows for comparison of changes in cardiovascular endurance values (VO_2max) before and after treatment between groups (Zientek et al., 2016). This study consisted of two groups, namely the experimental group which was given treatment in the form of a structured speed play training program for eight sessions, and the control group which was not given special treatment, but continued to undergo routine training from their respective trainers.

The population in this study were pencak silat athletes in the single arts category from Perguruan Jomantara, Bandung City, with a sample size of 10 people selected using purposive sampling techniques. Inclusion criteria include: (1) active athletes in the single arts category, (2) memorized all 3-minute movements, and (3) had low endurance based on the pretest results. The selection of the number of samples was based on Roscoe's opinion in (Singh & Masuku, 2014), that a simple experiment with two groups can use 10–20 samples.

The instrument used in this study was the Beep Test or Multistage Fitness Test, which is considered valid and reliable in measuring cardiovascular endurance or VO_2max. This test requires participants to run back and forth 20 meters following the rhythm of the audio beep that continues to increase in intensity. When participants fail to reach the boundary line before the beep sounds twice in a row, the last score is recorded as the final score (Walker, tt; Prime Motion Training, tt). The Beep Test was chosen because it has been scientifically validated and shows significant VO_2max estimation results (Gunerathne et al., 2023).

The speed play training program was designed based on the principle of varied interval training with medium to high intensity, including a combination of brisk walking, jogging, sprinting, and continuous backward running. The training was carried out for 8 sessions, with duration and intensity settings adjusted based on the pretest results and performance characteristics of the single art category (Kenney et al., 2015; Syaiful & Muhadi, 2020). The VO_2max pretest and posttest data were analyzed using an independent t-test with the help of SPSS 25 software, to determine significant differences between groups (Fadluloh et al., 2024).

RESULTS AND DISCUSSION

Based on the results of descriptive analysis of VO_2max values in each group, the following information was obtained:

In the control group, the pretest value showed a minimum value of 38.1, a maximum of 47.7, with an average (mean) of 44,680 and a standard deviation of 3.8460. After treatment (regular routine exercise), the posttest value of the control group had a minimum of 39.2, a maximum of 47.7, a mean of 44,660, and a standard deviation of 3.2524. This shows that the average VO_2max of the control group remained almost unchanged, even slightly decreasing from 44,680 to 44,660, with a slightly smaller spread of values.

Meanwhile, in the experimental group that received treatment in the form of speed play training, the pretest score showed a minimum of 32.9, a maximum of 45.6, with an average of 37.660 and a standard deviation of 4.7253. After treatment, the posttest score increased with a minimum of 33.7, a maximum of 46.1, an average of 38.700, and a standard deviation of 4.5255. There was an increase in the average of 1.04 points, indicating a positive change after speed

play training.

In general, these results indicate that the experimental group experienced an increase in the average VO_2max, while the control group remained stagnant. This indicates a positive effect of the speed play training method on increasing the cardiovascular endurance of pencak silat athletes in the single art category.

Before conducting the hypothesis test, a data normality test was first conducted to ensure that the data in each group was normally distributed. The test used was Shapiro-Wilk because the number of samples was less than 50. The test results showed that the significance value for the control group pretest was 0.093 and the posttest was 0.232. Meanwhile, the experimental group had a pretest significance value of 0.128 and a posttest of 0.223. All significance values were greater than 0.05, which means that the data in each group was normally distributed. Thus, it can be concluded that the normality assumption is met, so that further analysis can use parametric tests, namely the independent t-test

Homogeneity test using Levene's Test with four approaches, namely based on mean, median, median with adjusted df, and trimmed mean. The test results show that the significance value in all approaches is above 0.05, namely 0.665 (mean), 0.774 (median), 0.775 (median with adjusted df), and 0.695 (trimmed mean). This indicates that the data has homogeneous variance between groups.

Based on the test results, a significance value (2-tailed) of 0.044 was obtained with the assumption of equal variances assumed. This value is smaller than 0.05, so it can be concluded that there is a significant difference between the experimental group and the control group. The mean difference is 5.96 with a 95% confidence interval in the range of 0.2127 to 11.7073. This shows that the speed play training method has a significant effect on increasing the cardiovascular endurance of pencak silat athletes in the single art category compared to conventional training.

