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The impact of high-intensity interval training on body composition handball athletes

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Abstract

This research will review the impact of HIIT on the body composition of men's handball athletes and identify several factors. Was to evaluate the impact on body mass index (BMI), fat mass (FM), fat-free mass (FFM) and fat mass index (FMI) on the body composition of Malang City handball athletes. The subjects of this study were 14 men's athletes, 21 years old, and received the same training program. Explains that the Paired T-Test of BMI is 0.003, Fat Mass is 0.004, Fat-Free Mass is 0.087, and Fat Mass Index is 0.000 because of the sig value. < 0,05. It can be interpreted that there is a significant effect on high-intensity interval training. The impact of high-intensity interval training has a significant impact on body mass index (BMI), fat mass (FM) and body mass index (BMI) on the body composition of handball athletes. The exercises performed have a positive impact on the formation of body composition, in the sport of handball, it takes a lot of explosive movements so ideal body conditions are very supportive of athlete performance. HIIT method is very useful in preparing training programs to form ideal body composition for coaches and the general public.***Keywords:*** *High-Intensity Interval Training, Body Composition, Handball Athletes,*

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INTRODUCTION

High-Intensity Interval Training (HIIT) is an exercise method that has become to focus attention on the world of fitness and sports. The benefits of using this training model have advantages in cardiorespiratory fitness (Hannan et al. 2018). Handball games that dominate the anatomy body on the strength of the shoulder both pushing and pulling (Pamungkas, Nidomuddin, and Yusuf 2022), handball is a game that requires a combination of strength, endurance, agility, and technical skills. The impact of high-intensity interval training on body composition to handball athletes is very important, and serves as a time saver in training (Batacan et al. 2017). This study will review the impact of HIIT on the body composition handball athletes and identify several factors. To burn body fat using HIIT to increase metabolism during and after exercise, thus aiding in the reduction of body fat. The increase in total body mass of athletes that has been observed over the past 10 years is accompanied by an increase in body fat (Barth Noel et al. 2003). Athletes who exercise regularly can experience a significant reduction in body fat percentage.

In addition to reducing body fat impact of high intensity interval training can also aid in the increase muscle mass, minimal body fat levels will be advantageous for moving the athlete's body quickly and efficiently on the field (Fields et al. 2018). HIIT treatment involves a variety of movements that require muscular strength, such as sprinting, jumping, or push-up. Periodic

high-intensity training led to significant increases in maximal aerobic output accompanied by increases in SV and maximal CO (Astorino et al. 2017). To produce an increase of muscle mass, especially if performed at a high intensity, this training model can help athletes lose excessive weight, by identifying body mass index (BMI), fat mass (FM), fat free mass (FFM) and fat mass index (FMI). High-intensity exercise tailored to individual needs is mostly used as a training setting (Ross, Porter, and Durstine 2016). Weight reduction that can improve the fitness and ability of individual athletes in sports performance. The body composition of handball athletes can vary depending on individual factors such as age, gender, initial fitness level, and training goals as well as differences in morphological characteristics and body composition (Gardasevic and Bjelica 2020). High-intensity interval training programs used specifically for handball athletes must consider the unique demands of the sport.

Training structures with high-intensity intervals on balance and stabilization can help reduce the risk of injury in handball. Players in some positions during play will experience more changes due to higher demands (Bjelica et al. 2020). The HIIT program is a recommended method for improving the physical fitness capacity of athletes to strengthen muscles and joints, thereby reducing the likelihood of injury during competition (Wewege et al. 2018). Large amounts of muscle mass will improve athlete performance in training and competition, both muscle mass in the upper limbs and lower limbs (Yusuf, Nidomuddin, and Pamungkas 2023). Intensive training that engages multiple muscle groups can help improve the performance of handball athletes. HIIT models provide greater functional benefits when completing maximal movements and can help athletes achieve optimal body composition for sporting performance (Türk et al. 2017). The preparation of a HIIT program that is in accordance with the athlete's body composition goals, with attention to nutrition and adequate rest to support changes that are in accordance with the athlete's standard criteria.

