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# The effect of 20 repetitions badminton footwork training on increasing maximum oxygen volume (VO2Max)

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**Abstract**

Footwork is foot movements that regulate the body to position the body in such a way that makes it easier to make the movement to hit the shuttlecock according to its position. The type of quasi-experimental research with the design used in this research is "Pre-Test and Post-Test One Group Design". Researchers looked for samples in one group that received the same treatment and were given 20 repetitions of badminton footwork training. The research sample was a total sampling involving all 15 male athletes at UKM Badminton. The percentage increase in maximum oxygen volume in the training group for four weeks shows that the maximum oxygen volume increased after treatment. The percentage increase in maximum oxygen volume in group training was 30.25%. Can be conluded Badminton Footwork Training 20 Repetition Can Increase Maximum Oxygen Volume (VO2Max) in Badminton UKM Male Athletes at Bali International University in 2024.
**Keywords:** *Footwork, Badminton, VO2Max, Training*


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## INTRODUCTION

Footwork is foot movements that regulate the body to position the body in such a way that makes it easier to make the movement to hit the shuttlecock according to its position. This movement skill is very important to direct the body into the right position to hit the shuttlecock, while still maintaining balance and good body control, in other words, foot movement is needed to reach a very favorable position to hit the shuttlecock.

The footwork training provided in this study was to achieve optimal results, namely: (1) by doing the maximum number of sets and repetitions given each week during training; (2) pretend to swing a racket and hit the shuttlecock at the end of each touching or reaching movement; (3) holding the racket in your hand, reach out and touch the floor with your dominant hand; (4) use easy steps; (5) step quickly as if jumping, and pretend to make a punching movement at the end of the reaching movement, this movement as if jumping requires more energy and must be attempted to remain under control and remain balanced. Preparation for doing footwork exercises starts from: (1) preparation phase; feet shoulder-width apart, feet straight forward, feet parallel or tilted, knees relaxed, body weight on the front

of the feet, hold the racket upwards in a ready position; (2) implementation phase; look forward and begin to step with the dominant foot, reaching towards the floor with the dominant hand and foot, stepping quickly, using a cross-step only on the backhand; (3) follow-through phase; push with the dominant foot, then push the body back to the center of the field (Grice, 2002).

Footwork training is badminton training carried out with foot movements that regulate the body to position the body in such a way that it makes it easier to make movements to hit the shuttlecock according to its position (Subarjah & Hidayat, 2009). Badminton is a game that requires fast movements according to the speed of the shuttlecock, so it requires precise movement control, fast reactions and good muscle segment abilities. This footwork training involves the physiological system in the body, namely the cardiorespiratory system and the dominant leg muscles to be able to complete all the loads given during training (Gunawan, 2013). This exercise develops the strength of the leg muscles, especially the gluteals, hamstrings, quadriceps and gastrocnemius. The arm and shoulder muscles are also indirectly involved. This exercise has wide application for various sports involving jumping, running and swimming so it really requires a good VO2Max (Furqon & Muchsin, 2002).

One of the biomotor components that is very important in sports, especially in Badminton, is maximum oxygen volume (VO2Max). The importance of VO2Max in athletes is that it can support high intensity training, both technical and physical training in athletes, when VO2Max in athletes decreases it will impact the athlete's performance which can affect the training program, training programs in sports have high intensity which requires a high VO2Max enough so that athletes are able to adapt to the training program given. Badminton athletes apply a high training program which includes footwork, smashes, and long rallies or repeated techniques for hitting opponents with 1 to 3 sets per game. So it really requires strong cardiorespiratory endurance and muscle endurance.

