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The Impact of Virtual HIFT and HIIT Exercises on Physical Fitness and Health Indicators in Overweight Women

Fariba Farahbakhsh [1] *, Mohsen Aminaei [2], Mehdi Abbasipoor [3], Mana Aminaie [4]

[1] *Faculty of Sport Sciences, Shahid Bahonar University of Kerman, Iran,* [2] *Faculty of Sport Sciences, Shahid Bahonar University of Kerman, Iran B,* [3] *Faculty of Sport Sciences, Shahid Bahonar University of Kerman, Iran C,* [4] *Doctor of Medicine, Kerman University of Medical Sciences, Iran D*

ABSTRACT: Physical activity can significantly influence physical fitness and health indicators. This study aims to investigate the effects of high-intensity functional training (HIFT) and high-intensity interval training (HIIT) on the physical fitness and health indicators of overweight women.

Thirty-nine overweight housewives from Kerman City (BMI=25-29 kg/m2) participated through virtual networks. The participants were matched based on their BMI to High-Intensity Interval Training (HIIT=13), High-Intensity Functional Training (HIFT=13), and control groups (Control=13). The evaluated variables included aerobic power (Queen's scale), anaerobic power (Wingate), body mass index (BMI), body fat (skinfold calipers), waist-to-hip ratio (WHR), triglyceride, cholesterol, HDL and LDL levels, total cholesterol (TCT), and the LDL to HDL ratio. The HIIT and HIFT exercises were conducted in three sessions per week for eight weeks. Data was analyzed by covariance and post hoc Bonferroni test ($P<0.05$).

There was a significant increase in anaerobic power ($P<0.05$). Both groups showed an increase in BMI and a decrease in triglyceride, LDL, and cholesterol levels compared to the control group. Additionally, HDL levels significantly increased in both exercise groups. In comparison with the HIIT group, the HIFT group exhibited a reduction in LDL levels and LDL to HDL ratio and a decrease in body fat percentage ($P<0.05$).

Both HIIT and HIFT exercises can be beneficial for improving the health and fitness of overweight women. However, when considering health and fitness indicators, HIIT exercises appear to be more effective, particularly in terms of changes in fat profile and anthropometric measurements.

KEY WORDS: Overweight women, Lipid profile, aerobic, anaerobic, Anthropometry

Introduction

In 2018, the global prevalence of overweight or obesity exceeded two billion people, accounting for approximately 34% of the world's population. Obesity-related conditions contribute to 5% of global deaths (1). In Iran, the prevalence of obesity is 21.7% among individuals over 18 years old and 6.1% among those under 18, while the rates of overweight are 10.8% and 3.4%, respectively (2). These conditions pose significant health risks and are associated with various diseases, including cardiovascular diseases, diabetes, and cancer (3).

Overweight is defined as having a body mass index (BMI) between 25 and 29.9 kg/m2, whereas obesity is classified as having a BMI of 30 kg/m2 or higher (1, 4). Obesity is commonly linked to several diseases such as diabetes, hypertension, arthritis, and cardiovascular diseases. Accumulation of excess fat, particularly in the abdominal region, poses a greater risk as it is strongly associated with cardiovascular disease and type 2 diabetes (5). The causes of overweight and obesity can vary, ranging from genetic factors to environmental influences. Heritability accounts for 25-40% of BMI or body fat content, indicating that environmental factors also play a crucial role. Factors like family environment, genetic predisposition, physical activity, non-smoking, high-quality diet, sedentary behavior, and maintaining a normal weight all contribute to overweight and obesity. These lifestyle factors are essential in understanding the obesogenic environment, which is influenced by family, sports, leisure time, eating habits, and social education (6).

