



P-ISSN: 2394-1685  
E-ISSN: 2394-1693  
Impact Factor (RJIF): 5.38  
IJPESH 2023; 10(6): 28-31  
© 2023 IJPESH  
[www.kheljournal.com](http://www.kheljournal.com)  
Received: 08-09-2023  
Accepted: 12-10-2023

**Methodius Ferdyan Thino Chandrika**

Department of Sports Coaching Education, Universitas Negeri Yogyakarta, Colombo Street No.1, Karangmalang, Special Region of Yogyakarta, Indonesia

**Lismadiana**

Department of Sports Coaching Education, Universitas Negeri Yogyakarta, Colombo Street No.1, Karangmalang, Special Region of Yogyakarta, Indonesia

**Rezha Arzhan Hidayat**

Department of Physical Education Health and Recreation, Universitas Negeri Yogyakarta, Colombo Street No.1, Karangmalang, Special Region of Yogyakarta, Indonesia

**Corresponding Author:**

**Methodius Ferdyan Thino Chandrika**

Department of Sports Coaching Education, Universitas Negeri Yogyakarta, Colombo Street No.1, Karangmalang, Special Region of Yogyakarta, Indonesia

## The effect of circuit body weight training on increasing arm muscle endurance of badminton athletes

**Methodius Ferdyan Thino Chandrika, Lismadiana and Rezha Arzhan Hidayat**

DOI: <https://doi.org/10.22271/kheljournal.2023.v10.i6a.3132>

### Abstract

This study aims to recognize the effect of circuit body weight training on the increase in arm muscle endurance energy. This type of research is an experiment with one group pre-test and post-test design. The population in the Sleman badminton athlete research is 24 people. The illustrations in this study amounted to 10 people taken using a purposive sampling procedure. The tool used to measure arm muscle endurance is a 1-minute push-up test. The procedure for analyzing the information used is a paired sample t-test. The results verified that there was a significant effect of circuit weight training on the increase in arm muscle endurance of badminton athletes from early trials and final tests that were intertwined with an increase by a difference of 9.36, namely from an average score of 29.16 on the pre-test to 38.52 on the post test, and strengthened by the results of the t test using an illustrative t test paired with a calculated t value of 6.799 as well as significance values  $p < 0.000 < 0.05$ . Until it can be concluded that there is a significant effect of circuit weight training on the increase in endurance of the arm muscles of badminton athletes.

**Keywords:** Circuit body weight training, arm muscle endurance

### 1. Introduction

Physical training is very meaningful for athletes because it is a systematic process to improve the quality of the body that aims to improve sports performance. Athletes who have good physical condition want to have great skills to win competitions <sup>[1]</sup>. Excellent physical condition is one of the supporting elements in achieving optimal exercise performance. Sports achievements are obtained through a systematic and measurable process of coaching and training. To achieve great achievements in competitive sports, an athlete needs excellent physical stability for the needs and demands of sports <sup>[2]</sup>. Physical training is the most important aspect of a training program that aims to achieve great physical abilities <sup>[3]</sup>. Physical expertise is all component units that are one after another. One sport that requires maximum physical expertise is badminton.

Badminton is a game sport that has complex movement skills <sup>[4, 5]</sup>. The results of the literature review stated that badminton has movement characteristics such as sudden stops, jumping, running while changing direction quickly without experiencing fatigue, and having a stable balance <sup>[6]</sup>. Therefore, physical ability is an important point for badminton athletes. The physical components involved in badminton are muscular endurance, speed, agility, muscle power, balance, strength, and coordination. One of the most important specialized physical components in the sport of badminton is the endurance of the arm muscles <sup>[7]</sup>. This is also supported by previous research <sup>[8]</sup>. Revealed that the biggest contribution when doing a smash punch is muscle endurance, this is because when athletes punch at the time of a smash require strong power and endurance to get the results of a massive smash punch. If the athlete has good muscular endurance, he will get optimal smash results.

But the reality comes from the results of observations that researchers tried in August 2023 at the Badminton Gym Building in Sleman Regency, the coach said that the accuracy of badminton athletes' smash accuracy is still low when compared to service skills, while if a badminton athlete can understand a good smash method so that it will be easier to get points.

Researchers get the latest information on the field from badminton coaches when athletes carried out muscle endurance tests with push Ap tests which showed that the average endurance energy of arm muscles was 10 times / minute. When viewed from the normative data of male athletes Push-AP, these results were listed in less type. Longer running exercise programs still lack endurance training of athletes' arm muscles. More training increases the speed and agility of training. So that speed and agility are not balanced with the muscle power of the badminton athlete's arm. If this matter continues to be left until it will affect the shrinkage of athletes' performance.

