



# The Effect of Interval Training on Cardiovascular Endurance and Agility of Students in Futsal Extracurricular SMK Negeri 1 Trenggalek

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## Abstract:

**Background of study:** Interval training is a form of physical activity that involves alternating periods of high and low intensity training to improve speed, strength, and endurance. The primary challenge for most futsal players is their physical condition, particularly cardiovascular endurance and agility. This study aims to determine the effect of interval training on cardiovascular endurance and agility, as well as the relationship between endurance and agility. The scope of this study is the futsal extracurricular activity at State Vocational High School 1 Trenggalek.

**Methods:** This research employed a quantitative and experimental method with a one-group pretest-posttest design. The sample consisted of 20 students, using a purposive sampling technique. Data collection for cardiovascular endurance was conducted using a multistage fitness test, and data collection for agility using a zigzag run test. Data analysis used inferential statistics.

**Result:** The results of this study indicate the effect of interval training on students' cardiovascular endurance and agility, as evidenced by the significant difference in students' cardiovascular endurance and agility before and after training, which is reinforced by a p value of  $0.000 < 0.05$ . In addition, it also shows the influence of cardiovascular endurance on students' agility with a p value of  $0.000 < 0.005$ .

**Conclusion:** This study concludes that interval training can be used to improve cardiovascular endurance and agility in futsal. Furthermore, the better the cardiovascular endurance, the more positive the impact on agility.

**Keywords:** Agility, Cardiovascular Endurance, Extracurricular Futsal, Interval Training

## 1. INTRODUCTION

Interval training is a physical training method that involves alternating between strenuous activity and light activity that aims to increase speed, strength and endurance. In line with Prakoso & Sugiyanto (2017) who define interval training as an exercise that is coupled with high and low intensity training. In addition, Herlan & Komarudin (2020) also stated that this method is done through gradual training. This method is carried out by providing exercise based on the duration, rest, and intensity of exercise that has been determined (Ramadhan dkk., 2021).

Interval training is widely used in the world of sports, because it can adjust the intensity of training that provides training effects in improving various components of physical fitness (Rustiawan, 2020). Tribuana dkk., (2022) also supports that interval training is an effective training method to improve the aerobic and anaerobic capacity of athletes. Harianto dkk., (2025) also found that training with interval patterns can accelerate the body's physiological adaptation to high training loads. Thus, interval training is very suitable for use in sports that demand speed and direction of movement quickly (Imawan & Widodo, 2020).

One sport that requires speed and requires players to have a good and consistent physique is futsal (Kardian & Firdaus, 2022). Futsal requires fast movements, readiness for sudden changes in direction, and continuous game duration, thus making endurance and agility the main requirements in supporting player performance. Interval training specifically trains these components to be a relevant training method to be applied. This shows that interval training is very useful in increasing the endurance and agility of futsal players.

Cardiovascular endurance is one of the important components in sports (Handoko et al., 2020),

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especially in sports that demand physical activity for a long duration of time, such as futsal Interval training can increase the work capacity of the heart and lungs (cardiovascular), so it can support increased endurance (Ilyas & Sutriawan, 2025). Players with strong endurance are able to last longer on the field without experiencing excessive fatigue. In addition, players with good endurance tend to be able to maintain concentration and consistency of performance throughout the match.

Apart from endurance, agility is also an important physical ability in futsal games. Agility is the body's ability to move quickly and change direction efficiently. Interval training, which involves explosive movements with variations in speed and direction, is very relevant for improving agility. This exercise helps train muscle response and body coordination (Setiawan et al., 2024), so as to improve performance when running, turning, and performing fast maneuvers on the field.

Based on observations made at SMK Negeri 1 Trenggalek, it is known that most students who take part in extracurricular futsal activities still have limitations in the aspects of agility and endurance, especially cardiovascular endurance. This condition is an important concern because agility and endurance are two physical aspects that greatly determine performance in futsal games.