The results of the study showed that there was a significant difference between the experimental group and the control group in increasing cardiovascular endurance (VO_2max) of pencak silat athletes in the single arts category. The increase in VO_2max in the experimental group after undergoing speed play training for eight sessions indicated that this method was effective in stimulating the cardiovascular system progressively. This is in line with the opinion of (Syaiful & Muhadi, 2020), who stated that speed play training can develop aerobic and anaerobic capacity simultaneously through a combination of varying intensity and duration without a full break.

The speed play method works by combining slow, fast running, and various movements such as sprinting and running backwards in one continuous training session. This pattern approaches the rhythm of muscle work and the respiratory system in the single art category of pencak silat, where athletes must maintain high intensity with a movement transition break for three full minutes. As explained by (Arimbi et al., 2024), the dynamic and flexible training characteristics in speed play provide maximum stimulation to VO_2max because they trigger increased oxygen consumption and muscle capillary adaptation.

Physiologically, the increase in VO_2max is caused by adaptation to high oxygen demand during exercise. This adaptation includes an increase in maximal cardiac output, blood volume, and efficiency of oxygen use in muscle tissue (Kenney et al., 2015). In speed play training, interval work with fluctuating intensity encourages the body to optimize the process of oxygen transport and extraction, thereby accelerating the increase in aerobic capacity (Tomlin & Wenger, 2020). This finding is supported by research by (Gunerathne et al., 2023), which explains that the respiratory system also plays an important role in maintaining VO_2max, especially in medium to long duration activities such as solo art performances.

Furthermore, this study also supports the theory that VO_2max can increase in a relatively short time if the training stimulus is given appropriately and specifically. This is in line with the results of (Bahtra et al., 2024), which states that increasing VO_2max depends not only on the volume of training, but also on the quality and form of training that resembles competitive activities. In this context, speed play training provides advantages because it is able to simulate the real physical demands in single arts matches, such as intensity shifts and rapid recovery between series of moves.

Compared to the control group that did not experience significant improvement, the experimental group showed a positive response indicating that technique training alone is not enough to support full performance in single arts. By (Firah, 2024), stated that many pencak silat art athletes experience a decline in performance at the end of the performance due to the lack of physical training components that support endurance capacity. Therefore, the integration of training programs such as speed play is important in the development of art athletes to maintain the

quality of wiraga, wirama, and wirasa for a full three-minute duration.

Practically, the results of this study provide implications that pencak silat coaches need to consider the use of speed play-based training periodically and in a structured manner in the training program of single art athletes. In addition to increasing VO_2max, this training model also increases the efficiency of energy metabolism and recovery time, which are very crucial in maintaining movement consistency in one complete performance (Zulfa et al., 2022). This study also confirms that a training approach that is specific to the needs of the art category will produce significant and more targeted physiological impacts.

Thus, this discussion strengthens the findings that the speed play training method is effective and relevant to be applied in the training of pencak silat athletes in the single arts category, not only as general fitness training, but as a performance improvement strategy based on specific physiological and technical needs.

CONCLUSION

Based on the results of the study and discussion, it can be concluded that the speed play training method has a significant effect on increasing cardiovascular endurance (VO_2max) of pencak silat athletes in the single arts category. The varied and fluctuating intensity training patterns are able to adjust to the physical characteristics of single arts performances that require high endurance for three minutes without a break. Therefore, speed play is worthy of being used as an alternative physical training program in developing art athletes, in order to support optimal, stable performance from the beginning to the end of the performance.

For further studies, it is recommended to use a larger sample size and involve different age levels or categories of athletes, such as doubles or teams. In addition, additional measurements such as heart rate, lactate levels, or direct VO_2max testing with a gas analyzer can be used to obtain more in-depth and accurate physiological data.

