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The Effect of Punching Bag Drills with Intervals on Anaerobic Endurance in Boxers

Trisnar Adi Prabowo[1], Sekar Pudak Wangi[2]
Universitas Muhammadiyah Brebes, Indonesia[1], Universitas Pendidikan Mandalika, Indonesia[2]
trisnar.prabowo@umbs.ac.id[1], sekarpudakwangi@undikma.ac.id[2]

Abstract

The purpose of this study was to analyze the use of interval training in Punching Bag drills on anaerobic endurance in boxers. This type of research is quasi-experimental, with pretest-posttest. The experimental group (EG) is a group with Punching Bag drills training with interval training, while the control group (CG) is a group with Punching Bag drills training but does not use intervals or free training. Data collection used a 300-meter sprint. The sample consisted of 7 EG boxers and 7 CG boxers, with characteristics of age 18 – 24 years, height 160 – 174 centimeters, weight 52 – 66 kilograms, training experience 3.2±2.7 years. The training program was conducted for 6 weeks, 3 meetings per week. EG and CG were also given the same opportunity in the form of 15 rounds x 3 minutes, 1 minute recovery (table 1). The results of Wilcoxon Test ($p<0.05$) showed that EG had an effect on anaerobic $0.017<0.05$ with an increase in time of 9.11 seconds. CG also had an effect on anaerobic $0.042<0.05$ with an increase in time of 4.82 seconds. However, there was a difference in groups using the Mann-Whitney test $0.010<0.05$. These findings reinforce the benefits of interval training in increasing anaerobic energy expenditure. This study suggests the integration of interval training into boxing training to improve recovery, strength, and endurance. Given the limited sample size, training program, and previous training conditions of the athletes, future studies are needed for further verification.

Keyword: boxing, anaerobic, endurance, punching bag

INTRODUCTION

Boxing is a sport that demands high levels of physical ability, including strength, speed, precision, and endurance. Anaerobic endurance, in particular, is essential because boxing involves a series of intense movements that occur over short but repeated periods of time (de Oliveira et al., 2024). In practice, anaerobic endurance plays a role in carrying out a series of intense attacks, because in hitting the boxer does not breathe oxygen. Boxers who have good anaerobic endurance tend to be able to maintain the effectiveness of movement and punching power even when tired (Franchini, 2023). There are many effective training methods to improve anaerobic endurance such as high intensity interval training and several types of plyometric training.

Interval training, which is characterized by periods of intense exercise followed by periods of rest or light activity. Previous research on combat sports has shown that interval training is effective in increasing anaerobic capacity and strength in judo, boxing, karate, wrestling, taekwondo (Franchini et al., 2019). Interval training for 6 weeks has also been shown to increase anaerobic activity in pencak silat athletes (Yulianto et al., 2022). In karate in the kumite category, interval training for 18 meetings has been shown to increase anaerobic capacity (Hadi & Yudhistira, 2023). Interval training techniques in combat sports allow fighters to train their bodies to process oxygen intake and the efficiency of the anaerobic energy system, which is crucial in boxing which requires fast and powerful bursts of energy (Vasconcelos et al., 2020).

Punching Bag drills are one of the most fundamental training methods in boxing. They not only help in improving punching power and technique, but are also very relevant for training endurance due to the imitation of attacks and defenses in real matches (Finlay et al., 2020). The results of previous research, training with a punching bag allows fighters to increase the strength and violence of their attacks because of the full repetition of power that strengthens the relevant muscles (Halomoan & Hariadi, 2020). Punching bag training also sharpens eye-hand coordination and improves accuracy, critical skills in evaluating and hitting moving targets (ANA et al., 2023). By using intervals in punching bag drills, athletes can simulate match conditions that demand rapid recovery and the ability to return to fighting at high intensity.

However, until now there has been no scientific research on specific boxing training methods to improve anaerobic endurance. Therefore, this study aims to analyze the use of

interval training in Punching Bag drills can affect the improvement of boxers' anaerobic endurance. By understanding the effectiveness of this method, coaches and athletes can be more focused in compiling training programs that not only improve technical aspects, but also physical conditions, especially anaerobic endurance which is the key to athlete performance in the ring. The expected results of this study are expected to provide empirical data that supports the development of more efficient training programs for boxers, and has the potential to be applied in other sports disciplines that also require high anaerobic endurance.