VO2Max is the maximum volume of oxygen used by muscles during certain interval training. This maximum oxygen consumption is high and important for the human body because it is used to produce aerobic energy in the form of Adenosine Tri Phosphate (ATP) during heavy or light exercise. VO2Max reflects how efficiently the body uses oxygen. The respiratory system carries oxygen from the air into the body, while the cardiovascular system transports oxygen to the body's cells for ATP production. VO2Max is an important indicator of a person's fitness level and can be used regularly to assess cardiorespiratory capacity. Increasing VO2Max can be done by gradually increasing training intensity every week. VO2Max in athletes has a very important role, namely to provide support for athlete

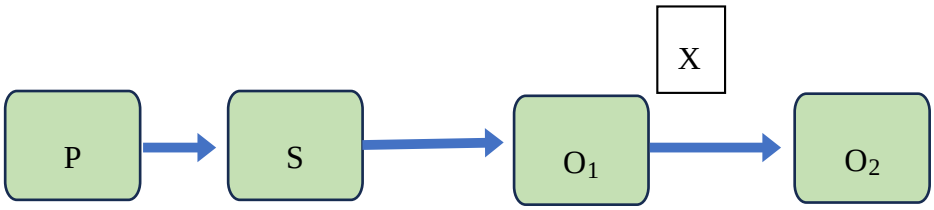
performance in undergoing high training programs and can provide the best results for the targets they achieve (Darmawan and Jatmiko, 2020). Measuring cardiorespiratory endurance in athletes is by measuring maximum oxygen consumption VO2Max which can measure the capacity of the heart, lungs and blood to transport oxygen to the muscles during exercise. The VO2Max value is measured using the Multistage Fitness Test (MFT) method.

One method to increase VO2Max is by doing footwork. This training is something that can be given to measure VO2Max in men's badminton UKM athletes at Bali International University. Specifically, this footwork training is given for 20 repetitions. Badminton footwork training 20 repetitions is badminton physical training which is carried out using foot movements that arrange the body in all corners of the court to control and position the body in such a way as to make it easier to hit the shuttlecock according to its position. The target for success is to touch the corner of the field 20 times (20 repetitions in 20-30 seconds per set, rest between sets for 30 seconds). Move your feet towards the corner of the field 2 – 6 steps

## METHOD

The type of quasi-experimental research with the design used in this research is "Pre-Test and Post-Test One Group Design". Researchers looked for samples in one group that received the same treatment and were given 20 repetitions of badminton footwork training.

The research design that will be used is a pre-test post-test group design, as explained in the following scheme:




Information:

P : Population

S : Sample

O1: Pretest with Multistage Fitness Test (MFT), badminton footwork 20 repetition before training.

O2: Posttest with Multistage Fitness Test (MFT), badminton footwork 20 repetition after training.

X : Treatment (badminton footwork 20 repetition).

This research was conducted at the Gor Arena Bedahulu X Badminton Court for four weeks on Thursdays, Fridays and Sundays, April-May 2024. The target population was all athletes at the Bali International University Badminton Activity Unit (UKM). The reachable population is the male athletes of Bali International University Badminton UKM who have met the inclusion and exclusion criteria. The inclusion criteria for this study are as follows: (1) Athletes aged 17-24 years, (2) Athletes who are male, (3) Athletes who are able/willing to serve as research samples from start to finish, (4) Athletes who have good physical condition. The exclusion criteria in this study are as follows: (1) Athletes who have experienced injuries such as fractures, sprint ankles, osteoarthritis knees in their lower extremities, (2) athletes who are unfit such as fever, (3) athletes who have a history of asthma/shortness of breath. The drop out criteria in this study are as follows: (1) The sample withdraws, (2) During the treatment the sample suddenly falls ill or is suddenly injured, (3) if the sample is absent 3 times in a row during the study.

In this study, the research sample was a total sampling involving all 15 male athletes at UKM Badminton, Bali International University in 2024.

## RESULTS

1. Normality and Homogeneity Test for Maximum Oxygen Volume Results

To determine the distribution of the research sample, a normality test was carried out using the Shapiro Wilk Test and data homogeneity using the Levene Test. Tests were carried out on data obtained in both groups both before and after training. The variables tested were the maximum oxygen volume before and after training in each research group, Table 1.

Table 1. Normality and Homogeneity Test Results of Maximum Oxygen Volume Data Before and After Training

| **Variable** | **Training** | **(p) Normality Test (*Shapiro Wilk Test*)** | **(p) Homogenity Test (*Levene Test*)** |
|---|---|---|---|
| | | Group | |
| $VO_2Max$ | *Pretest* | 0,200 | 0,921 |
| | *Posttest* | 0,200 | 0,104 |

Table 1 shows that data analysis using normality and homogeneity tests on the maximum oxygen volume results before and after training, it was found that the group had a p value greater than 0.05 (p > 0.05), which means the maximum oxygen volume results data before and after training is normally distributed and data variations are homogeneous so that further testing uses parametric statistical tests.

