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# Effectiveness of High Intensity Interval Training & Strength Training on Body Fat Percentage in Overweight and Obese Women

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#### ABSTRACT

[Purpose] The aim of the study was to evaluate the effectiveness of High intensity interval training & Strength training over a period of 6 weeks on body fat percentage, BMI, waist-hip ratio and BMR in overweight and obese women. [Subjects and Method] Thirty-five subjects with BMI >24.9 and body fat percentage >32% were selected. The study included only one experimental group (n=35), which received the combined effect of HIIT & Strength training. Fat percentage using body fat analyzer and BMI using the standard formula were measured before and after the 6 weeks intervention. Along with this waist-hip ration with a measuring tape and BMR with the body fat analyzer were measured. [Results] the group showed significant improvement in outcome measures. However, there was significant decrease in waist-hip circumference and no significant decrease in waist-hip ratio. [Conclusion] The 6 weeks HIIT & Strength Training program is found to be effective in reducing body fat percentage amongst overweight and obese women, there is decrease in waist & hip circumference and an increase in basal metabolic rate, which supports the findings of this study.

**Keywords:** HIIT, body composition, Strength training, obesity.

## **INTRODUCTION**

Obesity, defined by American College of Sports Medicine (ACSM) is an excessive amount of adipose tissue that presents a risk to individual's health<sup>[1]</sup>. Overweight & obesity are rapidly increasing in countries like India. The prevalence of obesity in the world for women is about 38.5% and exceeds more than 50% in some countries. As in India, the prevalence of obesity in women is 31.3 % and it has increased by 24.52% from the years 2006-2016 and is only increasing every year<sup>[2]</sup>.

Body fat is adipose tissue (body fat) in abnormal constituent of the human body that serves the important function of storing energy as fat for metabolic demand<sup>[3]</sup>. Body fat more than 24% in females is considered unhealthy and not fit<sup>[1]</sup> and there are many causes and risk factors of increased body fat, which of few include eating more food than

what body can use, not doing enough exercise and sedentary lifestyle<sup>[4]</sup>. It is associated with numerous health risks like bone and joint problem, gallstones and liver problems, coronary heart disease, high blood cholesterol, high blood pressure, sleep apnoea, fatigue and poor attention<sup>[3]</sup> Thus, to combat all these complications preventing the increase in fat mass by exercise is the best treatment option<sup>[2]</sup>.

Body fat percentage is the body fat percentage (BFP) of a human or other living being is the mass of fat divided by body mass; body fat includes essential body fat and storage body fat. Essential body fat is necessary to maintain life and reproductive function. Storage body fat consist of fat accumulation in adipose tissue, part of which protects internal organs in the chest and abdomen<sup>[3]</sup>. The body fat percentage is a measure of fitness level, since it is the only body

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measurement which directly calculates a person's relative body composition without regards to heights or weight<sup>[5]</sup>. American council on exercise (ACE) body fat % chart description for women ideal for 20-40 years are: essential fat 10-13%, athletes 14-20%, fitness 21-24%, average 25-31% and obese 32% and above<sup>[6].</sup>

The most common criteria used to determine overweight & obesity is by body mass index (BMI). The BMI values according to WHO<sup>[7]</sup> are Normal BMI range 18-24.9, Overweight range 25-29.9, Obese grade I 30-34.5, Obese grade II 35-39.5 and Obese grade III >40.

Exercise is an important strategy to attenuate loss of function through the life cycle<sup>[1,4]</sup>. High intensity interval training (HIIT) and Strength Training can sustain ease of movement, Stimulate NEAT (non-excessive activity thermogenesis), and attenuate the accretion of fat mass<sup>[8]</sup>. HIIT refers to activities such as walking or jogging with continuous, repetitive movement of large muscle groups for at least 10

minutes at a time . Strength Training on the other hand uses muscular strength to move a weight or to work against a resistive load, causing isolated, brief activity of a single muscle group and has received [10]

increasing attention in the last decade Strength training improves muscular strength and endurance, enhances flexibility and body composition decreases the risk of cardiovascular diseases<sup>[9,19]</sup>. Numerous studies have been conducted on the effect of HIIT for fat loss by Nejmeddine Ouerghi, et al. and Maillard

F., et al found significant decrease in body fat percentage <sup>[11,20]</sup>. and a very few studies have been done on the effects of strength training for fat loss by Leslie H. William et al.<sup>[12]</sup> also found significant decrease in body mass.