METHOD

This type of research is a quasi-experimental pretest-posttest with two groups, the experimental group and the control group. The experimental group (EG) is a group with Punching Bag drills training with interval training, while the control group (CG) is a group with Punching Bag drills training but does not use intervals or free training. Data collection on the pretest-posttest uses a 300-meter sprint (Khotimah et al., 2022).

The population of this study was boxing athletes in Brebes Regency, while the selection of samples was based on volunteerism from boxers with the provision of no injury, attaching a health certificate, a letter of willingness to participate in this study until completion. So that the number of boxers who underwent this study was 14 boxers (10 men and 4 women), the characteristics of the boxers were age 18-24 years, height 160-174 centimeters, weight 52-66 kilograms, training experience 3.2±2.7 years. Then the boxers were divided into two groups, namely 7 EG boxers and 7 CG boxers.

The following is a Punching Bag drills training program using intervals on EG (table 1), while CG is a boxer who only trains freely using a punching bag without intervals and remains under the supervision of a trainer. This research program was carried out for 6 weeks or 18 meetings with 1 week as many as 3 meetings on Monday, Wednesday, Friday. Training is carried out in the afternoon from 16.00 to 17.30. Before entering and after the core training program, warm-ups and cool-downs are required. However, after warming up, the boxers were asked to do additional warm-ups in the form of shadow boxing for 2 minutes x 3 rounds.

The EG training procedure is, in round 1 – round 6 in week 1 – 2, the coach blows the whistle every 5 seconds. In round 7 – round 10, the coach blows the whistle every 6 seconds. In round 11 – round 15, the coach blows the whistle every 9 seconds. This

procedure is the same for weeks 3-4 and weeks 5 – 6. Explanation of the number of punches, round 1 and round 2 is the boxer does 2 free punches, round 3 – round 15 the boxer does free punches then 'moving' which means after the boxer does a punch then steps and hits again as many punches as have been determined. The time determined in each round is 3 minutes or 180 seconds and recovery is 1 minute.

Table 1. Punching bag drills training program using intervals

Round	Number of Punches	Week 1 –2	Week 3 – 4	Week 5 – 6
1	2	5 seconds	4 seconds	3 seconds
2	2			
3	2 <moving> 1			
4	2 <moving> 1			
5	1 <moving> 2			
6	1 <moving> 2			
7	2 <moving> 3	6 seconds	5 seconds	4 seconds
8	2 <moving> 3			
9	1 <moving> 4			
10	1 <moving> 4			
11	1 <moving> 2 <moving> 1	9 seconds	6 seconds	5 seconds
12	1 <moving> 2 <moving> 1			
13	1 <moving> 2 <moving> 3			
14	1 <moving> 3 <moving> 3			
15	2 <moving> 3 <moving> 3			

The data analysis of this study used the Wilcoxon test ($p<0.05$) on the differences in pretest and posttest results to analyze the effectiveness of the training program. Then the Mann-Whitney test to analyze the differences in the EG and CG groups. Analysis of research data for the help of SPSS 26.

RESULTS

The first analysis for the research results is a descriptive analysis to analyze the average time in the experimental group (EG) and control group (CG) in table 2.

Table 2. Results of descriptive analysis

Group	Pretest		Pretest		Increased Time
	Mean	Std. Deviation	Mean	Std. Deviation	
Experiment	61,14	4,598	52,03	4,002	9,11
Control	61,09	2,708	56,27	2,870	4,82

Based on the results of table 2, in the experimental group (EG) the average pretest

was 61.14 seconds, the average posttest was 52.03 seconds, then the increase in time was 9.11 seconds. In the control group (CG) the average pretest was 61.09 seconds, the average posttest was 56.27 seconds, then the increase in time was 4.82 seconds.

After the descriptive analysis was conducted, the second analysis was using the Wilcoxon test ($p<0.05$) in both research groups in Table 3.

Table 3. Pretest-posttest results using the Wilcoxon test

	Experimental Group	Control Grup
Z	-2,388	-2,232
Asymp. Sig. (2-tailed)	0,017	0,043

Based on the results of table 3, the asymp. sig. value in the experimental group is $0.017<0.05$ so that there is a significant positive effect of training using Punching Bag drills with intervals (EG) on anaerobic endurance. Then, the asymp. sig. value in the control group is $0.042<0.05$ so that there is a significant positive effect in the control group (CG).

The third analysis is the Mann-Whitney test to analyze the differences in training groups in increasing anaerobic endurance in boxing athletes in Table 4.