Exercise has been shown to have a positive impact on blood lipids and lipoproteins, resulting in decreased total cholesterol (TC), low-density lipoprotein cholesterol (LDL-C), and triglyceride levels, as well as increased high-density lipoprotein cholesterol (HDL-C) levels (7). Physical activity is a vital lifestyle behavior that affects body weight, physical fitness, body composition, and various health indicators. It plays a crucial role in the prevention and treatment of overweight and obesity. Changes in fat profile and improvements in related ratios can be achieved through regular physical activity. High-intensity interval training (HIIT) has gained attention among researchers in sports science due to its effectiveness in improving fat profile and health indicators such as BMI, waist circumference, hip circumference, and waist-to-hip ratio (WHR) through enhanced energy expenditure. Similarly, high-intensity functional training (HIFT), which utilizes body weight exercises without specialized equipment, has been found to yield similar benefits to HIIT (8-12).

It appears that the rate of obesity in Iran is high (2), and the onset of the COVID-19 pandemic, along with the restrictions on physical activity, may contribute to the worsening of overweight and obesity. Given the circumstances of the COVID-19 pandemic, concerns about pollution, and the fear of contracting the disease, virtual home-based exercise has emerged as a viable option. This study aims to investigate the effects of two virtual training programs, namely HIFT and HIIT, on body composition (body fat percentage, body fat mass, and body fat-free mass) and fat profile. Implementing these exercise protocols virtually offers advantages such as time savings, elimination of travel to and from training locations, ease of implementation, and importantly, reduces the risk of COVID-19 transmission.

Methods

This study utilized a semi-experimental design with a pre-test and post-test, involving two experimental groups and one control group.

The target population consisted of 46 overweight housewives with a BMI between 25 and 29 kg/m2 in Kerman city. Participants were recruited through virtual networks.

Thirty-nine overweight women with a BMI between 25 and 29 were matched and assigned to three groups: HIFT (n=13), HIIT (n=13), and control (n=13), based on their BMI. Prior to participation, informed consent forms were completed by all participants. They were advised to adhere to dietary restrictions during the exercise protocol and maintain their regular food consumption routine.

The evaluated variables included aerobic power (measured using the Queen's Staircase test), anaerobic wheel power (Wingate), body mass index (BMI), body fat percentage (measured using a four-point skinfold measurement), waist-to-hip ratio, triglyceride levels, cholesterol levels (using a pars test kit), HDL and LDL levels, total cholesterol (TCT) levels (Randox laboratory kit with enzymatic calorimetric method), and LDL to HDL ratio.

Following the pre-test stage, the virtual HIIT and HIFT exercises commenced, with the researcher providing online follow-up. The exercise duration spanned eight weeks, with three sessions conducted per week.

A week prior to the start of the training protocols, a comprehensive orientation session was conducted. During this session, participants were provided with an explanation of all program details, benefits, and potential risks. The correct execution of HIIT and HIFT exercises was demonstrated, and participants were taught the precise pacing technique. All movements were thoroughly explained through video demonstrations and subsequently followed up through virtual networks such as WhatsApp and Instagram. After the pre-test stage, the practice phase commenced and post-test finally.

Ethical principles for medical research and human participants were followed throughout this study and evaluated by research ethics committee certificate number IR.UK.REC.1401.002.

HIFT Exercise Protocol

Participants in the high-intensity functional training (HIFT) group performed a series of functional exercises utilizing their own body weight. According to previous research, each training session consisted of eight movements, with each movement performed for 20 seconds (13, 14). The movements included in the protocol were as follows: in situ butterfly, side squat, mountain climbers, and forearm plank, push up, heel-to-hip movement, jumping jacks, and two-position exercise (three repetitions). A 10-second recovery period was allowed between each movement, and there were no rest intervals within the session. The total training time for each session was 4 minutes. The principle of overload was applied by adjusting the movement speed and heart rate based on individual capacity.

HIIT Exercise Protocol

The high-intensity interval training (HIIT) protocol involved participants walking at maximum speed for specific distances. Participants were instructed to walk 10 meters to one end, then 20 meters to the other end, and finally another 10 meters to the middle, completing a total distance of 40 meters in 30 seconds. This protocol was then repeated after a 30-second rest period. The number of repetitions per session progressively increased over the course of the program. In the first two weeks, participants completed four sets of the 30-second walking protocol. In the third and fourth weeks, five sets were performed. The fifth and sixth weeks involved six sets, and finally, the seventh and eighth weeks included seven sets. Exercise intensity was estimated using the heart rate calculated from the age-220 formula (15).