Therefore, it is necessary to determine a better training program by combining HIIT & Strength training to reduce body fat composition in overweight and obese women.

### Materials and Methods

Subjects were selected based on inclusion and exclusion criteria by purposive sampling. An informed consent was taken from each subject. The demographic data was recorded such as Age, Weight, height, Waist-Hip ratio, caliper and BMI was assessed with body fat analyzer (OMRON HBF-306). RPE according to Modified Borg Scale was explained to the subjects in which they instructed to exercise at an RPE of 7 (very strong) and were instructed to stop if their RPE exceeds 8 (extremely strong max p). 6 weeks training protocol with 4 sessions each week was taken for the group. The whole protocol includes 1 hour (60 minutes) it starts, with Warm up 7-10 minutes: (spot marching, forward, side lunge, active movements of all joints). Immediate HIIT session will be taken for 20 minutes with RPE of 7-8 (Modified BORG scale). 1 Cycle-60 sec- push ups ,60 sec- rest-60 sec- butt kicks, 60 sec- rest, 60 sec- sumo squats jumps, 60 sec- rest, 60 sec- burpees, 60 sec- rest, 60 sec- rest, 60 sec- step up and down.

MONDAY	TUESDAY	THURSDAY	FRIDAY
MONDAY	TUESDAY	THURSDAY	FRIDAY
BICEPS	LEG PRESS	BICEPS	LEG PRESS
CURLS		CURLS	
LATISSIMUS	LEG CURLS	LATISSIMUS	LEG CURLS
PULL DOWN		PULL DOWN	
TRICEPS	LEG	TRICEPS	LEG
EXTENSION FLEXION/		EXTENSION	FLEXION/
	EXTENSION		EXTENSION
CHEST PRESS SIT UPS		CHEST PRESS	SIT UPS

PUSH UPS	SEATED ROW	PUSH UPS	SEATED ROW
SHOULDER SHRUGS	LUNGE WALKING	SHOULDER SHRUGS	LUNGE WALKING
RETRACTORS	HIP SCOOTING	RETRACTORS	HIP SCOOTING

60 sec- rest. Duration- 5 minuted per cycle, Repitition- 4 times the cycle, Frequency- 4 days a week. After a 2 minute break Strength training protocol begins.

PECTORALS	PLAIN PLANKS	PECTORALS	PLAIN PLANKS
SHOULDER	SIDE PLANKS	SHOULDER	SIDE PLANKS
FLEXORS,		FLEXORS,	
EXTENSORS,		EXTENSORS,	
ABDUCTORS		ABDUCTORS	
SHOULDER MED.	DOLPHIN	SHOULDER	DOLPHIN
& LAT.	PLANK	MED. & LAT.	PLANKS
ROTATORS		ROTATORS	
STRETCHING	STRETCHING	STRETCHING	STRETCHING
	nd	•	

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1 set was taken at 50% of 10 RM. 2 set was taken

at 75% of 10 RM. 3 set was taken at 100% of 10 RM (following DeLorme Regimen) Progression was checked every 15 days by 10 RM. Immediately 5-7 minutes, cool down exercises will be taken which includes: (Stretching of major group of muscles and Shavasana 2 minutes).

#### Results

Statistics was done in the form of mean and standard deviation. Paired T test was used to measure changes within the group, analysis was done using InStat (Version 3.05, created September 2000). Significance was accepted with p < 0.0001.

There is extremely significant difference in body fat percentage. The mean value of pre-test body fat percentage is 36.42 and the mean value of post-test body fat percentage is 33.18. The mean value of pretest in BMI is 28.83 and the mean value of post-test BMI is 28.03. The mean value of pre-test in waist circumference is32.34 and the mean value of posttest waist circumference is 31.28. The mean value of pre-test in hip circumference is 39.65 and the mean value of post-test hip circumference is 38.48. The mean value of pre-test in BMR is 1490.33 and the mean value of post-test BMR is 1765.42.

There is significant difference in body fat percentage, BMI, waist & hip circumference and BMR as p values for all components is significant.