Through this study, researchers aim to determine the effect of interval training on cardiovascular endurance and agility of students in extracurricular futsal at SMK Negeri 1 Trenggalek, as well as the relationship between cardiovascular endurance and agility of students of SMK Negeri 1 Trenggalek.

2. MATERIAL AND METHOD

This study applied a quantitative approach with a pre-experimental design, specifically the one group pre-

test and post-test model, to assess the effectiveness of training on improving physical abilities. The subjects in this study were students who were members of extracurricular futsal activities at SMK Negeri 1 Trenggalek. Of these, 20 students were selected as samples through purposive sampling method, with the consideration that they were able to follow the entire series of training for 12 meetings, were in good health, and showed commitment in undergoing the program. The research was conducted in the school environment during the 12 training sessions, in accordance with the extracurricular agenda. The research procedure consisted of three main stages: initial measurement (pretest), interval training treatment, and final measurement (posttest).

Data collection techniques were carried out through physical fitness tests consisting of two indicators, namely cardiovascular system endurance measured by the Multistage Fitness Test (MFT) to obtain an estimate of VO<sub>2</sub> Max, and agility skills measured through the zig-zag run test. Data analysis included descriptive analysis to describe the distribution of values and inferential analysis with normality test as a prerequisite before hypothesis testing using paired sample t-test. This test is only applied if the data shows a normal distribution.

3. RESULT AND DISCUSSION

3.1 Result

3.1.1 Descriptive Analysis

The results in this study were used to describe data on cardiovascular endurance and agility of students before interval training in futsal games.

1. Pretest data analysis

The students' cardiovascular endurance pretest data are presented in Table 1 as follows.

Tabel 1. Cardiovascular Endurance Pretest Data

No	Interval	Category	Frequency	Percentage
1	> 10.9	Perfect	0	0%
2	8.9-10.9	Excellent	4	20%
3	7.6-8.8	Good	4	20%
4	6.5-7.5	Average	4	20%
5	5.2-6.4	Fair	5	25%
6	3.3-5.1	Less	3	15%
7	< 3.3	Poor	0	0%
<b>Total</b>			20	100%

Table 1 shows the frequency distribution pattern of students' cardiovascular endurance. most students are

in the fair category, as many as 5 students (25%). Each of the excellent, good, and average categories





has the same number, namely 4 students each (20%). Meanwhile, the poor category was filled by 3 students (15%), and there were no participants in the perfect or very poor categories, each of which had a

frequency of 0. These results indicate that students' cardiovascular endurance abilities are dominated by the moderate to good categories. Meanwhile, student agility pre-test data is presented in Table 2..

**Tabel 2.** Data Pretest Kelincahan Siswa

Interval (Seconds)	Frequency	Percentage
28 – 30	3	15%
31 – 33	3	15%
34 – 36	5	25%
37 – 39	3	15%
40 – 42	4	20%
43 – 45	2	10%
<b>Total</b>	<b>20</b>	<b>100%</b>

Based on Table 2, the results of the student agility pretest measured in seconds show that most participants are in the 34-36 second time interval, with a total of 5 people (25%). Furthermore, the interval of 40-42 seconds was filled by 4 participants (20%), followed by the intervals of 28-30 seconds, 31-33 seconds, and 37-39 seconds, each of which had a frequency of 3 people (15%). Meanwhile, the 43-45 second time interval had the lowest frequency, with only 2 people (10%). Overall, this data shows that the

majority of participants completed the agility test in a better time range than the pretest results.

## 2. Analysis of posttest data

Analysis of posttest data was carried out after going through the pretest stage and providing interval training exercises. Cardiovascular endurance posttest data can be seen in Table 3.

