Original Research Article

Effect of High Intensity Intermittent Exercise on Cardiometabolic Parameters in Obese Individuals

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Received: 26-04-2021 / Revised: 11-06-2021 / Accepted: 29-07-2021

Abstract

Background with Method: The current study clarifies the cardiometabolic health effects of high-intensity interval training (HIIT) in adults**.** **Method:** Study was classified by interventional andinterval of exercise andBMI. subjects were divided into obese and non-obese. Blood sample were taken for glucose levels andlipid profile**. Result**: Outcomes were measured after 12 weeks of training. The result showed significantly improvement in blood glucose level and lipid profile;(p<0.01). The cardiometabolic parameters also showed significant improvement in SBP, DBP, HR ;(p<0.01). **Conclusion:** Findings of the present study indicates that HIIT may be an effective training protocol for improving VO2 max, cardiometabolic risk factors such as WC, % body fat, resting HR, SBP, DBP and fasting glucose in overweight populations. in overweigh, performing HIIT results in significant, positive, physiological editions that improve cardiometabolic health and may reduce the development and development of disease-related risk factors that are associated with overweight and low aerobic fitness. However, whether these metabolic adaptations following HIIT is favourable to normal weight populations still needs further scrutiny. HIIT may serve as a time-efficient additional or as a compliment to commonly recommended MICT in improving cardiometabolic health. Health practionersare advised to recommend HIIT performed for 12 weeks as part of their exercise programme to improve cardiorespiratory fitness and to reduce body fat in overweight/ obese populations.

Keywords: Intensity, Exercise, Cardiometabolic& Obese.

Introduction

The WHO [1]and the American College of Sports Medicine (ACSM) [2]mentioned at least 150 min of moderate-intensity physical activity (40–60% maximum oxygen uptake (VO2 max)[3]or 75 min of High-intensity physical activity (60–85% VO2 max) per week for healthy adults to sustain or progress health. In spite of the established therapeutic potential of moderate-intensity to High-intensity physical activity, 31.1% of the adult worldwide (43% US population) fails to meet the minimum physical activity guidelines.HIIT is a larger form of anaerobic interval training (range from 85% to 250% VO2 max 6 s to 4 min) interrupted by brief but somewhat longer sessions of aerobic low-intensities (ranging from 20 percent to 40 percent VO2 max for 10 s to 5 min)[4]. More than typical moderate-intensity continuous training has demonstrated increased health benefits from HIIT compared with another research (MICT). (5-7)Compared to the MICT, aerobic capacity increase (VO2 max) and metabolic syndrome risk variables, including blood pressure (BP), insulin action and lipogenesis have been more efficiently documented in different patient populations.A desk bonded lifestyle was proven to be a forerunner to a rise in obesity, dyslipidemia and cardiovascular disorders.

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Low amounts of physical activity and bad eating habits (e.g. meals heavy in plain carbs and lipid saturation) have a significant contribution to the growth of metabolic conditions. Regular training practice has shown a decline in values of LDL-c and triacylglycerol, increasing HDL-c and reducing the probability of atherosclerosis [8,9].Various training approaches, including high intensity workouts, were proposed to treat and avoid the dangers of cardio metabolism in the fields of inflammatory and antitherogenic effects[10-13]. In addition HIIE is already proven to be useful in boosting HDL-c in association with strength training (Rossi et al., 2016). The purpose of this study was therefore to evaluate the effects on cardiometabolic markers in obese adults of 12 weeks of HIIE training.

Aim of the study

1. To measure the outcomes of HIIT exercise in obese individuals.
2. To assess the influence of HIIT exercise in cardiometabolic parameters.

Methodology

Study was conducted at Index Medical College Hospital & Research Centre, Indore from December 2018 to March 2021. Study Participants and procedures 130 subjects of both genders (65 obese individuals and 65 non obese individuals) between the ages of 25 to 45 years, were included in this study. The subjects were divided into 2 groups: High intensity intermittent exercise group and control group. Volunteers were informed about the procedures, risks and benefits, and permission was taken by signing theconsent form. Aproval was taken from the University Ethics Committee

Inclusion criteria.

1. Able to perform exercise
2. BMI<30
3. No other pathological conditions
4. Should not be on any medications.
5. Non -smokers and alcoholic.