Based on the results of previous literature, there have been several physical exercise methods to increase arm muscle endurance. Physical exercise programs that previously did more pull ap, and some used external weights such as dumbbells, but no more varied physical exercise method uses internal weights or own body weights. One of the exercises given to maximize arm muscle endurance is an exercise with the circuit weight training method<sup>[9, 10]</sup>. It is said that weight training can be tried by using weights from your own body weight (body weight) or using free external weights such as dumbbells, barbells, and machines (gym machines). Training using deep weights tends to be easier to try anywhere because the loading system only uses its own body weight. Body weight training is weight training that emphasizes more training procedures by using deep weights or body weights themselves.

Circuit body weight training is a training system that can be improved simultaneously the whole body is energy resistance energy, strength, flexibility, strength, muscular endurance power, agility, speed, balancing and some other components of physical conditions<sup>[11, 12]</sup>. Circuit bodyweight training is a mixture of aerobic and endurance exercises using body weight that is tried in a short time and can be tried anywhere<sup>[13]</sup>. Their early circuit training series consists of several stations arranged in a circle to train muscle groups alternately from station to station<sup>[14]</sup>. Circuit training is a form of conditioning that combines very serious resistance and aerobic training<sup>[14]</sup>. Circuit training is a form of conditioning that combines very

serious resistance and aerobic training. It is designed to be easily accompanied and targets the development of muscle strength and endurance energy. Based on the case that has been described earlier until the purpose of this research is to recognize the effect of circuit weight training training on the increase in arm muscle endurance of badminton athletes. It is hoped that the results of this research can share a training program that is right on target and as a reference to increase the endurance athlete's arm muscles.

## 2. Materials and Methods

This research uses an experimental type of research with a one group pre-test-post test design. This procedure for testing (validation) is to test the effect of one variable on another. This experimental research used a group that found the same treatment, namely the provision of circuit weight training. The population in this study amounted to 24 people, and the illustrations in this study amounted to 10 people. Photo Procedure Illustration using purposive sampling procedures. This research has found approval from all illustrations that have filled out the statement of ability to be a research illustration and have met the requirements of the research code of ethics. The procedure for collecting data in this research is testing and measurement. Instrumen untuk mengukur energi tahan otot lengan sebagai early test atau pre-test adalah dengan menggunakan push ap test. Setelah itu, penyembuhan atau olahraga dibagikan sebanyak 16 kali pertemuan dengan frekuensi 3 kali seminggu. And ended by exploring the final test or post test to measure the endurance energy of arm muscle strength using a push ap test with the aim of identifying a comparison of arm muscle endurance scores after treatment / treatment.

The data analysis procedure used in this research uses SPSS 22 by carrying out a Hypothesis Test using a paired sample t-test. at the level of significance  $p=0.05$ . Before arriving at the use of paired sample t-test, it is necessary to try prerequisite tests, including: (1) Normality Test (2) and Homegintas Test. There are details of the Circuit Weight Training training program using internal weights as follows:

**Table 1:** Training program session 1-8 Circuit Weight Training

No.	Exercise	Goal	Set	Reps	Breaks between posts	Breaks between sets
1.	Plank with Leg Lift	Arm	2	12 times	20 seconds	120 seconds
2.	Inchworm to Side Plank	Arm	2	12 times	20 seconds	
3.	Reclining Triceps Press	Arm	2	12 times	20 seconds	
4.	Single Leg Dip	Arm	2	12 times	20 seconds	
5.	Archers Push-ap	Arm	2	12 times	20 seconds	
6.	Reverse hand Push-ap	Arm	2	12 times	20 seconds	

**Table 2:** Training program session 9-16 circuit weight training

No.	Exercise	Goal	Set	Reps	Breaks between posts	Breaks between sets
1.	Plank with Leg Lift	Arm	3	15 times	20 seconds	120 seconds
2.	Inchworm to Side Plank	Arm	3	15 times	20 seconds	
3.	Reclining Triceps Press	Arm	3	15 times	20 seconds	
4.	Single Leg Dip	Arm	3	15 times	20 seconds	
5.	Archers Push-ap	Arm	3	15 times	20 seconds	
6.	Reverse hand Push-ap	Arm	3	15 times	20 seconds	

### 3. Results and Discussion

#### Results

##### A. Prerequisite Test

##### 1. Normality Test

The normality test is tried to test whether information has a fairly distributed distribution or not. The calculation of information normality was tried using the Shapiro-Wilk test. The normality test results are shown in the table at this base.

**Table 3:** Normality test results of pre-test and post-test data for arm muscle endurance

Data	Significance	P	Information
Pre-test arm muscle endurance	0,05	0,426	Usual
Post-test arm muscle endurance	0,05	0,743	Usual

Based on statistical analysis of normality tests that have been carried out using the Shapiro-Wilk test, all pretest and post-test data of arm muscle endurance obtained a significance value of  $p > 0.05$ , which means that the data is normally distributed, it can be concluded that all pre-test and post-test data are declared normal.