OUTCOME MEASURES	PRE	POST	T- Value	P value	Significance
	(mean± SD)	(mean± SD)			
Body fat %	36.42±1.1	33.18±1.1	6.939	< 0.0001*	Extremely
					Significant
BMI	28.88±5.1	$27.76 \pm 5.1$	3.863	< 0.0002*	Extremely
					Significant
Waist	32.34±5.2	31.28±4.8	7.168	<0.0001*	Extremely

circumference					Significant
Hip circumference	39.65±4.8	38.48±4.7	9.809	<0.0001*	Extremely Significant
BMR	1490.33±4.8	1765.42±4.7	9.809	<0.0001*	Extremely Significant

#### Discussion

This study was undertaken in interest to find the effectiveness of HIIT & strength training combined effect on body fat percentage and BMI as well as Waist-Hip circumference and BMR. Within the age group of 20 to 45 years females for acquiring the type of exercise that is best for fat reduction, in which 37 participants were selected and there were 2 drop-outs due to discomfiture and irregularity.

Following the 6 weeks intervention the participants of the exercise group attained more than 10% reduction (*Table 1*) in the body fat percentage.

Recent studies have shown that the effect of HIIT alone is effective in reducing subcutaneous and abdominal fat than other type of exercises with a 5-7% reduction<sup>[13]</sup>. HIIT has also shown to improve aerobic and anaerobic fitness<sup>[12,1]</sup>, increased skeletal muscle capacity for fatty acid oxidation also according to ACSM it helps to burn more body fat in less time and burns few calories post exercise<sup>[1]</sup>. Strength training on the other hand performed for 6 weeks and above showed significant decrease in abdominal fat, visceral fat and subcutaneous fat by a of 5% in 6 weeks<sup>[11]</sup> therefore increase in lean muscle tissue through strength training increases the calories and fat burnt at rest, strength training strengthens muscle and demands more calories<sup>[14]</sup>.

Various studies tested the effectiveness of HIIT & Strength training individually in reducing fat percentage, which showed significant decrease in body fat<sup>[5,10,12,13]</sup>. Matthew Monaco, et al. studied the effect of both HIIT & Strength training which showed effectiveness in reducing body fat than the exercise regime of HIIT & Strength training individually result in modest reduction in body fat percentage in young and middle aged women<sup>[15]</sup>. The combined effect also induced fat oxidation during and after exercise and suppressed appetite<sup>[15]</sup>.

Alongside body fat, there was extremely significant decrease in waist & Hip circumference and no

significant difference in pre & post findings on waisthip ratio.

There is increasing evidence that central obesity is more strongly correlated with cardiovascular disease than measures of general obesity<sup>[5]</sup> therefore it is important to note that the combines exercise group decreased significant waist & hip circumference (*Table 3*). Whereas studies on Strength training have shown minimal significance in reducing waist & hip circumference<sup>[13]</sup>. Perhaps the significant increase in the exercise duration of the combined group explains the findings.

There is also a significant increase in basal metabolic rate.

Basal metabolic rate is an important indicator of health<sup>[11]</sup>. BMR increase in response to 6 weeks of HIIT & Strength training combines exercise group (*Table4*) in conclusion, HIIT & Strength training combined provided a time-efficient stimulus to increase BMR in 6 weeks in healthy adults. Perhaps the most common cited reason for reduction in fat mass and body weight by exercise training is that basal metabolic rate theoretically increases as lean body mass increases<sup>[16,17,18,19]</sup>. In the present study, the effectiveness of HIIT & Strength training was extremely significant in reducing body fat percentage in overweight and obese women.

#### Conclusion

From the results of the study we conclude that the 6 weeks HIIT & Strength Training program is found to be effective in reducing body fat percentage amongst overweight and obese women, there is decrease in waist & hip circumference and an increase in basal metabolic rate which supports the findings of this study.