Statistical Analysis

Data analysis included central and dispersion indices. The Shapiro-

Wilk test was used to assess the normality of the data distribution, while Levin's test was employed to assess the equality of variance among variables. For inferential statistics, an analysis of covariance (ANCOVA) test and Bonferroni post hoc test were conducted for inter-group comparisons. Additionally, dependent t-tests were used to assess within-group effects. Data analysis was performed using SPSS version 22 software, with a significance level P<0.05.

Results

The normality of the data and the normal distribution of the data in all three groups were assessed using the Shapiro-Wilk and Levin tests. Descriptive information and differences between pre- and post-test variables were examined for each group, and the results are presented in Tables 1, 2, and 3.

Tables 1

Mean and standard deviation andcompare the pre-and post-test in the groups

Variable		HIIT	p	HIIT	p	Control	p
Age (yrs)	--	31.53±4.07	-	30±3.74	-	32±3.71	-
Height (cm)	--	162.15±3.82	-	159.84±5.39	-	160.15±4.05	-
Weight (kg)	pre	75.5±5.98	0.002 *	72.05±4.99	0.001 *	72.26±5.83	0.627
	post	71.88±6.80		69.23±5.03		72.37±5.64	
BMI (kg/m2)	pre	28.67±1.42	0.002 *	28.19±1.46	0.001 *	28.15±1.76	0.663
	post	27.30±1.93		27.08±1.26		28.19±1.61	
BF (%)	pre	30.54±2.36	0.001 *	28.30±2.22	0.001 *	30.54±2.36	0.091
	post	30.65±2.47		27.31±2.24		30.65±2.47	

Control group (C=13), High-Intensity Interval Training (HIIT=13), High- Intensity Functional Training (HIFT=13), * Significant at level p≤0.05

Significant differences were observed in several variables between the HIIT and HIFT groups, including body weight, body mass index, fat percentage, waist-to-hip ratio, average and peak anaerobic capacity, aerobic capacity, LDL, HDL, cholesterol, TG, and LDL/HDL ratio. However, no significant changes were observed in the control group.

Table 4. presents the results of covariance analysis for all variables, including BMI, fat percentage, mean and peak anaerobic power, LDL, HDL, cholesterol, and TG, in the HIIT, HIFT and control groups. It indicates a significant difference between the groups, except for waist-to-hip ratio, aerobic capacity in groups, and LDL/HDL ratio in pre-test.

Tables 2

Mean and standard deviation andcompare the pre-and post-test in the groups

Variable		HIIT	p	HIIT	p	Control	p
W/HR (cm/cm)	pre	0.81±0.02	0.011*	0.83±0.13	0.852	0.81±0.07	0.948
	post	0.79±0.04		0.83±0.12		0.81±0.09	
Mean Power (W/kg)	pre	1.70±1.23	0.009*	1.87±1.29	0.003*	1.70±1.23	0.579
	post	1.68±1.19		2.15±1.39		1.68±1.19	
Peak power (W/kg)	pre	4.19±0.92	0.034*	4.80±3.11	0.470	4.19±0.92	0.571
	post	3.98±1.51		5.0±2.49		3.98±1.51	
VO2max (ml/kg/min)	pre	34.08±2.13	0.007*	35.86±2.28	0.014*	34.08±2.13	0.559
	post	34.26±2.81		36.58±2.06		34.26±2.81	

Control group (C=13), High-Intensity Interval Training (HIIT=13), High-Intensity Functional Training (HIFT=13), * Significant at level p≤0.05