Table 4. Mann-Whitney Test Results on EG and CG

	Result
Mann-Whitney U	4,500
Wilcoxon W	32,500
Z	-2,564
Asymp. Sig. (2-tailed)	0,010

Based on the results of table 4, the asymp. sig. value is $0.010<0.05$ so that there is a difference in the results in the experimental group and the control group regarding the increase in anaerobic endurance in boxing athletes.

DISCUSSION

The results of this study indicate that the use of Punching Bag drills with intervals has a more significant effect in increasing the anaerobic endurance of boxers compared to Punching Bag drills freely. From the data obtained, the experimental group that did punching bag drills with intervals showed an average time increase of 9.11 seconds, while the control group that trained with punching bags freely only showed an increase of 4.82 seconds. This difference indicates the effectiveness of the interval method in increasing anaerobic capacity.

In previous research results on pencak silat, anaerobic endurance can affect kicks

(Sumetry et al., 2021). In that study, the similarity with this study is the anaerobic test using a 300-meter sprint. While this study is a 6-week training, which is also in accordance with the results of research from pencak silat that interval training for 6 weeks also affects the anaerobic endurance of fighter category athletes (Yulianto et al., 2022). Interval training in this study, involves periods of intense activity interspersed with rest or light activity, namely active recovery. This method is also in line with the results of research conducted on wrestling, that interval training by regulating the tempo of activity and recovery affects anaerobic capacity in wrestlers (Liu & Li, 2023). So, the mechanism behind this involves increased efficiency in anaerobic energy use and increased tolerance of lactic acid in the muscle. In the context of boxing, this can be explained by the boxer being able to throw powerful punches and last longer under high fatigue conditions. Ultimately the boxer has a significant competitive advantage.

Although free Punching Bag training also showed significant improvements, its effectiveness was relatively lower compared to interval training. This is because free training lacks the structure needed to maximize controlled anaerobic stress. In previous research results on taekwondo, the experimental group with intervals tended to experience significant improvements in endurance and athlete performance due to systematic and measured training programs than the unprogrammed free group (Mischenko et al., 2021). In judo, measured and monitored interval training in the experimental group with standard judo training has also been shown to have a positive effect on high and relatively long anaerobic capacity compared to the control group (Norkowski et al., 2014). In addition, free training programs tend to lack controlled pacing and optimal rest periodicity, key to maximizing anaerobic output. This is because free training programs do not incorporate the principles of progressive overload into everyday training (Gusman & Sugiharto, 2023).

Based on the results obtained, Punching Bag drills with intervals are highly recommended for coaches and athletes who aim to significantly improve anaerobic endurance. In the training in this study, not only was it more effective in improving overall endurance, but it also helped in accelerating recovery between rounds, increasing strength, which is very important in boxing matches (Munir et al., 2023). Then, punching training in a punching bag also has a positive impact on punching accuracy and speed, thus providing significant benefits by combining accuracy, speed and longer endurance (Finlay et al., 2020 & Maria et al., 2021). This study provides strong evidence that integrating intervals into

punching bag training can substantially improve the effectiveness of boxing training. By understanding and applying this method, coaches can be more strategic in designing training programs that not only improve strength and accuracy, but also the anaerobic endurance that is essential in boxing matches.

The limitation of this study is the small number of samples because this study offers voluntarily to each boxer. In addition, the sample status is an active boxer, but before this study was conducted only trained for 2-4 times each week. So there is a possibility of physiological differences before being given intensive treatment. Hope in the future, there is research on training variations in boxing with a validated training program. Then, grouping specifically such as weight according to competition, height, athlete experience. So that it can produce credible research results in the future.

CONCLUSION

The results of this study indicate the significant effectiveness of Punching Bag drills with intervals in improving anaerobic endurance of boxers compared to free punching bag training. The experimental group is Punching Bag drills with intervals recorded an average time increase of 9.11 seconds, indicating a better increase in endurance compared to the control group which only recorded an increase of 4.82 seconds. These findings underline the benefits of interval training to improve anaerobic energy efficiency and lactic acid tolerance, important factors that allow athletes to maintain high performance throughout the match. Similar studies in other sports also support the effectiveness of interval training, confirming that this method can substantially increase anaerobic capacity. Based on these results, coaches or practitioners in boxing are advised to integrate interval training into training programs to optimize recovery, punching power, and endurance of boxers. With the limitations of the number of samples, training programs and previous training conditions of athletes, future studies are needed for further verification. However, these findings provide a strong basis that Punching Bag drills with intervals can provide significant competitive advantages in boxing.

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