**Tabel 3.** Posttest Data of Cardiovascular Endurance

No	Interval	Category	Frequency	Percentage
1	> 10.9	Perfect	1	5%
2	8.9-10.9	Excellent	4	20%
3	7.6-8.8	Good	8	40%
4	6.5-7.5	Average	6	30%
5	5.2-6.4	Fair	1	5%
6	3.3-5.1	Less	0	0%
7	< 3.3	Poor	0	0%
<b>Total</b>			<b>20</b>	<b>100%</b>

Based on Table 3, the frequency distribution of endurance post-test results from 20 students shows that the majority of students are in the good category, as many as 8 people (40%). Furthermore, as many as 6 students (30%) are classified in the average category, and 4 students (20%) are in the excellent category. Only 1 student (5%) was in the perfect category and 1 other student (5%) was in the fair

category. Meanwhile, there were no participants who fell into the poor or very poor categories, each of which had a frequency of 0%. This shows that most students have an endurance level that is in the moderate to high category.

While student agility posttest data can be examined in table 4.

**Table 4.** Shows the internal consistency of the paragraphs of the two scales

Interval (Seconds)	Frequency	Percentage
28 – 30	4	20%
31 – 33	6	30%
34 – 36	4	20%
37 – 39	2	10%
40 – 42	2	10%
43 – 45	2	10%
<b>Total</b>	<b>20</b>	<b>100%</b>

Based on Table 4, the results of the student agility posttest show that the 31-33 second time interval has the highest number of students, namely 6 students (30%). Followed by two intervals, namely 28-30 seconds and 34-36 seconds, each of which was filled by 4 students (20%). Furthermore, the other three intervals, namely 37-39 seconds, 40-42 seconds, and 43-45 seconds have the same number of students, namely 2 students each (10%). In general, the majority of students completed the agility test within 28-36 seconds. This also shows that there is an improvement in performance compared to the pretest results.

### 3.1.2 Analisis inferensial

This analysis aims to estimate parameters and test hypotheses in a study, in order to obtain appropriate and relevant conclusions (Yam & Taufik, 2021). There are two stages that have been carried out in this analysis, namely prerequisite tests and hypothesis testing.

#### 1. Prerequisite tests

This tests are carried out to ensure that the data to be analyzed has met the basic assumptions required by certain statistical analysis methods, especially in parametric analysis (Sonjaya et al., 2025). This step is important to ensure the validity of the research results and the accuracy of the conclusions drawn. The prerequisite test used in this study is the normality test. This test is used to ensure that the data is normally distributed, which means that most of the data is around the average value and the amount of data is getting less at the ends of the distribution (Isnaini et al., 2025). Data is said to be normal if the Sig. ( $p > 0,05$  (the specified significant level)). This test uses the Shapiro-Wilk test formula because it has a high level of accuracy in detecting normality in small data, namely less than 50 samples (Sianturi, 2024). The results of the normality test in this study are presented in Table 5.

**Table 5.** Normality Test Results

	Data	Statistik	Df	Sig.
<i>Pretest</i>	Cardiovascular Endurance	0.954	20	0.427
	Agility	0.926	20	0.130
<i>Posttest</i>	Cardiovascular Endurance	0.958	20	0.505
	Agility	0.952	20	0.391

Table 5 indicates that the overall Sig. value is greater than 0.05. It can be concluded that the data in the pretest and posttest for the endurance and agility variables are normally distributed and meet the requirements for hypothesis testing using parametric statistical analysis.

#### 2. Hypothesis Test

This test acts as a procedure for testing conjectures (hypotheses) about the population based on empirical data from the sample (Keeler & Curtis, 2023). The hypothesis test in this study aims to determine the

significant difference between the mean scores of the pretest and posttest in the same group, so it uses the paired sample t-test statistical method. This test is used when two sets of data come from the same subject or are related, such as measurements before and after certain treatments in one group. If the p value is  $<0.05$  then  $H_0$  is rejected  $H_1$  is accepted, which means there is a difference before and after treatment. Conversely, if the p value is  $> 0.05$ , then  $H_0$  is accepted  $H_1$  is rejected, which means that there is no difference before and after treatment. The results of the paired sample t test can be seen in Table 6.