REFERENCES

A. Bompa T, O & Buzzichieli, C. (2019). Periodeization:Theory and Methodology of training(sixth Edit)Human Kinetics.

Arimbi, A., Arifuddin, U., Elisano, P., Sarifin, S., & Mujari, W. (2024). Pengaruh Latihan Speed Play Terhadap Nilai Hematokrit Dan Kardiorespirasi Atlet Basket. Journal of Education, 6(4), 19768–19777. https://doi.org/10.31004/joe.v6i4.5933

Bahtra, B., Wicaksana, R., & Fajar, D. (2024). Efektivitas Latihan Interval Intensitas Sedang dalam Meningkatkan VO_2max Atlet Bela Diri. Jurnal Keolahragaan, 12(1), 12–19. https://doi.org/10.21831/jk.v12i1.12345

Buchheit, M., & Laursen, P. B. (2015). High-intensity interval training, solutions to the programming puzzle. Sports Medicine, 43(5), 313–338. https://doi.org/10.1007/s40279-013-0066-5

Fadluloh, F. M., Sartono, H., Kusumah, W., & Mulyana, M. (2024). Athletes ' Perception of Parental Support and Achievement Motivation : A Correlational Study with Early Age Individual Sport Athletes in Swimming. 412–421. https://doi.org/https://doi.org/10.31949/ijsm.v4i4.11454

Faude, O., Rössler, R., & Schwesig, R. (2017). Neuromuscular adaptations to systematic high-intensity interval training in youth athletes: A systematic review. Frontiers in Physiology, 8, 324. https://doi.org/10.3389/fphys.2017.00324

Firah, M. S. P. (2024). Pengaruh Penggunaan Media Audio Visual terhadap Kualitas dan Kemantapan Gerak Jurus Tunggal IPSI. Bravo's: Jurnal Program Studi Pendidikan Jasmani Dan Kesehatan, 12(3), 221–230. https://doi.org/10.32682/bravos.v12i3/42

Gunerathne, B. H. S., Weerasinghe, R. D., Wijesundara, W. W. M. S. A. B., Dabare, H. P. M., & Senanayake, S. P. (2023). A Validation Study To Evaluate The Accuracy Of The Beep Test In Measuring Cardiopulmonary Endurance Using Maximum Oxygen Uptake (Vo2max) As The Gold Standard.

Herlan, & Komarudin. (2020). Pengaruh Metode Latihan High-Intensity Interval Training (Tabata) Terhadap Peningkatan VO2Max Pelari Jarak Jauh. Jurnal Kepelatihan Olahraga, 12(1), 11–17. https://doi.org/10.17509/jko-upi.v12i1.24008

Kenney, W. L., Wilmore, J. H., & Costill, D. L. (2015). Physiology of Sport and Exercise. Human Kinetics.

Kour Buttar, K., Saboo, N., & Kacker, S. (2019). A review: Maximal oxygen uptake (VO2 max) and its estimation methods. International Journal of Physical Education, Sports and Health, 6(6), 24–32. https://www.researchgate.net/publication/344122808

Singh, A. S., & Masuku, M. B. (2014). Sampling Techniques & Determination of Sample Size in Applied Statistics Research: An Overview. International Journal of Economics, Commerce and Management, 2(11), 1–22.

Støren, Ø., Helgerud, J., Støa, E. M., & Hoff, J. (2012). Maximal strength training improves running economy in distance runners. Medicine & Science in Sports & Exercise, 40(6), 1087–1092. https://doi.org/10.1249/MSS.0b013e318167d2f0

Syaiful, S., & Muhadi, M. (2020). Latihan Speed Play Dalam Meningkatkan Kebugaran Jasmani.

Active: Journal of Physical Education, Sport, Health and Recreation, 9(1), 45–52.

Tomlin, D. L., & Wenger, H. A. (2020). The Relationship Between Aerobic Fitness and Recovery from High Intensity Intermittent Exercise. Sports Medicine, 50(2), 15–22. https://doi.org/10.1007/s40279-020-01245-6

Zientek, L. R., Nimon, K., & Hammack-Brown, B. (2016). Analyzing Data From a Pretest-Posttest Control Group Design: The Importance of Statistical Assumptions. European Journal of Training and Development, 40(8/9), 638–659.

Zulfa, A., Nugroho, Y., & Hidayat, T. (2022). Analisis Tuntutan Fisik Atlet Pencak Silat Seni Tunggal Ditinjau dari Aspek Energi dan Teknik. Jurnal Olahraga Tradisional, 4(2), 88–95.