##### 2. Homogeneity Test

The homogeneity test is used to test for the similarity of variance between the compared information. The results of the homogeneity test data of pre-test and post-test information are as follows:

**Table 4:** Test results homogeneity of pre-test and post-test information

Data	Fcount	P	Information
Pre-test arm muscle endurance	0,139	0,710	Homogeneous
Post-test arm muscle endurance	1,497	0,225	Homogeneous

The results of the homogeneity test to test the similarity of variance information pre test post test endurance arm muscles. Since the significance value is greater than 0.05 ( $p > 0.05$ ), it can be stated that the energy information of arm muscles resistance pre-test and post-test are homogeneous.

##### B. Test the Hypothesis

##### 1. Paired Sample t-test

**Table 5:** Paired Sample t-test results

Data	Group	Mean	t count	P	Information
Arm muscle endurance	Pre-test	29,16	6,799	0,000	Significant
	Post-test	38,52			

Based on the results of the Paired Sample t test analysis, arm muscle endurance information was obtained by a calculated t value of 6.799 with a significance value ( $p$ ) of 0.000. Because the significance value of 0.000 is smaller than  $0.05 < (0.05)$ , it can be concluded that there is a significant comparison of arm muscle endurance throughout the pre-test and post-test. This means that there is a significant increase in arm muscle endurance energy before and after treatment.

#### 4. Discussion

This review of research results shares further descriptions of the results of data analysis that have been presented. Based on hypothesis testing, there is a significant influence on the main aspects of research.

Based on hypothesis testing, it is known that there is a significant effect of circuit weight training procedures on the increase in endurance energy of badminton athletes' arm

muscles. Circuit weight training is an effective training procedure to improve physical fitness variables, one of which is muscular endurance. This finding is supported by some previous research<sup>[15]</sup> saying that they created circuit training with great seriousness to increase muscular endurance energy in a fairly fit population. This discovery does not change with some facts first<sup>[16]</sup> explained that circuit weight training for 6 weeks is an efficient way to increase muscle endurance. The increase in muscle endurance can be caused by the seriousness of weight training. Recent findings support the hypothesis that circuit weight training procedures can improve physical condition, especially in the endurance component of muscle strength<sup>[17]</sup>. The use of circuit training systems affects strength. Circuit training is very effective and can be applied to increase muscle endurance energy<sup>[18]</sup>. Circuit training is the best way to improve mobility, endurance energy, strength, and power. Circuit training: Consists of 6 to 8 posts, completing one exercise after another. Each exercise is tried for a few reps or for a set time before shifting to the next exercise. Training at each circuit is separated by short downtime, and each circuit is separated by longer downtime. The total number of circuits attempted during a training session can vary from 2 to 6 depending on your training level (newcomer, intermediate, or advanced), your training period (preparation or competition) and training objectives.

Circuit training is a training system that can affect various components of the body and fitness. Circuit weight training exercises can cause very sturdy muscle contractions which are reactions to dynamic loading or lightning stretching of the participating muscles<sup>[19]</sup>. The impact caused by muscle hypertrophy will cause the formation of an increase in muscle strength and muscle resistance energy. This statement is reinforced by the results of research from<sup>[20]</sup> which reports that the formation of increased endurance of muscle strength is due to increased amounts of contractile proteins, actin filaments and myosin and increased strength of connective tissue and ligaments. Exercising with maximum muscle contractions with a frequency of 3 times per week gradually for 6-8 weeks can increase muscle endurance energy. Therefore, this research was tried by exercising 3 times per week, and increasing the training load for 6 weeks can create optimal arm muscle endurance energy.

#### 5. Conclusions

Based on the results of research and analysis of information that has been tried, it can be concluded that there is a significant influence of circuit weight training procedures on the increase in arm muscle endurance energy in badminton athletes. The results showed that the circuit weight training procedure is an efficient procedure used to increase the endurance energy of the arm muscles of badminton athletes. Implications of results of this study is to find effective and innovative training programs and methods to increase the endurance of the arm muscles of badminton athletes and encourage coaches to apply these training methods to trigger athletes' involvement in training.

#### 6. Acknowledgments

This research post can be carried out well thanks to the encouragement of various parties, therefore researchers express their gratitude to academic supervisors Dr. Lismadiana, M.Pd and Rezha Arzhan Hidayat, M.Pd at the Faculty of Sports and Health Sciences, Yogyakarta State University.