Tables 3

Mean and standard deviation and comparethe pre-and post-test in the groups

Variable		HIIT	p	HIIT	p	Control	p
LDL (mg/dl)	pre	107.07±24.16	0.010*	127.9±32.83	0.012*	107.07±24.16	0.427
	post	109.0±24.06		123.93±31.79		109.0±24.06	
HDL (mg/dl)	pre	41.34±7.89	0.0010*	42.11±8.29	0.001*	41.36±7.89	0.804
	post	40.84±12.08		48.30±10.85		40.84±12.08	
Cholesterol (mg/dl)	pre	177.46±27.26	0.0010*	197.69±40.45	0.001*	177.46±27.26	0.574
	post	178.69±25.09		184.30±41.25		178.69±25.09	
TG (mg/dl)	pre	145.46±76.32	0.020*	138.0±77.31	0.002*	145.46±76.32	0.305
	post	147.07±78.81		128.0±70.16		147.07±78.81	
LDL/HDL	pre	2.73±0.33	0.0010*	3.14±0.45	0.056*	2.73±0.33	0.622
	post	2.84±0.74		2.71±0.42		2.84±0.74	

Control group (C=13), High-Intensity Interval Training (HIIT=13), High-Intensity Functional Training (HIFT=13), * Significant at level p≤0.05

Table 4

Results of covariance to compare in the pre-test, post-test, and groups of variables

		F	P
BMI (kg/m2)	Pre-test	120.985	0.001*
	Groups	11.395	0.001*
BF (%)	Pre-test	1351.357	0.001*
	Groups	137.639	0.001*
WHR (cm)	Pre-test	176.992	0.001*
	Groups	1.199	0.314
Mean Power (W/kg)	Pre-test	606.312	0.001*
	Groups	5.880	0.007*
Peak Power (W/kg)	Pre-test	3.633	0.001*
	Groups	3.490	0.042*
VO2max (ml/kg/min)	Pre-test	200.535	0.001*
	Groups	2.37	0.108
LDL (mg/dl)	Pre-test	241.205	0.001*
	Groups	8.628	0.001*
HDL (mg/dl)	Pre-test	54.518	0.001*
	Groups	6.460	0.001*
Cholesterol (mg/dl)	Pre-test	477.105	0.001*
	Groups	13.294	0.001*
TG (mg/dl)	Pre-test	1566.550	0.001*
	Groups	6.852	0.003*
LDL/HDL	Pre-test	0.154	0.697
	Groups	9.455	0.001*

Control group (C=13), High-Intensity Interval Training (HIIT=13), High-Intensity Functional Training (HIFT=13), * Significant at level p≤0.05

In terms of the percentage of body fat, significant differences were found both between the experimental group and the control group, as well as between the HIIT and HIFT groups.

In WHR and VO2max there was no significant difference between the two experimental groups and the control group. In addition, no difference was found between the HIIT and HIFT experimental groups.

The variables of mean anaerobic power, a significant difference was observed between the two experimental groups and the control group. However, no difference was found between the HIIT and HIFT experimental groups.

At peak anaerobic power, the only significant difference observed was between the control group and the HIIT training group. No significant difference in aerobic capacity was found between the groups.

Examining the LDL blood variable, a significant difference was observed between the control group and the HIIT exercise group, whereas this difference was not seen with the HIFT exercise group. Furthermore, there was a significant difference between the two HIIT experimental groups and the HIFT group.

Regarding the variables of HDL, cholesterol, and TG, a significant difference was observed between the two experimental groups and the control group. However, no difference was found between the HIIT and HIFT experimental groups.

Lastly, when considering the LDL to HDL ratio, a significant difference was evident between the control group with HIIT training and the HIFT training group with HIIT. However, this difference was not observed between the control groups with HIFT training.

