May 6th, 12:00 AM

Effect of High Intensity Interval Training vs Low Intensity Training on Fat Loss in Patients with Obesity

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Abstract

Nowadays, there are several exercise modalities to lose weight, retain, and or build lean body mass. A widely known training philosophy that has gained increased popularity is high-intensity interval training (HIIT). HIIT is based on exercising at submaximal or maximal intensity for a brief period then reducing work to minimal intensity for a longer duration in a series of repeated bouts. The benefit of HIIT is to increase fat loss through the scientific principle of EPOC (excess post-exercise oxygen consumption). Low intensity training (LIT) also has its benefits in that it is more sustainable but with the caveat of it being longer duration and slower rate of fat loss. The goal of this research study was to elicit the effect of HIIT and LIT on fat mass, lean body mass, total body water and motivation to maintain an exercise regimen. Ultimately it was found that LIT tends to make obese patients lose more body fat and keep them adhered to a program versus HIIT; also, just having obese patients on a weight loss program also produces statistically significant results in body fat reduction.

Background

The application of HIIT should be consistent in its benefits for all population types. Unfortunately, this is not always the case for patients with obesity. It turns out that at the Center for Medical Weight Loss and Metabolic Control in Stratford, NJ, patients with obesity were prescribed LIT rather than HIIT due to loss of lean body mass. As a result, the patients mostly lost a high percentage of body fat. If these patients were to do HIIT we could expect an overall higher amount of calories burned but the percentage of fat burned will be less and lean tissue making up the difference. Also, adherence to a HIIT program would diminish due to intensity and muscle loss. We hypothesized that reducing the intensity of exercise for patients with obesity maximizes fat loss and retain lean body mass.

Methods

Three groups (10 subjects per group) of patients with a BMI greater than 25 were recruited, and written consent was obtained. The study was approved by Rowan SOM Institutional Review Board (IRB). This study was single-blinded, where once patients/subjects were recruited, they were randomized and allocated to one of three groups – a) Control Group, b) High-intensity Interval training group (HIT), and c) Low-intensity longer duration (LIT) group. The ***control group*** received personalized nutritional counseling and instruction on daily activity (up to 45 minutes daily) and on strength training (2 times per week 2 days apart). They were told to perform whole-body strength training during the strength training session and were allowed to do the exercises the way they saw feasible. The ***High-intensity interval training (HIIT)*** group was given similar instruction as the control group with the addition of HIIT 2 times per week

Results

Table 1

Pre- and Post-Test Means, Standard Deviations, and Wilcoxon Signed Ranks Tests for Weight, BMI, % Body Fat, % Muscle, and % Body Water

Sample	Variable	N	Pre-Test		Post-Test		Wilcoxon Signed Ranks Test	
Control		9	M	SD	M	SD	Z	p
	Weight		202.23	40.80	194.00	43.36	2.67	0.008
	BMI		33.76	5.74	32.30	6.27	2.67	0.008
	% Body Fat		45.85	5.46	44.09	6.11	2.43	0.015
	% Muscle		50.41	11.33	49.08	10.17	1.24	0.214
	% Body Water		39.68	3.81	41.19	4.38	2.31	0.021
HIIT		6						
	Weight		246.45	58.38	238.28	58.31	1.57	0.116
	BMI		36.74	5.80	35.45	5.49	1.57	0.116
	% Body Fat		44.58	5.11	43.48	4.55	1.57	0.116
	% Muscle		69.12	21.84	67.85	22.98	1.15	0.249
	% Body Water		41.29	3.60	41.89	3.22	0.94	0.345
LIT		9						
	Weight		207.59	51.08	201.46	51.55	2.31	0.021
	BMI		34.82	7.60	33.88	7.61	2.25	0.024
	% Body Fat		44.34	6.37	42.82	6.20	2.43	0.015
	% Muscle		54.86	10.91	54.24	11.49	0.77	0.441
	% Body Water		41.46	4.67	42.50	4.52	2.43	0.015

Table 1 gives the means, standard deviations, and Wilcoxon Z tests comparing each of the three groups with respect to their pre- and post-test scores. SPSS 26.0 was used to perform the statistical analyses. As the table shows, the pre- and post-test changes in weight, BMI, % Body Fat, and % Body Water were statistically significant for the Control and LIT groups, whereas none of the differences was significant for the HIT group. Unfortunately, the sample sizes were too small to assess whether the mean improvements for the same variables that were found for both the Control and LIT groups were statistically comparable. However, the mean differences for Weight, BMI, % Body Fat, and % Body Water for the Control and LIT groups were, respectively, 8.23 lbs, 1.46, 1.85%, and 1.42% and 6.13 lbs, .94, 1.56%, and 1.04% suggesting that the significant improvements were clinically similar in both groups.

Methods Cont.

for 30 minutes, supervised by a personal trainer. The ***Low-Intensity training (LIT) – long-duration*** group was given similar instruction as the control group with the addition of low intensity-long duration exercises 2 times per week for 45 minutes - 1 hour, also supervised by a personal trainer. These sessions were conducted at a university fitness facility. The data that was recorded include the patients' progress every two weeks for a total of six weeks - BMI, body fat percentage, lean body mass, and total body water via bioelectrical impedance analyzer (Seca mBCA 514 machine), and macronutrient intake via a fat-secret app (free app on AppStore for iOS and android).

At the first visit for the exercise session, subjects were screened to determine the overall fitness level. Screening assessments that were determined was target heart rate (which would determine the goal intensity for HIIT or LIT) and flexibility (determines ROM for exercises). With this assessment every session was curated specific to the individual.

Discussion

This study was aimed at patients with a BMI greater than 25 on two different fitness programs that were also eating at their daily calorie requirements – ultimately leading to a calorie deficit with exercise. It is worth noting that most research studies that incorporate HIIT and LIT only use one or two types of training modalities (running or bicycle). This study, integrated multiple different forms of equipment that were used in varying intensities. The outcome did not reflect several research studies that concluded both HIIT and LIT on body fat loss being equal; the only difference being that BMI and muscle percentage was affected in both groups, with a greater loss in the HIIT group.

Conclusion

After reviewing all of the data, the present results found that just participating in a weight loss program or volunteering for a LIT modality affords similar improvements in fat loss and preserving lean body mass in people with obesity. It is also worth noting that muscle mass will decrease due to the implementation of both diet and exercise resulting in a calorie deficit in people with obesity; and this being more so evident in the implementation of HIIT.

Future studies should look further at the use of exercise prescription and create algorithms based on patient populations. This provides a very effective treatment for patients that empowers them and they can physically witness the benefit of improved fitness and wellness.