2. Mean Difference Test Results for Maximum Intra-Group Oxygen Volume Results

The results of the different tests are used to determine and compare the average results of maximum oxygen volume, before and after training between groups. Results of significance analysis using the t-paired test for intra groups, Table 2.

Table 2. Results of the Maximum Average Difference in Oxygen Volume Test Before and After Intra-Group Training

| | **$VO_2$Max** | **n** | **Average** | **t** | **p** |
|---|---|---|---|---|---|
| Group | Before Training | 15 | 24,49 | -10,90 | 0,000 |
| | After Training | | 32,46 | | |

Table 2 shows that the mean maximum oxygen volume results, before and after training, have a p value smaller than 0.05. This shows that the mean maximum oxygen volume results after training in the groups were significantly different (p < 0.05). Thus the results of the difference in mean maximum oxygen volume before training between groups are comparable. The difference in maximum oxygen volume after different training is significant, meaning that the difference in final results is caused by an increase in VO2Max due to the training provided.

3. Percentage Increase in Maximum Oxygen Volume in the Group

After four weeks of training, there was a difference in improvement and percentage. Percentage increase in maximum oxygen volume in the group, using the Arikunto (2004) formula: $P = \frac{T2 - T1}{T1} x(100\%)$

Table 3. Percentage of Maximum Oxygen Volume in Group

| **$VO_2$Max** | **Group** |
|---|---|
| Before Training (T1) | 24,49 |
| After Training (T2) | 32,46 |
| Difference (T2–T1) | 7,96 |
| Percentage | 30,25% |

The percentage increase in maximum oxygen volume in the training group for four weeks in Table 3 shows that the maximum oxygen volume increased after treatment. The percentage increase in maximum oxygen volume in group training was 30.25%.

## DISCUSSION

Based on research to increase muscle strength, a volume of 2–10 RM in 1–3 sets, with a density or frequency of 2–4 times a week provides better results. The training dosage to increase muscle strength so that it works well is with high intensity (70–100%) accompanied by low volume training (6–10 repetitions & 3–5 sets) and frequency (2–3 times a week) (Nala , 2011). In this case, it is very appropriate for 20 repetitions of badminton footwork training to increase muscle ability as well as muscle endurance and involve the aerobic energy system, namely VO2Max. Footwork training is 20 repetitions, with high training volume 3 times a week, with low intensity and high volume (reps & sets), the resulting increase in muscle endurance (Nala, 2011).

Theoretically, the results of this research can be explained that training is a physical movement or mental activity that is carried out systematically and repeatedly over a long period of time with a progressively increasing load which aims to improve the body's physiological and psychological functioning system at that time. carry out sports activities in order to achieve maximum results (Kanca, 2004). Sports training with an aerobic energy system is a form of physical training that provides stress to the body organs being trained. This loading will provide an opportunity to increase the ability of the cardiorespiratory system to distribute oxygen to all body tissues.

Training for all competitions from strides, sprints, middle distances to long distances requires increased anaerobic and aerobic endurance. In badminton footwork training, 20 repetitions predominantly use the aerobic energy system, where aerobic endurance is controlled by the capacity of the heart, lungs and respiratory system to provide oxygen to the muscles.

The badminton footwork training method is 20 repetitions by providing a gradual and progressive increase in load, either from sets or repetitions of each exercise per week. As a form of training using an aerobic energy system, this method has a positive influence on increasing VO2Max which is the dominant factor in showing a person's body abilities and VO2Max ability will provide an overview of the magnitude of motor ability (motoric power) in a person's aerobic process (Astrawan, 2013).