Table 5

Bonferroni post-hoc test of means difference comparing groups in post-test

Groups		**HIIT**	**HIFT**
BMI (kg/m2)	C	1.372*	1.149*
	HIIT	---	---
	HIFT	0.223	---
BF (%)	C	2.449*	1.135*
	HIIT	---	---
	HIFT	1.315*	---
WHR (cm)	C	0.018	0.003
	HIIT	---	---
	HIFT	0.021	---
Mean Power (W/kg)	C	0.371*	0.314*
	HIIT	---	---
	HIFT	0.057	
Peak Power (W/kg)	C	1.065*	0.517
	HIIT	---	---
	HIFT	0.503	---
VO2max (ml/kg/min)	C	---	
	HIIT	0.22	---
	HIFT	0.34	0.12
LDL (mg/dl)	C	14.474*	3.021
	HIIT	---	---
	HIFT	11.449*	---
HDL (mg/dl)	C	8.456*	6.689*
	HIIT	---	---
	HIFT	1.766	8.98
Cholesterol (mg/dl)	C	16.116*	13.342*
	HIIT	---	---
	HIFT	2.775	---
TG (mg/dl)	C	12.785*	11.955*
	HIIT	---	---
	HIFT	0.829	---
LDL/HDL (mg/dl)	C	0.951*	0.129
	HIIT	---	---
	HIFT	0.822*	---

Control group (C=13), High-Intensity Interval Training (HIIT=13), High-Intensity Functional Training (HIFT=13), * Significant at level $p \leq 0.05$

Discussion

Aerobic and anaerobic power

In the present study, it was observed that there were no significant changes in aerobic power among the groups studied. However, there was a significant difference in anaerobic power between the HIIT training group and the control group. These findings are consistent with the studies conducted by Menz et al. (2019) (16) but inconsistent with the studies conducted by Ouerghi et al. (2014) and Knowles et al. (2015) (17, 18).

Aerobic activities are known to improve athletic performance. However, HIIT training may not significantly enhance aerobic capacity due to factors such as lactic acid production and the utilization of creatine phosphate during training. It is important to note that the conflicting results might be attributed to variations in HIIT protocols and the participants' fitness levels. If the duration of the training protocols is longer, it is more likely to have an impact on aerobic capacity.

Research by Nakahara et al. (2015) demonstrated that performing HIIT exercises can improve aerobic capacity, particularly in healthy young men (19). They found that maintaining repetitions while reducing the workload did not have a detrimental effect on improving aerobic capacity in young men. Overall, it appears that the total time spent on HIIT activity per session and the duration of recovery intervals play a crucial role. This has important implications for exercise prescription, especially among overweight women who are sedentary and may prefer shorter work-to-rest ratios due to better tolerance.

Lipid profile

In the present study, it was found that eight weeks of virtual HIFT and HIIT exercises had a significant effect on various aspects of the fat profile in overweight women, including triglyceride levels, HDL cholesterol, LDL cholesterol, total cholesterol, and fat percentage.

Previous studies examining the impact of exercise on plasma lipids have generated conflicting results. Some studies have shown that physical training does not have a significant effect on lipid profiles. For instance, Imamoglu et al. (2005) observed no notable differences in plasma lipids between groups with varying levels of physical training (20). These findings have been echoed by several other studies as well.

It is worth noting that HDL cholesterol is generally more prevalent in women, whether sedentary or engaged in exercise, compared to men. On the other hand, LDL cholesterol tends to be lower in women. Some researchers suggest that changes in lipid and lipoprotein profiles may be influenced more by gender than by exercise itself (20).

However, other studies have reported significant changes in lipid profiles among athletes and untrained individuals following continuous or intermittent aerobic exercise. Factors such as the study design (including randomization methods), participant characteristics (such as race, ethnicity, use of medications affecting plasma lipids, smoking habits, alcohol consumption, diet, and baseline physical activity levels), and overall fitness level could contribute to the discrepancies observed across studies.

The present study builds upon previous research indicating the positive effects of HIFT on various aspects of health in individuals with type 2 diabetes. Specifically, after six weeks of HIFT training, significant improvements were observed in beta-cell function, accompanied by reductions in body fat and the preservation of lean mass (21).