**Table 6.** Paired Sample t Test Results

Data Type	p-value	Sig.
Cardiovascular Endurance Pretest–Posttest	0.000	0,05
Agility Pretest–Posttest	0.000	0,05
Cardiovascular Endurance Posttest – Agility Posttest	0.000	0,05

Table 6 shows that the hypothesis test for cardiovascular endurance has a p value of ( $0.000 < 0.05$ ), which indicates that there is a significant difference in endurance before and after the application of interval training. This table also displays the difference in student agility, which

shows a p value of ( $0.000 < 0.05$ ), which means there is also a significant difference in student agility before and after interval training. These two hypotheses show that interval training has an effect on cardiovascular endurance and student agility. This is evidenced by the increase in cardiovascular



endurance and agility before and after the application of interval training.

In addition, the table also shows that there is a significant relationship between cardiovascular endurance and agility after the interval training treatment. This is proven by the significance value of the comparison between the posttest of endurance and agility also shows a p-value of  $0.000 < 0.05$ , which indicates that increased endurance has a positive relationship to increased agility. This is proven by the significance value of the comparison between the posttest of endurance and agility also shows a p-value of  $0.000 < 0.05$ , which indicates that increasing endurance has a positive relationship to increasing agility.

### 3.2 Discussion

The effect of interval training obtained based on the data exposure above shows two main conclusions, namely the effect on cardiovascular endurance and agility, and the relationship between cardiovascular endurance and student agility in futsal extracurricular activities.

According to [Putra et al. \(2025\)](#), interval training is an exercise method that aims to increase lung capacity, strengthen cardiovascular endurance, and increase athletes' physical speed in responding to activities that demand high energy intensity. In line with the findings of [Atakan et al. \(2021\)](#), interval training provides an effective physiological stimulus to the respiratory and circulatory systems, which is very important in high-intensity sports. This is also supported by the results of [Wibowo et al. \(2021\)](#) which found that interval training performed regularly can increase the efficiency of oxygen use ( $VO_2$  max) and accelerate muscle recovery after strenuous activity. This phenomenon strengthens the evidence that interval training can provide positive adaptations to athletes' physical performance, especially in aspects of endurance, speed, and energy recovery ([Mappaompo, 2025](#)).

The strength of a player's cardiovascular endurance and agility are important aspects that must be considered to maintain performance consistency during futsal matches ([Kharisma & Faruk, 2022](#)). Not only limited to futsal games, the need for optimal cardiovascular capacity is also very important in various other sports that rely on high intensity and rapid changes in direction ([Rafi dkk., 2023](#) & [Wijaya dkk., 2023](#)). This indicates that the combination of interval training with agility training can improve

motor reaction, coordination, and resistance to fatigue ([Suyoko, 2024](#)).

This study also found that the relationship between cardiovascular endurance and agility not only impacts physical endurance, but also affects movement efficiency and motor responses in dynamic game situations. Athletes with good cardiovascular capacity tend to have lower fatigue levels when performing complex and fast movement maneuvers ([Priska dkk., 2023](#)). This is due to an efficient circulatory system in maintaining the supply of oxygen and energy to the muscles, thus helping to maintain optimal motor coordination, body stability, and motion control. In line with these findings, [Risky dkk. \(2024\)](#) concluded that the higher a person's level of cardiovascular endurance, the better their ability to maintain agility performance, even in conditions of fatigue or high game intensity. This suggests that a strong cardiovascular system allows athletes to maintain a fast and accurate movement tempo over a longer period without significant performance decline. In addition, there is also a positive correlation between  $VO_2$  max (an indicator of cardiovascular endurance) and the results of agility tests such as the Illinois Agility Test and T-test, which shows that athletes with higher  $VO_2$  max are able to complete sports activities such as agility with faster and more consistent times ([Wibowo dkk., 2021](#)).