Physical activity, especially aerobic exercise, can increase VO2Max because this exercise directly involves the cardiovascular and respiratory systems. Aerobic exercise such as running, cycling and swimming increases heart rate and breathing, which in turn strengthens the heart muscle and increases the capacity of the lungs to deliver oxygen to the body's muscles. Through consistent exercise, the body will be more efficient at taking in, transporting and using oxygen, all of which contribute to increasing VO2Max (Darmawan and Jatmiko, 2020).

According to Wiarto in 2013, physical exercise can provide changes to all body system functions. Changes that occur during training are called responses. Meanwhile, changes that occur as a result of continuous and programmed training in accordance with training principles are called adaptation. The fast heart rate during exercise is a response from the heart, but after a long period of training the heart rate slowly becomes stable because the strength of the heart muscle increases to pump blood, this is the heart's adaptation to the physical exercise undertaken. The heavier the physical activity carried out when exercising, the greater the need for oxygen in the body. To compensate for this, the heart and circulatory system have to work more to meet the oxygen needs of the body's tissues.

Aerobic exercise also increases the metabolic efficiency of muscle cells by increasing the number and function of mitochondria, the organelles responsible for energy production. In addition, aerobic exercise increases blood volume and the amount of hemoglobin, the protein that carries oxygen in the blood, so that more oxygen can be transported to working muscles. All these physiological adaptations increase the body's capacity to work at high intensity for longer periods, which is reflected in increased VO2Max values.

## CONCLUSIONS

Based on the results badminton footwork training 20 repetition can increase maximum oxygen volume (vo2max) in badminton ukm male athletes at Bali international university in 2024.

## REFERENCES

Arikunto, S. 2004. Dasar-Dasar Evaluasi Pendidikan (Edisi Revisi). Jakarta: Bumi Aksara.

Astrawan, I P. Pengaruh Pelatihan Lari 800 m Dan Lari 1500 m Terhadap Volume Oksigen Maksimal (VO2Maks) Pada Siswa Putra Ektrakurikuler Atletik Sma Negeri 3 Singaraja Tahun Pelajaran 2013/2014. (Skripsi). Singaraja: Universitas Pendidikan Ganesha.

Darmawan, Y., & Jatmiko, T. 2020. Pengaruh Interval Training 400 m dan Tabata Training Terhadap Peningkatan VO2Max Mahasiswa Aktif Non-Atlit Unesa. Jurnal Prestasi Olahraga, 3(2).

Furqon H. & Muchsin D. 2002. Plaiometrik Untuk Meningkatkan Power. Surakarta: Universitas Sebelas Maret Press.

Ghasemi, A., & Zahediasl, S. (2012). *Normality tests for statistical analysis: a guide for non-statisticians*. Int J Endocrinol Metab, 10(2), 486–489..

Grice, T. 2002. Bulutangkis Petunjuk Praktis Untuk Pemula dan Lanjut. Jakarta: PT Rajagrafindo Persada.

Gunawan, E. 2013. Pengaruh Pelatihan Footwork Tenis Meja Terhadap Kecepatan Reaksi dan Kelincahan Pada Siswa Putra Kelas VII SMP Negeri 2 Denpasar Tahun Pelajaran 2013/2014. (Skripsi). Singaraja: Universitas Pendidikan Ganesha.

Kanca, I N. 2004. Pengaruh Pelatihan Fisik Aerobik Terhadap Absorbsi Karbohidrat dan Protein Di Usus Halus.(Disertasi). Surabaya: Program Pasca Sarjana UNAIR.

Milanović, Z., Sporiš, G., & Weston, M. (2015). *Effectiveness of high-intensity interval training (HIIT) and continuous endurance training for $VO_2$max improvements: a systematic review and meta-analysis*. Sports Medicine, 45(10), 1469–1481.

Nala, N. 2011. Prinsip Pelatihan Fisik Olahraga. Denpasar: Universitas Udayana Press.

Powers, S. K., & Howley, E. T. (2021). *Exercise Physiology: Theory and Application to Fitness and Performance*. 10th Edition. McGraw-Hill Education.

Subarjah H. & Hidayat Y. 2009. Bahan Ajar Permainan Bulutangkis. Bandung: Universitas Pendidikan Indonesia.

Wiarto, G. 2013. Fisiologi dan Olahraga. Yogyakarta: Graha Ilmu.