Furthermore, the effectiveness of a six-week HIFT intervention in improving cardiometabolic risk factors has been reported. This intervention resulted in improvements in blood pressure, body composition, fat oxidation, plasma triglyceride levels, and very low-density lipoprotein (VLDL) cholesterol (22). These findings are promising for individuals with type 2 diabetes.

In line with these results, the present study found improvements in body fat (BF) in the HIFT group, which is particularly beneficial for individuals with type 2 diabetes. The reduction in glucose uptake in the legs reported by Olsen et al. (2005) may also improve with an increase in lean body mass, which could be achieved through HIFT training (23).

Regarding lipid profiles, Martinez et al. (2010) demonstrated that exercise can lead to decreases in total cholesterol (TC), LDL cholesterol (LDL-C), triglycerides (TG), and the TC/HDL-C ratio (24). Exercise programs that lower lipid profile levels have also been associated with increased strength in postmenopausal women (25). However, it is important to note that not all exercise programs result in lipid profile improvements, and there seems to be a dose-response relationship between physical activity levels (intensity and duration) and serum lipid levels (TC, TG, HDL-C, and TC/HDL-C) in both adult women and men (24, 25).

In support of these findings, Cox et al. (2002) demonstrated lower TC and LDL-C levels after six months of higher-intensity exercise in moderately sedentary and elderly women (25).

It is worth noting that the effectiveness of exercise interventions on lipid profiles can vary depending on factors such as the duration, intensity, and type of exercise, as well as the characteristics of the study participants. In the case of Sillanpaa et al. (2009) study, which involved heavy endurance and resistance training in healthy middle-aged and older men, no changes in total cholesterol (TC), triglycerides (TG), and LDL cholesterol (LDL-C) were observed after 21 weeks (26).

However, it is important to consider the clinical significance of even small reductions in TC and LDL-C levels. A 1% reduction in TC has been shown to correspond to a 2% reduction in the risk of coronary artery disease (27). Martinez et al.'s study (2010) demonstrated that participants in an exercise program achieved a reduction in their risk by approximately 12%. Similarly, a 1% reduction in LDL-C has been associated with about a 2% decrease in the risk of major coronary events, which in the mentioned study represented a 26% reduction (24).

Triglycerides are indeed an important source of energy during endurance physical activity. The impact of exercise on triglyceride levels can vary depending on multiple factors, including the duration and intensity of the activity, individual metabolic factors, and dietary considerations.

Lipoprotein lipase (LPL) is an enzyme involved in the release of free fatty acids (FFAs) from triglycerides for energy utilization during aerobic activity. Physical activity and exercise, particularly aerobic exercise, have been shown to increase HDL cholesterol levels, which can impact the activation of enzymes like LPL and acyl-CoA synthetize cholesterol transferase, while also decreasing liver lipase activity (24).

Regular exercise can lead to fat loss, including a reduction in visceral fat, even without significant weight loss. Exercise promotes hormone-stimulated fat lipolysis, increasing the availability of circulating fatty acids. When combined with a sustained increase in metabolic rate (VO2), this results in enhanced uptake and oxidation of fatty acids in the working muscles. While the exact mechanism behind preferential fat reduction is not fully understood, it is believed that hormonal changes related to exercise influence the lipolysis of visceral adipose tissue. HIIT exercises, characterized by short bursts of intense effort, have been shown to increase catecholamines (epinephrine and norepinephrine) and growth hormone, which stimulate lipolysis. Therefore, HIIT may be effective in reducing visceral fat.

However, it is important to note that increased lipolysis and fatty acid availability through HIIT do not necessarily guarantee significant increases in fatty acid oxidation and subsequent fat loss. The total amount of fat oxidation during and after exercise depends on factors such as fatty acid availability, metabolic rate, and exercise duration. In the case of HIIT, the overall fat oxidation may still be compromised due to the nature of the training (27).

Anthropometry

In the present study, both training methods (HIFT and HIIT) resulted in significant changes in anthropometric parameters such as body mass index (BMI), fat percentage, and waist-to-hip ratio (WHR) compared to the control group. However, no significant differences were observed between the two training groups.