Exclusion criteria

1. Hypertensive
2. Diabetic
3. Patients who have undergone any major surgery in the past.
4. Not able to perform exercise

Experimental design: Participants visited the laboratory for screening as follows:

1. Blood sample was taken for lipid profile, and blood glucose.
2. Heart rate, and blood pressure were measured at rest and recovery (30-minutes postexercise)
3. Anthropometric measurement was taken.
4. BMI

Participants were re-tested and outcomes were measured after completion of the 12-week of exercise training program. The control group was instructed to keep usual activities without performing any training protocols.

Maximum high intensity exercise programme

For estimation of maximal aerobic fitness, subjects performed a maximal incremental test to exhaustion on a treadmill. Each stage was 1 minutes with 8 km/h,in case the subject was not able to finish the 1-minute exercise, the speed was adjusted according to their comfort. The Results of the present studyadvise that HIIT is an effective interference to progress cardiometabolic health in overweight populations. HIIT helpfully influenced WC, VO2 max, fasting glucose and DBP, in overweight/obese people.According to our results, the proposed HIIT intervention favored clinically significant improvements of body composition, physical fitness, and blood lipid profile in overweight/obese youth.

Results

Table 1: Training program

	3 weeks	6 weeks	9weeks	12 weeks
HIIT	3× (5× 30 sec) (1:1) (100%:50% MAV)	3× (7× 30 sec) (1:1) (100%:50% MAV)	3× (7× 30 sec) (1:1) (110%:50% MAV)	3× (9× 30 sec) (1:1) (110%:50% MAV)

Example: 3× (5× 30 sec) (1:1) (100%:50% MAV) means that each intermittent subject should run at 100% MAV for 30% of the time, followed by 30% of active recovery with 50% MAV each time. Each workout consists of three sets, each five times. (1:1): reflects the workout period ratio with a period of recovery that implies that the working period is equal to the active recuperation period. MAV, aerobic speed; R, set recovery.HIIT, high-intensity interval training.

Table 2:Physical,physiological and blood variables before and after 12 weeks in control (CON) and high-intensity interval training (HIIT) groups

Variable	Control		HIIT		Anova
	Before	After	Before	After	
Weight (kg	89.3± 10.5	88.2± 11.0	91.2± 12.1	87.3± 10.5	0.96
BMI (kg/m2)	29.0± 2.2	29.2± 2.2	29.3± 2.5	28.0± 1.9	0.67
BF (%)	21.4± 1.8	21.6± 1.9	22.2± 1.6	20.7± 1.2	0.90
WC (cm	97.5± 8.7	97.9± 9.3	99.5± 8.9	95.1± 7.9	0.93
VO2max (mL/kg/min)	42.7± 5.3	41.6± 4.9	41.8± 4.7	46.6± 5.1	0.40
TC (mg/dL)	171.6± 35.3	174.4± 42.9	176.6± 34.4	151.7± 18.0	0.59
TG (mg/dL)	120.5± 41.8	124.4± 42.1	127.0± 36.3	88.4± 22.1	0.37
HDL-C (mg/dl)	38.4± 5.3	37.7± 5.9	36.6± 2.7	36.7± 3.9	0.55
LDL-C (mg/dL)	109.1± 32.9	111.7± 42.0	114.6± 33.2	97.3± 19.1	0.78

Values are presented as mean± standard deviation. ANOVA, analysis of variance; BMI, body mass index; BF, body fat; WC, Waist circumference;MAV, maximal aerobic velocity; VO2max, maximum oxygen uptake; FC max, maximum cardiac frequency; TC, total cholesterol, TG, triglycerides; HDL-C, high-density lipoprotein cholesterol; LDL-C, low-density lipoprotein cholesterol. Values are presented as mean± standard deviation.

Statistical analysis

The statistical analyses have been performed using StatView ver. 5.0 (SAS Institute Inc., Cary, NC, USA). All data are expressed as mean±standard deviation. Data was checked for normality using the Kolmogorov–Smirnov test. A two-way analysis of variance (ANOVA) with repeated measures has been performed to compare the data from the two groups before and after the intervention. Test de Mann–Whitney has been used to compare deltas (T1–T0) between groups.65 young overweight/obese males (19.4±1.1 years) with a mean weight of 90.2 kg (±10.9) and mean BMI of 29.2 kg/m² and 65 adult young non obese participated in the study.Following the training program, the HIIT group showed significant improvement in weight (-3.9± 3.2, P>0.01), BMI (-1.2±1, P>0.01)

