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Effects of high and low intensity exercise training on body fat in young individuals- Comparative study

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ABSTRACT

The purpose of the study is to compare between the high intensity interval training (HIIT) and low intensity steady state (LISS) training for reduction of body fat % in young individuals. Since there are a lot of complications of increased fat in the body, it is necessary to find a protocol for fitness. A sample size of 42 was taken and 2 groups were made of 21 each using chit method. Subjects in LISS underwent a 40mins low intensity workout at RPE 11-12 for 5 times a week including aerobics, jog, and brisk walk. At the same time HIIT subjects had to undergo a protocol of 20mins at RPE 17-18 including 4 cycles of 1min work and 1min rest (step up and down, burpees, push-ups, butt kicks, sumo squats) 3 times a week. Data was recorded post the protocol of 5 weeks. An intraclass analysis showed statistically significant difference in pre and post values of both the groups (p values>0.001), whereas the interclass comparison between both the groups showed significant difference with HIIT having a significantly better result. Thus it was concluded that both the groups helped in fat reduction but HIIT had better and efficient results for fat reduction in young individuals. Also it is time efficient.

Keywords: 40mins LISS, 20mins HIIT, RPE, Fat reduction.

INTRODUCTION

Overweight and obesity are defined by American College of Sports Medicine as an excessive amount of adipose tissue that presents a risk to an individual's health. Body fat >24 in females and >18 in males is considered unhealthy [1].

Body fat

Adipose tissue (body fat) is a normal constituent of the human body that serves the important function of storing energy as fat for metabolic demands. [2]

Body fat percentage

The body fat percentage (BFP) of a human or other living being is the total mass of fat divided by

total 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 consists of fat accumulation in adipose tissue, part of which protects internal organs in the chest and abdomen. [2] The body fat percentage is a measure of fitness level, since it is the only body measurement which directly calculates a person's relative body composition without regards to height or weight. [2]

The CAUSES and RISK FACTORS of increased body fat include

1. Eating more food that what body can use.
2. Drinking too much alcohol.
3. Not doing enough exercise.
4. Sedentary lifestyle.
5. Eating habits inculpated since childhood.
6. Lack of self-control over eating. [2]

COMPLICATIONS of excess body fat include

1. Major health threat. Extra weight puts added stress on every part of the body.
2. Bone and joint problems- osteoarthritis.
3. Gall stones and liver problems.
4. Heart attack from coronary heart disease, congestive heart failure and stroke.
5. High blood cholesterol and triglycerides.
6. High blood pressure and high blood sugar sleep apnoea, fatigue, poor attention and problems at work. [2]

Therefore, to combat all these complications preventing the increase in fat mass is the best treatment option. Few of the TREATMENT options include:

Changing lifestyle

An active lifestyle and regular exercise, along with healthy eating, is the best way to lose weight. Even modest weight loss can improve health.

Exercise

Activity requiring physical effort, carried out to sustain or improve health and fitness. Best way to tackle overweight complications apart from dieting and other methods. This includes:

Low intensity steady state training

(LISS) As the name implies, it is a steady cardiovascular form of exercise where you keep your intensity low but your effort consistent. [3]

High intensity interval training

(HIIT) is a system of organizing cardio respiratory training which calls for repeated bouts of short duration, high intensity exercise intervals intermingled with periods of low intensity intervals of active recovery. [4]

Cardiovascular training

It involves increasing your HR to pump blood and deliver oxygen to your muscles for increased demands.

Strength training

Muscles require fuel to operate, so the leaner mass you have, the more calories you will burn with the help of strength training. [5]

Methodology

Type of study is experimental study with random sampling. The study was carried out at MAEER's Physiotherapy College on 42 subjects who had body fat >24 in females and >18 in males. Any individuals with musculoskeletal, cardiovascular conditions, metabolic, hormonal conditions & who are not willing to take up an extensive treatment protocol were excluded from the study.

Procedure

With the approval of Institutional Ethical Committee, the study was conducted & 42 samples, which were selected as per the inclusion criteria. Two groups were made, HIIT and LISS. The allocation was done randomly by chit method. The following parameters were recorded before the start of the protocol: weight, height, BMI, body fat%, BMR, waist and hip circumference, skin fold of 7 areas. The RPE scale was explained to the subjects. Both the groups underwent and extensive training program of 5 weeks with HIIT sessions 3 times a week for 20mins with RPE of 17-18 on BORG Scale, and LISS 5 times a week for 40mins with RPE of 11-12 on BORG Scale. Subjects in LISS received Continuous aerobic training session including various aerobic exercises: 20mins – aerobics including marching, step touch, step

touches front and back, double step touch, grapevine, side walk, leg curl, reach outs, knee lift,10mins – brisk walking, 10mins – jogging for DURATION**: 40 MINS** and FREQUENCY**: 5 TIMES** a week while subjects in HIIT received 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- step up and down, 60 sec- rest [7] for DURATION- **5 MINS,** REPETITION- **4 TIMES** the cycle FREQUENCY- **3 TIMES** a week. A warm up and cool down session was done before and after the session for 10mins respectively.