Previous studies have also reported significant improvements in anthropometric measures following HIIT interventions compared to control groups or other types of exercise interventions. For instance, HIIT has been shown to yield greater improvements in cardio-metabolic variables compared to moderate-intensity interval training (28). In overweight children, HIIT programs have led to significant reductions in total skin folds compared to low-intensity interval training (29).

Comparisons between different variations of HIIT programs have also demonstrated significant results in terms of anthropometric changes. Russell et al. (2016) compared HIIT programs with HIIT-plus-plyometric programs and found that both approaches, along with a moderate-intensity endurance training program, produced significant improvements in BMI, fat percentage, and weight (30).

Studies focusing on high-intensity games as a form of intervention have shown significant improvements in anthropometric parameters among obese children compared to control groups (31). However, it is important to note that not all studies with similar characteristics have reported significant anthropometric changes. For example, McNarry et al. (2015) who conducted an intervention similar (32) to that of Lambrick et al. (2016), did not observe significant anthropometric changes (31).

These findings suggest that both HIFT and HIIT interventions can lead to significant improvements in anthropometric measures compared to control groups. However, the specific outcomes may vary depending on factors such as the characteristics of the intervention, including intensity, duration, and exercise modality, as well as individual participant factors.

Indeed, several studies have shown comparable or even superior results in body composition outcomes when comparing HIIT training to traditional endurance training. One notable advantage is that the duration of HIIT training sessions can be significantly shorter than those of endurance training while still yielding similar benefits (33).

In the context of weight loss interventions for obese adolescents, HIIT training has been found to be more effective than endurance training. This may be attributed to a greater increase in the rate of fat oxidation and a larger decrease in BMI observed with HIIT (34). Russell et al. also reported that HIIT resulted in greater reductions in body fat percentage compared to moderate-intensity interval training (MIIT). Additionally, HIIT was associated with greater weight loss in obese adolescents compared to moderate exercise interventions (35).

Another advantage of high-intensity exercise, particularly HIIT, for individuals with obesity and cardiovascular health is its potential to improve parasympathetic tone and cardiac autoregulation in obese adolescents (36). This suggests that HIIT may have additional cardiovascular benefits beyond weight loss.

The primary goals of weight management programs typically include promoting an active lifestyle, reducing body fat, and improving fitness. In order to achieve adipose tissue reduction, it is important to increase physical capacities and optimize fat oxidation during exercise (34).

Conclusion

Controllable limitations include the age, volume, intensity, duration of exercises, BMI, and gender of subjects.

Uncontrollable limitations include:

- Lack of control over the mental and psychological conditions of the subjects and their motivation during the research
- Failure to control the level of responsibility of the subjects during the training period
- Lack of strict control of their day and night activity as well as the amount of their sleep
- Lack of control over the subjects' menstrual cycle
- The effect of individual and hereditary differences on research results

The findings suggest that both HIIT and HIFT exercises can be beneficial for improving the health levels of overweight women. However, when considering health and fitness indicators, HIIT exercises demonstrated greater effectiveness. This was particularly evident in factors such as fat profile and anthropometric changes.

The exercise programs implemented in this study resulted in significant improvements in body fat (BF), waist circumference (WC), body mass index (BMI), triglycerides (TG), total cholesterol (TC), and high-density lipoprotein cholesterol (HDL-C) among overweight women. These results indicate that both HIIF and HIIT exercises, when performed for a duration of 8 weeks, have positive effects on the health and fitness indicators of overweight women.

It is important to note that this study had limitations in terms of not investigating inflammatory and oxidative factors, which could provide a more comprehensive understanding of the effects of HIIT and HIFT exercises. Future studies examining these factors can contribute additional information to the field.

Conflict of interest

The authors certify that they have no affiliations or involvement, organization, or entity with any financial interest or non-financial interest in the subject matter or materials discussed in this manuscript.

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