Based on the description above, it shows that interval training has a significant effect on increasing cardiovascular endurance and agility of students who take part in extracurricular futsal. These two aspects not only play an important role individually, but are also interrelated in supporting the overall performance of athletes, especially in facing the demands of a game that is fast, dynamic, and full of changes in direction. Good cardiovascular ability allows the supply of energy and oxygen to be maintained during intense physical activity, thus supporting movement efficiency, motor response, and consistency of agility performance. Therefore, the implementation of interval training in a structured and sustainable manner is highly recommended as part of a training program for futsal and other sports that demand speed/agility, endurance, and agility.

### 4. CONCLUSION

The conclusions of this study are: 1) interval training has a positive effect on cardiovascular endurance and student agility. This is evidenced by the increase in cardiovascular endurance and agility in the pretest and posttest. In addition, it is also corroborated by the value of  $p < 0.05$  which identifies that there are

differences in cardiovascular endurance and student agility before and after being given interval training; 2) there is a positive relationship between cardiovascular endurance and student agility with a value of  $p < 0.05$ , which indicates that the better the endurance of a player, the higher the potential for agility in maneuvering the game.

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## 6. AUTHOR CONTRIBUTION STATEMENT

All authors contributed substantially to this research. Mohammad Faizza Hafidz Izzul Fikri was responsible for the conceptualization, methodology, data collection, and formal analysis of the study. Muhammad Soleh Fudin provided supervision, validation, and contributed to the writing, review, and editing as the corresponding author. Nendra Febrianto took part in data collection, software processing, visualization, and drafting the original manuscript. Sugeng Sulendro contributed to the investigation, resources, validation, and assisted in reviewing the final version of the manuscript. All authors have read and approved the final manuscript.

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## REFERENCE

- Atakan, M. M., Li, Y., Kosar, S. N., & Turnagöl, H. H. (2021). Evidence-Based Effects of High-Intensity Interval Training on Exercise Capacity and Health: A Review with Historical Perspective. *International Journal of Environmental Research and Public Health*, 18(13), 2–20. <https://doi.org/10.3390/ijerph18137201>
- Handoko, D., Fahrizqi, E. B., & Yuliandra, R. (2020). Tingkat Daya Tahan Jantung Paru Mahasiswa Olahraga Angkatan 2019 Selama Pandemi Covid. *Journal Of Physical Education*, 1(2), 1–5. <https://doi.org/10.33365/joupe.v1i2.584>
- Hariato, J., Kusuma, D. W. C. W., Maulidin, & Hulfian, L. (2025). Efektivitas Latihan Internal Training dan Circuit Training Terhadap VOMAX Atlet Bola Basket ditinjau dari Tingkat Kelincahan. *Jurnal Olahraga Dan Kesehatan Indonesia (JOKI)*, 5(2), 117–125. <https://doi.org/10.55081/joki.v5i2.4079>
- Herlan, H., & Komarudin, K. (2020). Pengaruh Metode Latihan High-Intensity Interval Training (Tabata) terhadap Peningkatan Vo2Max Pelari Jarak Jauh. *Jurnal Kepeleatihan Olahraga*, 12(1), 11–17. <https://doi.org/10.17509/jko-upi.v12i1.24008>
- Ilyas, M. Bin, & Sutriawan, A. (2025). Penerapan Model Latihan Interval Dalam Meningkatkan Daya Tahan Kardiovaskuler Pemain Bola Baske Fikk Unm. *Jurnal Ilmiah Spirit*, 25(2), 32–38. <https://doi.org/10.36728/jis.v25i2.4842>
- Imawan, R., & Widodo, A. (2016). Pengaruh Latihan Rope Jump Selama 20 Detik Dengan Metode Interval Training 1: 5 Terhadap Kelincahan. *Jurnal Kesehatan Olahraga*, 06(2), 523–529. <https://adoc.pub/pengaruh-pelatihan-rope-jump-dengan-metode-interval-training.html>
- Isnaini, M., Afgani, M. W., Haqiqi, A., & Azhari, I. (2025). Teknik Analisis Data Uji Normalitas. *J-CEKI: Jurnal Cendekia Ilmiah*, 4(2), 1377–1384. <https://doi.org/10.56799/jceki.v4i2.7007>
- Kardian, F., & Firdaus, K. (2022). Kondisi Fisik Pemain Sepakbola Club Basoka FC Kota Pariaman. *Jurnal JPDO*, 5(2), 28–35. <http://jpdo.ppj.unp.ac.id/index.php/jpdo/article/view/920%0Ahttp://jpdo.ppj.unp.ac.id/index.php/jpdo/article/download/920/267>
- Keeler, C., & Curtis, A. (2023). Introduction to Statistical Hypothesis Testing in Nursing Research. *American Journal of Nursing*, 123(7), 53–55. <https://doi.org/10.1097/01.NAJ.0000944936.37768.29>
- Kharisma, C., & Faruk, M. (2022). Analisis Kondisi Fisik Tim Futsal Maestro Putri Tulungagung. *Jurnal Prestasi Olahraga*, 5(5), 96–102. <https://ejournal.unesa.ac.id/index.php/jurnal-prestasi-olahraga/article/view/47669/39842>
- Mappaompo, M. A. (2025). Pengaruh Latihan High-