Statistical analysis and Graph

The body fat calculated using body fat analyser and skin fold was statistically analysed using paired t- test for comparing the pre and post of both the groups, whereas the difference of both the groups was compared using unpaired t- test.

Table 1: pre and post values of body fat using body fat analyser and skin fold

	BODY FATANALYSER		SKIN FOLD	
	PRE	POST	PRE	POST
HIIT	32.34	30.52	110.57	99.048
LISS	33.34	32.33	110.95	106.43

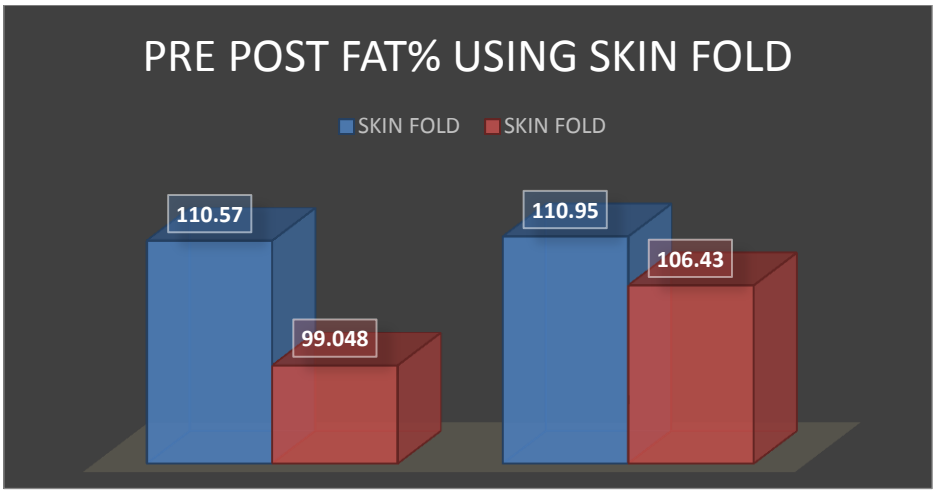

Chart 1: pre post body fat % values of HIIT and LISS groups using skin fold callipers.

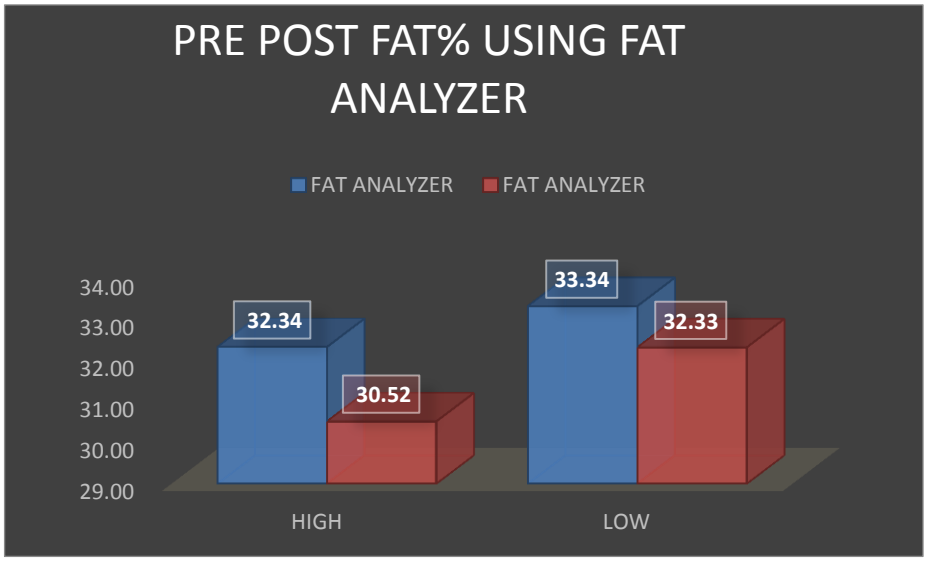

Chart 2: pre post body fat% values of HIIT and LISS groups using body fat analyser.

Table 2: mean difference of HIIT and LISS using skin fold calliper and fat analyser