### References

1. Lippincott Williams & Wilkins ACMS's guidelines for exercise testing and

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prescription 9 Edition pg no318 publised by American College of Sports Medicine.

th

- 2. Rajendra Pradeepa, Ranjit Mohan Anjana, Prevalane of generalized & abdominal obesity in urban and rural India. Indian J Med Res. 2015:141(2): 139-150.
- William D.MCArdle, Frank I. Katch, Victor L. Katch exercise physiology nutrition, energy and human performance. 8<sup>th</sup> Edition published by Wolters Kluwer Health.
- 4. M. Dena Gardiner, the Principles of Exercise Therapy 4 Edition pg55, Published by the London hospital.
- 5. E G Trapp, D J Chisholm, et al. The effects of high-intensity intermittent exercise training on fat loss and fasting insulin levels of young women. International journal of obesity 2008; 32 (4):684-691.
- Maillard F., Pereira B., Boisseau N. Effect of High-Intensity Interval Training on, Abdominal and Visceral Fat Mass: A Meta-Analysis 2018; 48(2):269-288.
- Florie Maillard, Bruno Pereira, Nathaie Boisseau the effects of HIIT training on abdominal visceral fat. Sports med. 2017; 48(2):269-288.
- 8. Hunter GR, Plaisance EP, Carter SJ, and Fisher G. why intensity is not a bad word: optimizing health status at any age. Clin Nutr. 2018; 37(1):56-60.
- Avari A., Najafipoor F., Aliasgaradeh A., Niafar M., Mobasseri M. effects of aerobic exercise, resistive training or combined training on glycaemic control and cardiovascular risk factors in patients with type 2 diabetes. Department of physical education, Tabriz University of Medical Sciences, Iran. 2012; 29(2):135-143.
- Zuyao Yang, Catherine A. Scott, Chen Mao, Jinling Tang, Andrew j. farmer. Resistance Exercise versus Aerobic Exercise for Type 2 Diabetes: A Systematic Review and Meta-Analysis. Springer International Publishing Switzerland. 2014; 44(4):487-99.
- 11. Nejmeddine Ouerghi, Mohamed Kacem Ben, Fradj, Anissa Boussida Effect of HIIT on body composition, aerobics and anaerobic performance and plasma lipids in overweight

and plasma lipid in overweight/obese and normal weight young men.2017; 34(4):385-392.

- 12. Leslie H. willis, Cris A. Slentz, William E. Kraus Effect of aerobic and/or resistance training on body mass and fat mass in overweight or obese adults. J Appl physiol. 2012; 113(12): 1831-1837.
- Pratley R, Nicklas B, Rubin M, Miller J, Smith A, Smith M, Hurley B, Goldberg A. Strength training increases resting metabolic rate and norepinephrine levels in healthy 50- to 65-yr-old men. J Appl Physiol 1994; 76: 133–137.
- 14. Jason L. Stuart D.R. Galloway, et al two weeks of HIIT on women to check fat oxidation. J Appl physiol 1985; 102(4): 1439-47.
- 15. Schubert MM, Clarke HE, Seay RF, Spain KK. Impact of 4 weeks of interval training on resting metabolic rate, fitness, and health-related outcomes. 2017; 42(10):1073-1081.
- 16. Gary R. Hunter, Nuala M. Byrne, Bovorn Sirikul, jose R. Fernandez, Paul A. Zuckerman, Betty E. Darnell, Barbara A. Gower- the effects of Resistive Training on Conserves Fat-free Mass and Resting Energy Expenditure. Obesity 2008; 16(5):1045-1051.
- 17. Dolezal BA, Potteiger JA. Concurrent resistance and endurance training influence basal metabolic rate in nondieting individuals. J Appl Physiol 1998; 85(3) 695-700.
- 18. Lemmer JT, Ivey FM, Ryan AS, Martel GF, Hurlbut DE, Metter JE, Fozard JL, Fleg JL, Hurley BF.Effect of strength training on resting metabolic rate and physical activity: age and gender comparisons. Med Sci Sports Exerc 2001; 33(2) 532–541.
- 19. Pollock ML, Franklin BA, Balady GJ, Chaitman BL, Fleg JL, Fletcher B, Limacher M, Pina IL, Stein RA, Williams M, Bazzarre T. AHA Science Advisory. Resistance exercise in individuals with and without cardiovascular disease: benefits, rationale, safety, and prescription: An advisory from the Committee on Exercise, Rehabilitation, and Prevention, Council on Clinical Cardiology, American Heart Association; Position paper

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endorsed. the American College of Sports Medicine 2000; 101(3): 828-833.

Abdominal and Visceral Fat Mass: A Meta-Analysis 2018; 48(2):269-288.

20. Maillard F., Pereira B., Boisseau N. Effect of High-Intensity Interval Training on,

#### **Figures**









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