- Intensity Interval Training (HIIT) terhadap Kapasitas VO<sub>2</sub>Max Atlet Futsal Universitas Negeri Makassar. *Jurnal Dunia Pendidikan*, 5(6), 2602–2608. <https://doi.org/10.55081/jurdip.v5i6.4168>
- Prakoso, G. P. W., & Sugiyanto, F. (2017). Pengaruh metode latihan dan daya tahan otot tungkai terhadap hasil peningkatan kapasitas VO<sub>2</sub>Max pemain bola basket. *Jurnal Keolahragaan*, 5(2), 151. <https://doi.org/10.21831/jk.v5i2.10177>
- Priska, D. K., Utami, D., Pribadi, A., & Kustiawan, A. A. (2023). Daya Tahan Kardiovaskuler Personal Trainer Celebrity Fitness Lippo Plaza Yogyakarta. *Indonesian Journal of Sport Science and Technology (IJST)*, 2(1), 94–103. <https://doi.org/10.31316/ijst.v2i1.4777>
- Putra, H., Bahtra, R., Tohidin, D., & Alimuddin. (2025). Pengaruh Latihan High Intensity Interval Training (HIIT) Terhadap Daya Tahan Kardiovaskuler Pemain Sepak Bola Mungka Selection Fc. *Jurnal Ilmu Keolahragaan*, 3(2), 46–54. <https://doi.org/10.21831/jk.vXiY.00001>
- Rafi, A. C., Yuliadi, T., & Istiwaru, E. M. (2023). Pengaruh Aktivitas Olahraga Sehari-Hari Terhadap Insidensi OA Genu pada Mahasiswa Fakultas Kedokteran Universitas Yarsi Angkatan 2019 dan Tinjauannya Menurut Islam. *Junior Medical Journal*, 1(6), 645–654. <https://doi.org/10.33476/jmj.v1i6.3124>
- Ramadhan, R. A., Nuridin Wibisana, M. I., & Kresnapati, P. (2021). Perbandingan Interval Training dan Circuit Training terhadap Peningkatan Daya Tahan Anaerobik SSB Putra Mororejo U-16. *Journal of Physical Activity and Sports (JPAS)*, 2(3), 303–309. <https://doi.org/10.53869/jpas.v2i3.110>
- Risky, R., Jafaruddin, & Nurmasyita. (2024). Analisis Tingkat Daya Tahan Atlet Sepak Bola Klub Mutiara Usia 16-18 Tahun 2024. *Jurnal Sport Health Education (JSHE)*, 15(1), 108–119. <https://doi.org/10.25130/sc.24.1.6>
- Rustiawan, H. (2020). Pengaruh Latihan Interval Training Dengan Running Circuit Terhadap Peningkatan Vo<sub>2</sub>Max. *Jurnal Wahana Pendidikan*, 7(1), 15. <https://doi.org/10.25157/wa.v7i1.3108>
- Setiawan, C., Jannah, S. M., Kurniawan, M. D., & Nurhayati, S. E. (2024). High Intensity Interval Training (HIIT) dalam Meningkatkan Daya Tahan dan Mencegah Cedera pada Pemain Bulu Tangkis. *Jurnal Kesehatan Vokasional*, 9(1), 50. <https://doi.org/10.22146/jkesvo.88362>