## 7. References

1. Sabillah MI, Tomoliyus A, Nasrulloh R, Dev DO, Fauzi. The Effect of the Pyramid Exercise Method on the Maximum Strength of the Wrestler's Arm Muscles, *Phys. Educ. Theory Methodology*. 2023;23(4):512-519. DOI: 10.17309/tmfv.2023.4.04.
2. Sabillah MI, Nasrulloh A, Yuniana R. Original Article The effect of plyometric exercise and leg muscle strength on the power limb of wrestling athletes. 2022;22(6):1403-1411. DOI: 10.7752/jpes.2022.06176.
3. Naisidou S, Kepesidou M, Kontostergiou M, Zapartidis I. Differences of physical abilities between successful and less successful young female athletes, *J Phys. Educ. Sport*. 2017;17(1):294-299. DOI: 10.7752/jpes.2017.01044.
4. Li S, Zhang Z, Wan B, Wilde B, Shan G. The relevance of body positioning and its training effect on badminton smash, *J Sports Sci*. 2017;35(4):310-316.
5. Sholeh M, Pipit, Yulianto F, Kuncoro B. Comparative Study of Post-Marriage Nationality Of Women in Legal Systems of Different Countries *International Journal of Multicultural and Multireligious Understanding Improved Badminton Forehand Smash Through Training Methods*; c2020. p. 579-582. [Online]. Available: <http://ijmmu.comhttp://dx.doi.org/10.18415/ijmmu.v7i10.2168>.
6. Phomsoupha M, Laffaye G. *The Science of Badminton: Game Characteristics, Anthropometry, Physiology, Visual Fitness and Biomechanics*, Sports Medicine, vol. 45, no. 4. Springer International Publishing; c2015 Apr. 01. p. 473-495. DOI: 10.1007/s40279-014-0287-2.
7. Mahulkar SS. Relationship of strength and flexibility with skill performance in badminton players, *Int. J Phys. Educ. Sport. Heal*. 2016;3(5):38-40.
8. Pratama F. The Correlation of Arm Muscle Explosive Power, Leg Muscle Explosive Power, and Hand-Eye Coordination towards the Smash of Badminton Player; c2020.
9. Yachsie BTPWB, Suharjana S, Satia Graha A, Suhasto S. Metode Latihan Circuit Training Untuk Meningkatkan Daya Tahan Otot Lengan & Akurasi Memanah, *J Pendidik. Olahraga*. 2022;10(2):103-113. DOI: 10.31571/jpo.v10i2.2790.
10. Nasrulloh A, Yuniana R, Pratama KW. The effect of skipping combination with body weight training on cardiorespiratory endurance and body mass index (BMI) as a COVID-19 prevention effort for overweight adolescents, *J Keolahragaan*. 2021;9(2):220-230. DOI: 10.21831/jk.v9i2.41678.
11. Yuniana R, Kushartanti BMW, Nasrulloh A, Pratama KW. The Effectiveness of the Weight Training Method and Rest Interval on VO<sub>2</sub> max, Flexibility, Muscle Strength, Muscular Endurance, and Fat Percentage in Students; c2023 Feb. DOI: 10.13189/saj.2023.110125.
12. Hartati H, Bayu WI, Aryanti S. Effect of 8-Week Circuit Weight Training on Strength; c2020. DOI: 10.2991/ahsr.k.200214.008.
13. Kim JW, Ko YC, Seo TB, Kim YP. Effect of circuit training on body composition, physical fitness, and metabolic syndrome risk factors in obese female college students, *J Exerc. Rehabil*. 2018;14(3):460. DOI: 10.12965/jer.1836194.097.
14. Sonchan W, Moungrmee P, Sootmongkol A. The Effects of a Circuit Training Program on Muscle Strength Agility Anaerobic Performance and Cardiovascular Endurance, *Int. J Sport Heal. Sci*. 2017;11(4):176-179. [Online]. Available: <https://www.researchgate.net/publication/334535073>.
15. James A. Effect of aerobic circuit training on muscular endurance among men students, *Asian J Multidimens. Res*. 2018;7(2):783-787.
16. Omorczyk J, Puszczalowska-lizis E, Nowak M, Markowski A. Effects of 6-week basketball training using the modified circuit weight method. 2017;9(4):44-54. DOI: 10.29359/BJHPA.09.4.04.
17. Wijaya KT. Upaya Meningkatkan Daya Tahan Otot Atlet Pencak Silat Kabupaten Banjarnegara Melalui Latihan Circuit Weight Training Tahun; c2022.
18. Putra GN. Meningkatkan daya tahan otot atlet panahan kabupaten sukoharjo melalui circuit-weight training; c2017.
19. Kumar D, Yadav M. Effect of circuit weight training on physical fitness variables of Gorakhpur university basketball players. 2018;3(1):1195-1197.
20. Murlasits Z, Kneffel Z, Thalib L. The physiological effects of concurrent strength and endurance training sequence: A systematic review and meta-analysis, *J Sports Sci*. 2018;36(11):1212-1219.