METHOD

Research method the impact of High-Intensity Internal Training (HIIT) on body composition of handball athletes involves various research approaches. The purpose of the study was to evaluate impact of HIIT on body mass index (BMI), fat mass (FM), fat free mass (FFM), fat mass index (FMI) and body composition of Malang City handball athletes. Subjects of this study were 14 male athletes, age 21 years, and obtained the same training program.

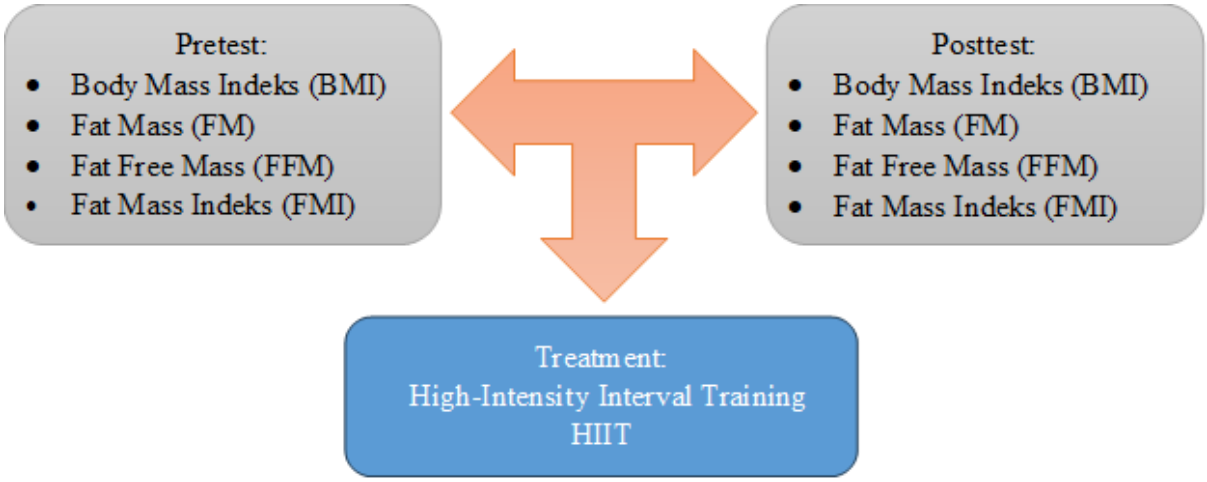

Figure 1. High Intensity Interval Training (HIIT)

Initial measurements (pretest) of body composition in all subjects included measurements, design of a HIIT exercise program that would be applied to a group of handball athletes. The program included exercises suitable for achieving research objectives, such as strength, cardio, and balance training for two months regularly undergoing exercise program with consistency. After the HIIT intervention period was completed, a posttest of body composition was taken on all subjects. Comparison of results with baseline measurements to see the impact of HIIT on body composition of handball athletes. Using statistical analysis to process the data collected. Data was processed using statistical tests to determine the impact between treatment groups.

RESULTS

Table 1. Description of pretest – post-test Body Composition

Variable	N	Minimum	Maximum	Mean	SD
BMI Pre	14	16,20	30,00	22,02	3,50
BMI Post	14	16,00	28,50	21,60	3,17
Fat Mass Pre	14	10,20	31,60	17,59	5,78
Fat Mass Post	14	10,00	25,00	16,00	4,34
Fat Free Mass Pre	14	68,40	94,80	83,15	7,06
Fat Free Mass Post	14	69,00	98,10	85,12	7,86
Fat Mass Indeks Pre	14	1,30	9,50	4,45	2,36
Fat Mass Indeks Post	14	1,20	9,00	3,97	2,20

Table 1 description the mean and standard deviation (SD) of pretest and post-test data on Body Composition after doing impact HIIT there are changes in pre-post BMI 22,02 ± 21,60, pre-post Fat Mass 17,59 ± 16,00, pre-post Fat Free Mass 83,15 ± 85,12, pre-post Fat Mass Index 4,45 ± 3,97.