- Sianturi. (2024). Uji Normalitas Sebagai Syarat Pengujian Hipotesis. *Jurnal Pembelajaran Dan Matematika Sigma (Jpms)*, 10(2), 133–138. <https://doi.org/10.36987/jpms.v10i2.5881>
- Sonjaya, R. P., Aliyya, F. R., Naufal, S., & Nursalman, M. (2025). Pengujian prasyarat analisis data nilai kelas : uji normalitas dan uji homogenitas. *Jurnal Pendidikan Tambusai*, 9(1), 1627–1639. <https://jptam.org/index.php/jptam/article/view/24426>
- Suyoko, A. (2024). *Pelatihan Kondisi Fisik Dasar*. Grup Penerbitan CV BUDI UTAMA. [https://books.google.com/books?hl=id&lr=&id=SsRDEQAAQBAJ&oi=fnd&pg=PP1&dq=bahwa+ko+mbinasi+latihan+interval+dengan+latihan+kelincahan+mampu+meningkatkan+reaksi+motorik,+koordinasi,+dan+ketahanan+terhadap+kelelahan&ots=re35d8JTZ9&sig=8uZ5btGQ5aNmGHkG\\_WezLk](https://books.google.com/books?hl=id&lr=&id=SsRDEQAAQBAJ&oi=fnd&pg=PP1&dq=bahwa+ko+mbinasi+latihan+interval+dengan+latihan+kelincahan+mampu+meningkatkan+reaksi+motorik,+koordinasi,+dan+ketahanan+terhadap+kelelahan&ots=re35d8JTZ9&sig=8uZ5btGQ5aNmGHkG_WezLk)
- Tribuana, M. R., Ridwan, M., Yenes, R., Haryanto, J., Oktavianus, I., Afrizal, S. A., & Arifan, I. (2022). Pengaruh Latihan HIIT (High Intensity Interval Training) Terhadap Daya Tahan Anaerobik Atlet Bolabasket. *Jurnal Gladiator*, 2(5), 219–229. <https://doi.org/10.24036/glttdor119011>
- Wibowo, B. R. A., Widiatmaja, D. M., Sakina, Abdurachman, & Rejeki, P. S. (2021). Comparison of High-Intensity Interval Training and Moderate-Intensity Continuous Training on VO<sub>2</sub>max and Response Reaction Time in Basketball Referees. *Indian Journal of Forensic Medicine & Toxicology*, 15(3), 2700–2708. <https://doi.org/10.37506/ijfimt.v15i3.15715>
- Wijaya, M. R. A., Aisyah, Putri, N. A., & Tantra, I. A. (2023). Penyuluhan Tentang Norma Latihan Kebugaran Jasmani Pada Cabang Olahraga Pencak Silat. *Prosiding Seminar Kesehatan Masyarakat*, 1(Oktober), 265–272. <https://doi.org/10.26714/pskm.v1ioktober.265>
- Yam, J. H., & Taufik, R. (2021). Hipotesis Penelitian Kuantitatif. *Perspektif: Jurnal Ilmu Administrasi*, 3(2), 96–102. <https://doi.org/10.33592/perspektif.v3i2.1540>