Discussion

According to our results, the proposed HIIT intervention favored clinically significant improvements of body composition, physical fitness, and blood lipid profile in overweight/obese youth.The results of the study indicated that anthropometric measurement has increased. These results indicate that HIIT is an effective method for the reduction of corporal fat content in large fatty persons. Positive mechanisms underlying fat loss generated by HIIT include catecholamine production that increases fat oxidation and visceral fat release, reduces post-exercise hunger, and increases surplus oxygen in post-exercise use after increasing fat loss[14,15]. A reaction to catecholamine was demonstrated to rise considerably following HIIT[16,17].Since β3-adrenergic receptors are located mainly in the adipose tissue[18] and β-adrenergic receptor sensitivity in adipose tissue is increased subsequent exercise,[19] these factors might explain why HIIT is active in reducing body fat in overweight/obese individuals.These findings are similar to previous meta-analyses which have confirmed that HIIT improves aerobic fitness by moderate effects to large effects (Hedges' g=0.63, 95% CI 0.39 to 0.87; SMD 0.86, 95% CI 0.72 to 0.99) in healthy sedentary, young adults(20-23) and in adults with cardiometabolic disorders.Raciletal. (2013)[24] used a training programme similar to the ours (30 to 30) for 12 weeks and found considerable reduction in body mass and WC (-3,58 percent) in obese teenage girls (2 sorts of 6 to30 sec at 100 percent –110 percent) with a recovery interval of 30 sec at 50 percent MAV with 4 minutes of rehabilitation between series). Molina et al. (2016)[25] demonstrated that twelve nutrition analysis sessions of HIIT are beneficial in BF dropping in obese and overweight patients. Increased heart countersectility[26] and the diffuse capacity of the skeletal muscle 112, thus enhancing aerobic capacity, also enables

HIIT to enhance the volume of stroke. HIIT has also been observed to decrease HR in overweight/obese individuals significantly, but not in normal populations of weight. The results of this study are comparable with the results of which reveal a decline in heart rate after HIIT[27,28].

Htt2 the decrease in resting HR following LT-HIIT may be explained by increased stroke volume64 and enhanced cardiac autonomic function via increased baroreflex-mediated modulation of the sinoatrial node[29].Taken together, these improvements in cardiorespiratory fitness (VO2 max) and HR response provided by HIIT are important since both are self-determining interpreters of all cause and CVD mortality.BP is another commonly evaluated measure related to cardiovascular health. ST-HIIT showed no significant effect on SBP and DBP in normal weight populations. HIIT significantly upgraded DBP in overweight/obese populations with an average reduction of 4.74 mm Hg[30-32]. It was noted by that longer HIIT intervention periods are obligatory to produce a significant effect in SBP in this population[33].This is supported by the observation that LT-HIIT significantly decreased SBP and DBP in overweight/obese populations. The average reduction is 4.57 mm Hg for SBP and 2.94 mm Hg for DBP, above 4 mm Hg SBP reduction which is expected to decrease CVD mortality by 5–20%. The findings of the current study also demonstrate the beneficial impact of HIIT on blood pressure in overweight/obese populations . The mechanisms accountable for the BP lowering effect of HIIT may result from intensity-dependent increases to blood flow velocity, resulting in augmented levels of endothelial nitric oxide (NO)[34,35]. Increases in endothelial NO obtainability and bioactivity improve NO-dependent vasodilation in the vasculature, resulting in improved peripheral compliance and decreased BP[36,37]. ST-HIIT and LT-HIIT showed no significant effect on glucose/ insulin response in normal weight populations., but a decrease in fasting glucose was noted in overweight/obese populations subjected to ST-HIIT. The reason for improvement in glucose response in ST-HIIT is not fully known, but activation of AMP-activated kinase (AMPK) has been shown to increase glucose uptake in skeletal muscle via increased translocation of Glut 4.

Conclusion

Findings of the present study indicates that HIIT may be an effective training protocol for improving VO2 max, cardiometabolic risk factors such as WC, % body fat, resting HR, SBP, DBP and fasting glucose in overweight populations. in overweigh, performing HIIT results in significant, positive, physiological editions that improve cardiometabolic health and may reduce the development and development of disease-related risk factors that are associated with overweight and low aerobic fitness. However, whether these metabolic adaptations following HIIT is favourable to normal weight populations still needs further scrutiny. HIIT may serve as a time-efficient additional or as a compliment to commonly recommended MICT in improving cardiometabolic health. Health practionersare advised to recommend HIIT performed for 12 weeks as part of their exercise programme to improve cardiorespiratory fitness and to reduce body fat in overweight/ obese populations.

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Conflict of Interest: Nil
Source of support:Nil