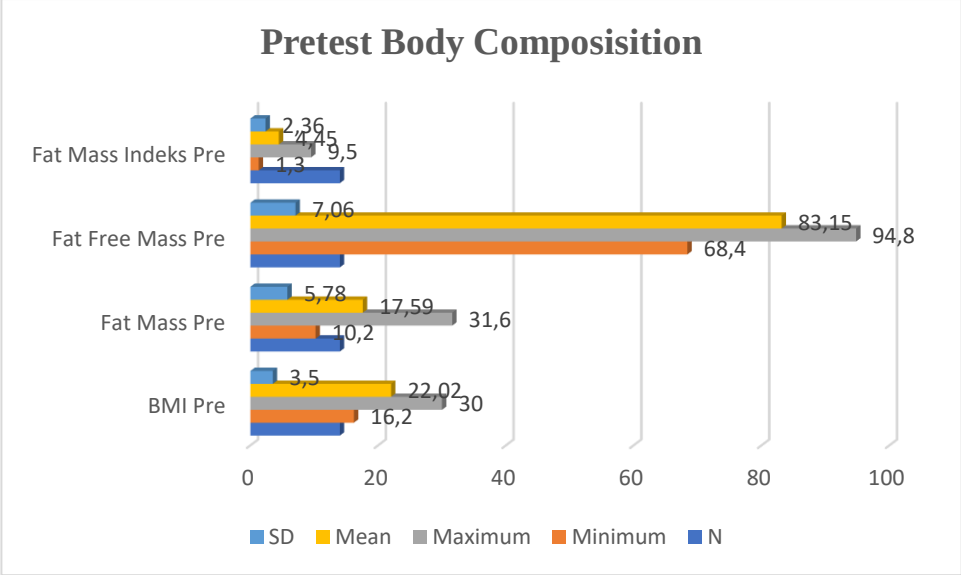

Figure 1. Pretest body composition in bar

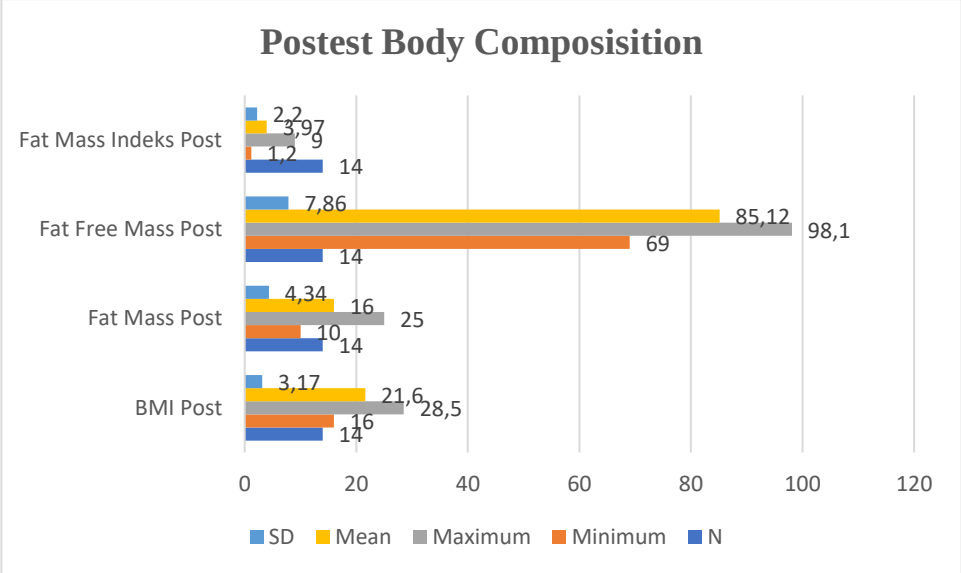

Figure 1. Post-test body composition in bar

Table 2. Shapiro Whilk test results

Body Composition Category	Shapiro-Wilk		
	Statistic	df	Sig.
BMI Pretest	0,960	14	0,722
BMI Post-test	0,976	14	0,944
Fat Mass Pretest	0,927	14	0,279
Fat Mass Post-test	0,949	14	0,550
Fat Free Mass Pretest	0,940	14	0,421
Fat Free Mass Post-test	0,943	14	0,465
Fat Mass Index Pretest	0,888	14	0,075
Fat Mass Index Post-test	0,879	14	0,056

Table 2 the test normality of all variables is body mass index (BMI), fat mass (FM), fat free mass (FFM) dan fat mass index (FMI). Based on the descriptive table data above are all declared normally distributed because p>0.05.