	MEAN DIFFERENCE IN FAT %	
	SKIN FOLD	**FAT ANALYSER**
HIIT	11.52	2
LISS	4.52	1

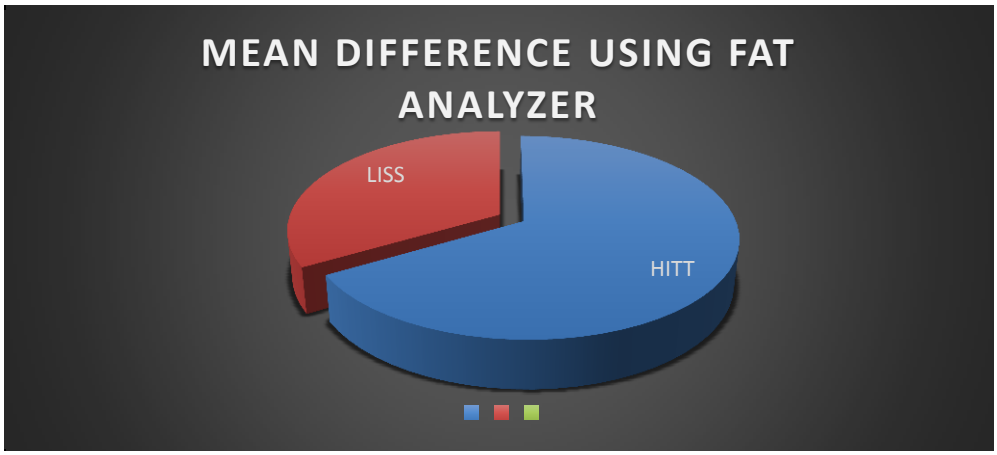

Chart 3: mean difference of HIIT and LISS using body fat analyser

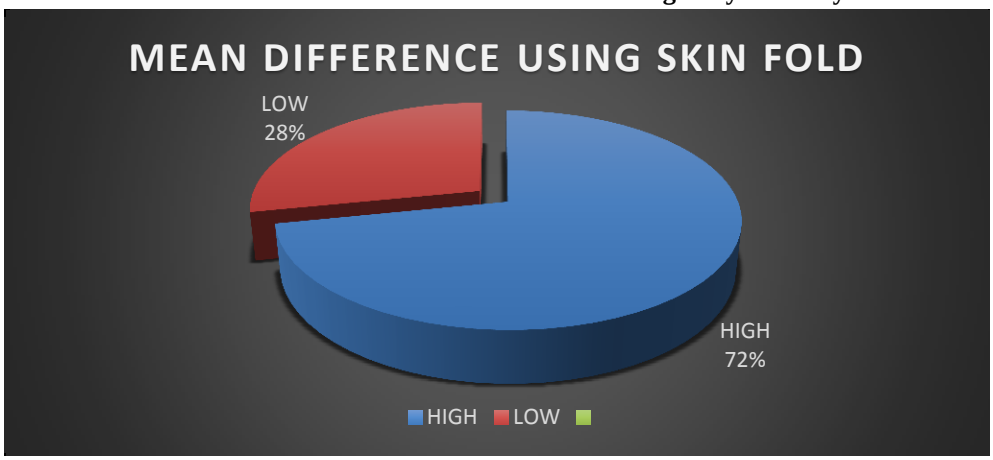

Chart 4: mean difference of HIIT and LISS using skin fold callipers

DISCUSSION

The current study demonstrates that both HIIT and LISS were efficient in reduction of body fat%, since the P values indicate that there was significant difference in the pre post values of both the groups. But since the difference between the pre and post values of HIIT was more significant than LISS, it shows that HIIT is more efficient in reduction of body fat%. The possible reasons for greater fat loss in HIIT could be that it increases the $V0_{2max}$ and the aerobic power with a significant level that will help burn fat reservoirs to a greater extent. Towards the end of an HIIE session that consists of numerous repeat sprints (e.g., ten 6-second bouts of maximal sprinting) an inhibition of anaerobic glycogen lysis occurs and ATP resynthesis is mainly derived from PCr degradation and intramuscular triacylglycerol stores. That increased venous glycerol accompanied HIIE in both trained female cyclists and untrained women supports the notion that acute HIIE progressively results in greater fatty acid transport. It is feasible that the catecholamine's generated by HIIE could influence post exercise fat metabolism. Increased fat oxidation after HIIE may also occur as a result of the need to remove lactate and H+ and to resynthesize glycogen. The elevated GH levels documented after a bout of HIIE may also contribute to increased energy expenditure and fat oxidation. One reason may be the so-called after

burn effect, in which the metabolism remains elevated for hours — and sometimes even days — after an intense workout. Regular HIIT workouts also improve your ability to withstand the rigors of other types of interval training. The aching sensation in your muscles that accompanies a hard sprint (which results from burning carbohydrates for fuel) becomes less intense and subsides more quickly over time, allowing you to work at a higher intensity with less rest. Your capacity to transition smoothly from burning fat (before your workout and during rest periods) to burning carbohydrates (during your work intervals) and back again — known as your "metabolic flexibility" — improves with HIIT, as well. Together, these metabolic benefits bolster health and athletic performance, particularly in sports requiring short bursts of all-out effort interspersed with periods of reduced effort, such as basketball or martial arts. All these benefits result from time-efficient workouts that are much shorter than your average lower-intensity cardio session. Just six HIIT workouts performed over two or three weeks, each lasting just a few minutes, produced measurable improvements in key markers of cardiovascular health. Regardless of your goals, it's hard to argue against including at least some HIIT in your routine, which helps reduce body fat and increases your endurance.

CONCLUSION

1. The conclusion based on the evidence and results, strongly emphasized that both the groups viz. HIIT and LISS are effective in reduction of body fat%.
2. This study also emphasized that HIIT is more effective than LISS in reduction of body fat%.
3. Hence, it can be said that HIIT is an excellent workout protocol which involves lesser time and gives better results for reducing body fat and increasing the BMR and endurance of the individual, hence making the individual fit.

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