Table 3. Paired Sample T-test

	t	df	Sig. (2-tailed)
BMI Pre – Post	3,698	13	0,003
Fat Mass Pre – Post	3,494	13	0,004
Fat Free Mass Pre – Post	-1,853	13	0,087
Fat Mass Index Pre – Post	6,629	13	0,000

From the results of data table 4 explains that Paired T-Test of BMI is 0,003, Fat Mass was 0,004, Fat Free Mass is 0,087, Fat Mass Index was 0,000, because the sig.<0.05 value. It can be interpreted that there is a significant impact on high intensity interval training.

DISCUSSION

The results of this study there are significant results Impact HIIT on BMI, Fat mass and fat mass index. While on fat free mass there is less significant effect from the results of the exercise that has been done. This training method has become very popular among athletes and non-athletes alike as it is considered effective in impacting body composition. The method can be used in groups with excellent results in improving variables related to physical condition (Alonso-Férnández, Fernández-Rodriguez, and Gutiérrez-Sánchez 2017). Here are some the impacts of HIIT on athletes' body composition, this is also a consideration for coaches considering similar preventive interventions for athletes (Kelly et al. 2017). Training program is known to help athletes reduce body fat more effectively than conventional training methods. The more important issue is how to make sports fun to continue in long run (Foster et al. 2015). High-intensity exercise over a short period of time can increase metabolic rate and burn more calories during and after exercise. In addition, HIIT is suitable as an alternative to continuous exercise training in improving fitness and weight loss, this can help reduce body fat, especially harmful visceral fat (Shehata and Mahmoud 2018).

Athletes can build muscle mass because high-intensity training involves body weight and strenuous exercise. Training intensity should be greater than 85% HRmax and increased muscle mass can also help increase basal metabolism, which in turn helps in the reduction of body fat (Murawska-Ciałowicz et al. 2021). It can also improve an athlete's cardiorespiratory fitness. Improvements occur in neuromuscular characteristics that transfer into increased muscle strength and muscle work (Felipe et al. 2016). This includes increased lung capacity, better blood circulation, and cardiovascular endurance. Players express excellent results in the

foundation athletic qualities of the sport itself, such as speed, acceleration, deceleration, and endurance (Izzo, Carrozzo, and Riccardo Izzo 2015). An important physiological measure that indicates an athlete's capacity during strenuous exercise and can help athletes improve their endurance during exercise, which contributes to improved body composition (Pamungkas et al. 2023).

Intense exercise can stimulate the production of growth hormone (GH) in the body. Physical performance of athletes, to prevent the accumulation of body fat while increasing fluid levels and muscle mass (Kahraman and Arslan 2023). Growth hormone helps in the recovery and growth of muscle tissue, muscle characteristics in addition to body composition are useful for improving performance, injury prevention, and assessing health risks (Hirsch et al. 2016). Increased GH can contribute to better muscle building, can also increase an athlete's basal metabolic rate. Concentric and eccentric muscle strength can simulate athletes' agility, speed, change of direction, and decision-making (Principe et al. 2021). This means they will burn more calories in a resting state, which can help them maintain or improve their body composition.

CONCLUSION

The results of study there was a positive impact on the body composition of handball athletes, varying depending on various factors, including training intensity, frequency, and adherence to the training program. The impact high intensity interval training has a significant impact on body mass index (BMI), fat mass (FM) and fat mass index (FMI) of the body composition of Malang City handball athletes. The exercises performed have a positive impact on formation of body composition, in the sport of handball it takes a lot of explosive movements used so that ideal body conditions are very supportive of athlete performance. HIIT method is very useful in the preparation of training programs to form an ideal body composition for trainers and the public.

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